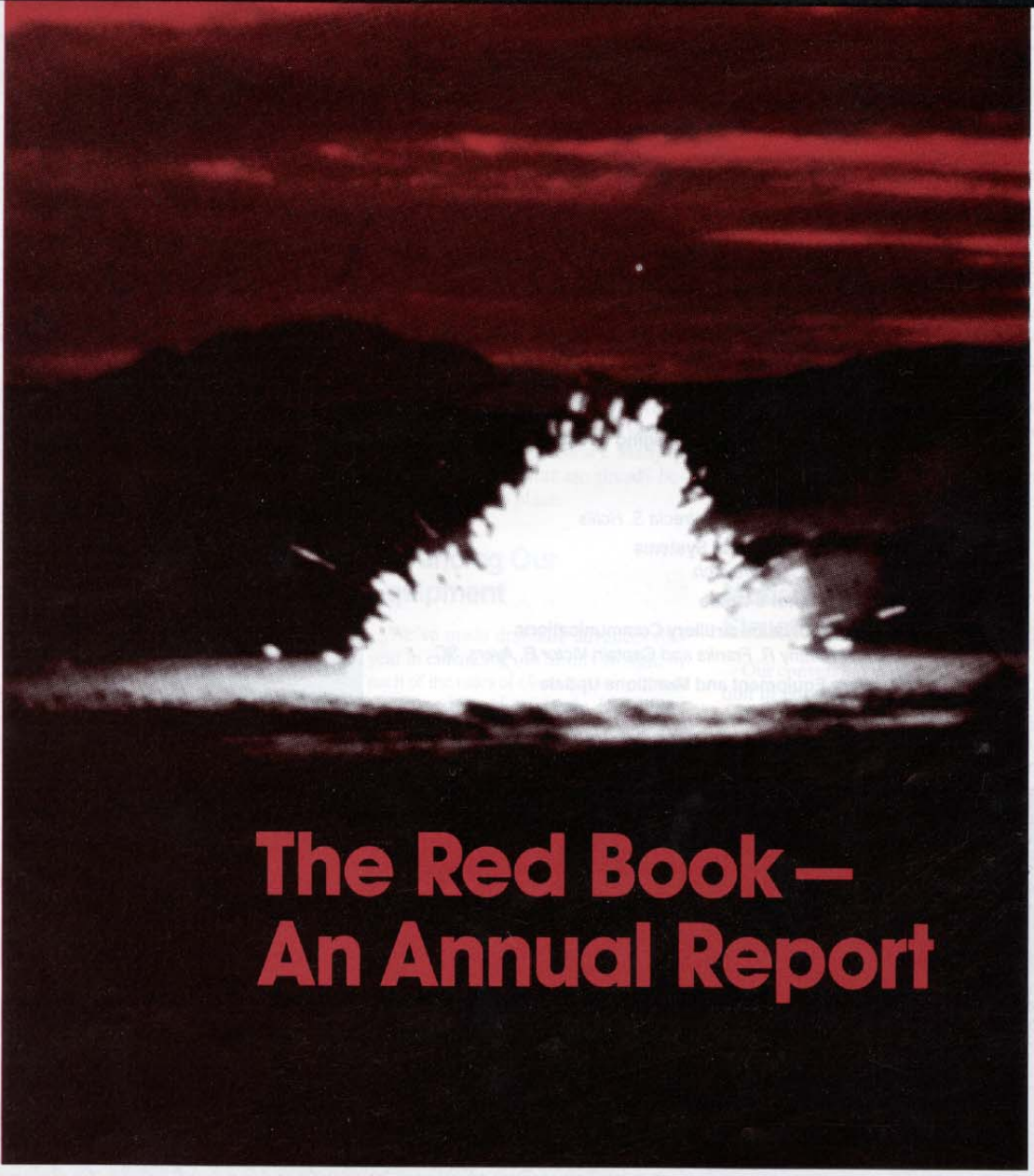




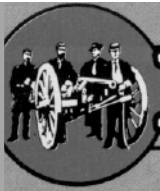
# Field Artillery

*A Professional Bulletin for Redlegs*

December 1989



## **The Red Book — An Annual Report**



# Field Artillery

A Professional Bulletin for Redlegs

December 1989

HQDA PB6-89-6

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**PURPOSE** (as stated in the first *Field Artillery Journal* in 1911): *To publish a journal for disseminating professional knowledge and furnishing information as to the Field Artillery's progress, development and best use in campaign; to cultivate, with the other arms, a common understanding of the power and limitations of each; to foster a feeling of interdependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country.*

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## The Danger of Instability

*A regime, an established order, is rarely overthrown by a revolutionary movement; usually a regime collapses of its own weakness and corruption and then a revolutionary movement enters among the ruins and takes over the powers that have become vacant.*

For Charles De Gaulle, From **Today and Tomorrow** (June 5, 1958).

If the recent events in Tiananmen Square, Poland and East Germany tell us anything, they tell us that the inherent weaknesses and corruption of communist governments force their eventual collapse. The communist states of our world are in varying stages of this collapse—most, though, are far from impotent.

The Soviet Union, with all its economic and political problems, is still marching inexorably toward a large, high-quality force. It's more threatening today than it has ever been. And as other political remedies become less and less effective, the Soviets and other communist states could decide to use their military might to retain control. What a dangerous time we face—a time when our preparedness for war may be even more important than it was during the Cold War.

Today we have a lean, ready force, thanks to the build-up in the Reagan era. But our strategic requirements for the year 2000 and beyond necessitate a continuing commitment by Congress to fund the force structure, hardware and training needed to assure that readiness for AirLand Battle-Future.

This annual report edition of *Field Artillery* offers both the reference material you've come to expect and overviews of the current state of our Branch. We hope these and our other features continue to serve you, the soldiers of the Field Artillery.

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*Field Artillery*



# Field Artillery State-of-the-Branch Address

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by Major General Raphael J. Hallada

**T**his year has been another exciting one for the Field Artillery—indeed, historic in many respects. We've continued to pick up the pace in modernizing our forces, enhancing training and leader development and advancing doctrine. In all respects, we've made great strides in improving our ability to provide fire support to the flexible, globally deployable forces of our Army and Marine Corps.

## Responding to the Threat

No matter what you may have read, the Threat still exists. The Soviet Union and Warsaw Pact remain very potent and dangerous, despite overtures of goodwill and openness on their part. Though there appears to be encouraging progress in East-West relations, we have all too clearly seen through this year's events in China that such progress carries no guarantees of continuance, let alone success. The military power of a number of Soviet surrogates and other potentially hostile nations of the Third World has continued to increase as well. Our mission thus remains, as ever, to stay vigilant and ready.

Fire support continues to be a key to effective conventional deterrence and our ability to win on the modern battlefield. Our importance is growing as our forces begin to move away from a reliance on theater nuclear weapons and assess the requirements of the dynamic future battle. Though today we remain quantitatively far outgunned by potential foes, we've begun moving to gain ground in the

critical effort of qualitative catch-up. Progress takes time, however, and the present reality of fiscal and manpower constraints increases our challenge.

The Fire Support Master Plan strategy is providing the azimuth in our joint development of the Fire Support Modernization Plan with the Department of the Army. The Mod Plan will establish the affordable and achievable objectives for the fire support system of systems into the 21st century. Many of the pieces of this effort are already beginning to fit into place.

## Advancing Our Equipment

We've made dramatic advances this year in enhancing our ability to fight in each of the roles of close support, counterfire and attack at depth. Highlights include the outstanding performance of the howitzer improvement program (HIP) in its operational test, the December fielding of the M119 extended-range 105-mm howitzer, our continued success in testing the Army tactical missile system (Army TACMS), and a successful concept evaluation of the advanced field artillery tactical data system (AFATDS), resulting in its approval for full-scale development.

## Enhancing Our Doctrine

Our new procedure of asking selected units to review our draft manuals, then return them to the Field Artillery School with one of their experts to assist in the final revision, is working well and has

resulted in some excellent products for the field.

Looking toward the future, we've been studying the roles and requirements for fire support as the Army's doctrinal concept evolves into AirLand Battle-Future. Of particular interest was the work of the Close Support Study Group IV, which focused on fire support in the brigade- and division-level fight and provided some excellent findings and recommendations for force structure, equipment requirements and doctrine for the present and into the next century. (See the article, "Close Support Study Group IV," in this edition.)

## Modernizing Our Force Structure

Our conversion to the 3x8 configuration in our 155-mm and 8-inch howitzer battalions and the resulting capability to conduct platoon operations is providing greater firepower, flexibility and survivability, while improving manpower efficiency. The 3x8 conversion is 90-percent complete in our active units. Reserve Component (RC) round-out units are converting with their division counterparts. Our remaining RC units will convert to platoon operations later as personnel and equipment become available.

The echelons-above-division (EAD) transition will begin shortly in Europe, replacing the aging and manpower-intensive 8-inch howitzers and Lance missile systems with the multiple launch rocket system (MLRS) in the corps artillery. The 8-inch units will convert directly to MLRS. Certain

Lance battalions initially are compressing from 3x2 to 3x4 organizations, and some eventually will convert to MLRS while others will inactivate. In the objective force, MLRS launchers will provide the preponderance of corps artillery firepower.

## Providing for Our Personnel

The Field Artillery is, above all else, *people*—high-quality soldiers and superbly competent leaders (supported and complemented, I should add, by a staff of outstanding Department of the Army civilians). Our Active and Reserve Component Redlegs today number more than 96,000, including 18,000 officers and 78,000 enlisted soldiers, who hold 15 military occupational specialties.

### Enlisted

Our soldiers are our most precious asset, and today's are indeed the best we've ever had. In the field, you're doing an outstanding job of retaining and promoting our good soldiers. The Field Artillery Training Center (FATC) with its dedicated professional cadre is producing top-notch, highly motivated, physically fit and proficient new soldiers for the total force and truly setting the pace for the Training and Doctrine Command (TRADOC).

Integrated field training exercises, job books that encourage new soldiers to progress beyond the required initial entry training tasks and the Fast-Track program for exceptional soldiers are just some of the efforts the FATC has instituted to produce a soldier who is better adjusted and more fully prepared to assume his duties with his first unit.

### NCOs

In this Year of the NCO, our sergeants, the backbone of the Field Artillery, have continued their excellence as the primary leaders and trainers of our soldiers. Professionally, our NCO ranks are healthy: reenlistment rates are good and our NCOs are successfully competing for promotion and school selections.

We have implemented a number of NCO education system (NCOES) initiatives in our institutional training (the basic and advanced NCO courses) that give the NCO a better opportunity to learn and experience his role as a combat leader. These include small group instruction, common leader training and

scenario-driven field training exercises.

### Officers

In the officer ranks, the Field Artillery is the second largest branch in both authorizations and actual numbers. (Infantry is the largest by a small number.) We are accessing high-quality lieutenants (more than 900 this year) and have seen an increase in the number of cadets stating a preference for the Field Artillery, both at West Point and in our ROTC programs.

The word is getting out that the Field Artillery truly provides opportunities and challenges for leaders and war-fighters. A major contributor to this trend is the field's outstanding support of the cadet troop leader training (CTLT) program and ROTC summer camp, as well as the interest in the Field Artillery that's being generated by our USMA and ROTC cadre members. Keep it up!

The restructured, two-phased officer basic course instituted in May of 1988 has been graduating technically and tactically qualified Marine and Army officers for more than a year. The new officer advanced course (OAC) with its small group instruction (SGI) methodology better prepares an officer to serve as a fire supporter, commander and staff officer. This month we graduate our third class under the restructured OAC program.

Responses from students, instructors and the field indicate we're definitely on the right track in both our initial and career officer courses. The reorganization of the Field Artillery School has been important to the success of these and all our institutional training courses.

An important point regarding officer assignments: fire support is the Field Artillery's province—it's our mission and our obligation to the Army. The officers assigned as fire support coordinators (FSCOORDs) and brigade fire support officers (FSOs) must be our best and brightest. Battalion command boards select our FSCOORDs, but responsibility for picking a brigade FSO lies with the field commander. Put your star players into this job. It's unquestionably one of the premier assignments for a Field Artillery major, and the promotion and school selection boards recognize this.

## Improving Our Training

Beyond the training base, our ability to fight and win on the modern battlefield will be directly proportional to the realism and quality of the training

conducted in our units. Here we're improving as well.

We're finally "breaking the code" at the combat training centers (CTCs) by analyzing fire support effectiveness, developing lessons learned and spreading the word. Your willingness to share your CTC experiences and innovations has been of tremendous benefit to the force overall.

We're also taking steps to further increase the impact of fire support in the CTC battle. Fielding the combined-arms training integrated evaluation system (CATIES) at the National Training Center, Fort Irwin, California, in the second quarter of FY 90 will accurately simulate the effects of indirect fires. The expanding use of other simulators is providing additional training opportunities in our resource-constrained world, and we're getting smarter by embedding training functions in our new systems, such as HIP and AFATDS.

The King of Battle *reigns*, and the nation is relying on our continued strength and modernization. We're making "dynamite progress," but we've got to keep our sleeves rolled up and keep on pushing.

The challenges we face are great and many, but the possibilities are exciting. As we move into the new decade and look forward to the next century, it's clear that now, as ever, the Future Belongs to the Field Artillery. **Let's have another great year.**



**Major General Raphael J. Hallada is Chief of Field Artillery and Commanding General of the US Army Field Artillery Center and Fort Sill, Oklahoma. He has spent more than 15 years in troop assignments in three divisions, including heavy and light, with two tours in Vietnam. In the 82d Airborne Division, Fort Bragg, North Carolina, he commanded the 2d Battalion, 321st Field Artillery, and the Division Artillery and served twice as Chief of Staff and as the Assistant Division Commander before commanding the Division for three months as a brigadier general. Among other assignments, General Hallada served on the Army Staff in the Office of the Deputy Chief of Staff for Operations and Plans, Washington, D.C.**

# Planning and Communications—

## The Keys to Long-Term Readiness

Interview by Major Charles W. Pope, Jr.

*As Congress sets the defense budget and looks for ways to decrease our national deficit, what advice would you give fellow lawmakers to help assure long-term strategic readiness?*

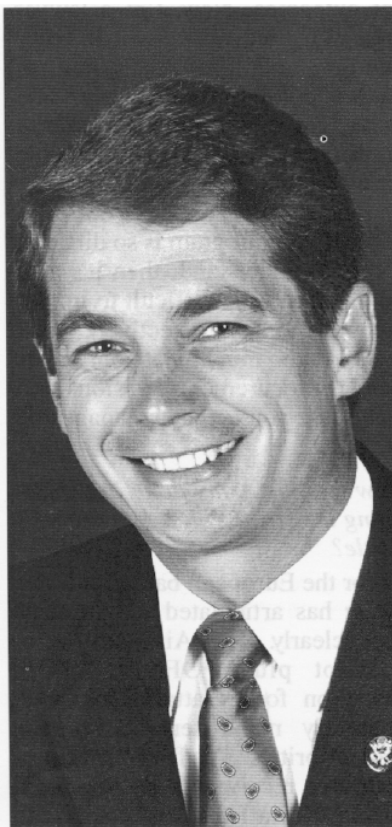
We need to ensure our defense budget is driven by policy considerations as opposed to parochial concerns—partisan politics, jurisdictional tiffs within the Department of Defense and interservice rivalries. The *policy* should be the primary consideration. And that means we need analysis and planning to develop that policy.

The way you put the first "P" back into the planning, programming and budgeting system (PPBS) is to start with a clear understanding of what the Threat is. I presented an amendment requiring accurate and objective net assessments and incorporating those into a planning phase. When the Department of Defense (DoD) and the Office of the Secretary of Defense (OSD) submit to Congress a five-year plan that's based on the Threat and that matches resources accordingly, then we're in a better position to sustain our strategic doctrine. It gives us the vision to overcome the jurisdictional issues. If you can do that, you have a better case to make to Congress and the country.

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**. . . the Army Caucus is a dialogue that simplifies and clarifies Army goals and objectives for us and, in turn, for the American public.**

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*As founder of the House Army Caucus, what is it and what does it do?*

It's an off-the-record forum that promotes interaction among Army officials, interested House Members and defense experts. The idea is to have better communications and look at conventional issues. Nationally, we spend a lot of time talking about strategic and "big-dollar" systems—the ones that have been the focus of arms control. But we sometimes ignore the conventional issues.

Conventional conflict is where you win a war or you don't, and you win a war with forces *on the ground*. You deter wars with forwardly deployed and rapid-deployment forces. It's important not only for us to understand the strategy behind current programs, but also to have some input into the development of those programs.

The benefit General [Carl E.] Vuono [Chief of Staff of the Army] and others have gotten from the Army Caucus is a dialogue that simplifies and clarifies Army goals and objectives for us and, in turn, for the American public. If you know somebody on a first-name basis, then you can pick up the telephone, call and say, "Tell me why you want this."

**The first net assessment we received from the Joint Chiefs of Staff also indicated that counterfire was one of the highest priorities and one of the greatest threats.**



*It often appears the Army gets the relatively "short end of the stick" in US military force modernization. Is this true? Why?*

The other services have done, quite honestly, a better job of marketing their strategies and their programs than the Army has. For some reason, people have a better grasp of what the Navy or Air Force does than they do of what the Army does. Because the Army does *so much*, the public loses sight of the individual programs.

*What can we do to fix that?*

It's not easy. Communication is key. The Army actually has been more reluctant to communicate with policy makers on Capitol Hill. The Army, by the nature of the institution, is historically conservative, and as one Rand study showed, it has been more inclined to take orders. "Good" soldiers don't go out and do those external things that, for some reason, the Navy, Marines and Air Force haven't been as reluctant to do—lobby for programs. We call it marketing, but it's a combination of lobbying and marketing.

Congress is cutting some programs we had major fights on. The Army should have been more articulate about heavy force modernization, for example. As is the case with most military, the Army briefers came to Congress with their charts and viewgraphs and presented a thick book trying to explain 17 types of chassis and configurations to get to four different outcomes. Now, I'm a lawyer and did graduate work in economics, and I'm not afraid of charts, but I looked at those and said, "No way in the world you're ever going to convince people based on that."

You've got to simplify your message. If your program is so difficult for us to understand, then it's also going to be very difficult to implement and manage effectively. Don't try to do too much. Get your hands around procurement decisions and make sure you've got a manageable program.

*How has the Army done in articulating the strategy for conventional battle?*

For the European battlefield, the Army has articulated the strategy very clearly. The AirLand Battle concept plus FOFA [NATO's follow-on forces attack doctrine] obviously make sense and give clear priorities. The first net assessment we received from the Joint Chiefs of Staff also indicated that

**We need to demonstrate more flexibility and improve our capabilities in . . . low-intensity conflict.**



counterfire was one of the highest priorities and one of the greatest threats. So, yes, for the European battlefield, we have a clear sense of strategy.

That's where we've been preparing to fight for 40 years. We had good guys and bad guys, a line and a front. We knew how many tanks and aircraft they had and how they modernized. We generally had an understanding of not only their order of battle, but also of their logistical support—the whole nine yards. The Army prepared for a "Super Bowl."

In the mid-80s, all of a sudden we started having some "scrimmages" with different adversaries we'd never prepared for because we

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**. . . to reduce the defense budget without a clear strategy is dangerous.**

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were getting ready to meet the Bears. And all of a sudden they killed 243 Marines in Beirut, and they did unconventional things to us. They got our attention. Vietnam wasn't the Super Bowl—it wasn't a good contest.

So, we do the *big things* very well—we can play in the ultimate conflict. But we need to demonstrate more flexibility and improve our capabilities in unpredictable areas where we need a more rapid response—low-intensity conflict.

*With the entire spectrum of conflict to cover, where do we take cuts?*

Although I'm fiscally conservative and want to reduce the budget, to reduce the defense budget without a clear strategy is dangerous. I also thought that doubling the defense budget in the last 10 years without a clear strategy was stupid or, at least, not very wise.

I'd like to have a little more coherent plan of how to reduce our armed forces if we have to. But we don't have that luxury, and the perception of the Threat has changed much more rapidly than the Threat itself. Accordingly, we have to look at our priorities.

I would have preferred that we first go through the arms control process completely and then design forces to meet that changing environment. But that may not occur.

The reason it's not occurring is you've got people who are concerned about their own interests. They're all for peace, and they want to see a reduction in hostilities. However, if you take people away from their economies, that becomes a different consideration. That puts burdens on Congress.




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**. . . the perception of the Threat has changed more rapidly than the Threat itself.**

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If I were cutting—and we're going to have to—my preference would be first to protect individual soldiers' benefits and incentives. Secondly, I'd protect readiness. We can't afford to go back to the 1970s where we were scavenging systems to support other systems. Third, I'd protect long-range research and development. If you cut that short now, then you won't be able to respond as well in the future.

And the fourth and last would be procurement. We went through a major modernization and procurement effort in the 80s, and if we have to slow down anywhere, I'd say we'd probably have to slow down there.

*Do you think Congress will continue to support a strong US military presence in Europe? Korea? Why or why not?*

We'll have force structure reductions overall. If things go according to the trends in the conventional forces drawdown (CFD), there's a strong possibility we could see reductions in the total US forces in Europe. How much, I don't know. What timeframe, it's again unknown—probably not for four or five years. Will we decouple and leave Europe totally? No. The Intermediate-Range Nuclear Forces Treaty (INF) was probably the first step toward reductions.

The same trend holds in Korea, with a different timetable, though. If China hadn't gotten off track with the June 4th massacre in Tiananmen Square and if North Korea were not such a dictatorial country and so unpredictable, we might have been able to set a clearer timetable.

It's obvious in each of those situations the host countries are going to have to do more. Koreans are pretty well-prepared, and there's a lot to be said for most of the Allied forces in Europe. I think we may end up shifting some of our equipment over to them on the front lines and take a more rapidly deployable role—be the backstop. That may change.

*Because the Soviet-Warsaw Pact artillery clearly outnumbers ours and those of our European Allies, the Office of the Secretary of Defense Science Board met in 1988 to study ways to counter this threat. The Study reported a severe shortage of US artillery. What should we be doing to moderate this shortage?*

The Defense Science Board (DSB) Study was buried. I brought it back and started using it in conferences over the budget, trying to raise its points more and more. I think Congress is aware that it's a very harsh reality.

***The CINCs will tell you what's required logistically and what they want on the battlefield.***

Unfortunately, artillery is just not a high priority. It doesn't appear as "sexy" as intercontinental ballistic missiles or stealth bombers, and that's a battle we continue to have to wage.

MLRS [multiple launch rocket system] has helped; it's a real success story. MLRS has given us a little more edge. It has greater potential to change that correlation of forces than any system in the Army today.

*A key system in the Field Artillery Master Plan is the M109 howitzer improvement program (HIP), which we'll use to replace our 25-year-old M109 howitzer fleet starting in late 1991. What priority for funding and development should Congress give the HIP?*

The biggest problem I have and the Army has is trying to explain what HIP is to the Congress. When you deal with the federal budget of a trillion dollars, the defense budget is only 300 billion dollars, and you're trying to make a decision on airplanes that cost 500 million dollars apiece, improving an artillery weapon often doesn't make the cutoff.

Our challenge is to try and get that information beyond the staff level in front of the Members.

*Should the Joint Chiefs of Staff [JCS] take a more active role in setting priorities for all services?*

In spite of the loyalty I have for the green suiters, the purple suiters [decision makers in joint billets] are going to have to be more involved. Congress is going to have to give more power to the Chairman to set those priorities and give greater authority to the CINCs [commanders-in-chief in the field].



***The hyper-velocity kinetic energy missile (KEM) offers the greatest long-term payoff for the Army.***

The CINCs will tell you what's required logistically and what they want on the battlefield. They're more inclined to say, "Give me some more artillery support," as opposed to saying, "Well, I'm an Armor man, I can take care of it all myself." That's an important overview we need.

*From your perspective as a member of both the Research and Development and the Science, Space and Technology Committees, which of our new technologies will have the greatest impact on the Army? How?*

The hyper-velocity missile, in my opinion, offers the greatest long-term payoff for the Army. When you look at Soviet counter-measures, reactive armor and some other developments, our ability to kill armor becomes more important. And even though I've been a big supporter of SADARM [sense and destroy armor] and other types of top-down killing

systems, the best advantage we could have right now would be to have something that can't be duplicated. We've got to make it work. We're within engineering range now, and we've proven the technology.

The kinetic energy missile, KEM, is a hyper-velocity missile and the fastest thing in the atmosphere today. And instead of penetrating a tank, it knocks the turret off. That's the kind of overmatch we need.

*If you could send a message to US Field Artillerymen around the world, what would that be?*

You're doing a good job! Keep it up. You have a vital mission. I pray to God we never have to use you.

There's a pay raise coming. It's not the best in the world, but it's the best we could get in this kind of environment.

Fort Sill has fared well vis-a-vis the other Army posts—very well. If anything, Fort Sill will continue to grow. You need to be proud of what you've accomplished and recognize that Fort Sill and the Field Artillery have a great future.



**The Honorable Dave McCurdy, a Democrat from Norman, Oklahoma, represents Oklahoma's Fourth District in the US House of Representatives. He's a member of the House Armed Services Committee, where he's the second-ranking Democrat on the Research and Development Subcommittee on Military Installations and Facilities and the Committee on Science, Space and Technology. In addition, he's the second-ranking Democrat on the House Permanent Select Committee on Intelligence. Congressman McCurdy is founder and Chairman of two groups aimed at national defense policy debates: the Task Force on Foreign Policy, an arm of the Coalition for a Democratic Majority, and the House Army Caucus, an off-the-record forum for Congressmen, Army policy makers and defense experts. He's a Captain in the Air Force Reserve.**

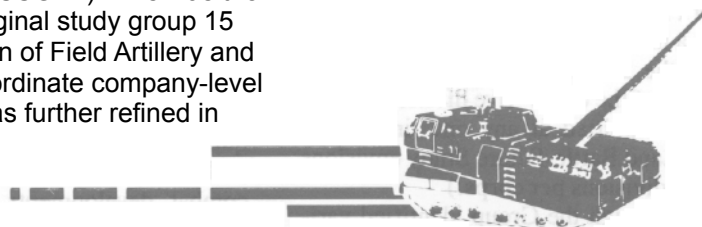




# Close Support Study Group IV

by Major (Retired) Edward J. Stiles

In December of 1988, the Commandant of the Field Artillery School directed we convene Close Support Study Group IV (CSSG IV). This was the fourth in a series of such efforts that began with the original study group 15 years ago. That 1974 study resulted in the consolidation of Field Artillery and mortar observers into a single team to observe and coordinate company-level fire support. The fire support team, or FIST, concept was further refined in subsequent close support studies in 1979 and 1984.



**M**ajor changes have occurred since 1984, and even more changes are coming as the Field Artillery moves into the 1990s and beyond. New weapons and acquisition systems will combine with the emerging doctrine of AirLand Battle-Future. These impending changes warranted the convening of this latest close support study group.

The Study Group was formed with a nucleus of members from the Field Artillery School. Other service schools and agencies were represented by dedicated points of contact. The Study was a six-month effort, including two one-week sessions that brought the other representatives to Fort Sill. A general officer steering committee comprised of assistant commandants of the

schools involved and selected assistant division commanders provided oversight.

Whereas the focus of previous study groups was on the company and battalion levels, CSSG IV concentrated on brigade- and division-level issues. It examined literally hundreds of issues during the study, with emphasis on counterfire, future Field Artillery force design, the non-line-of-sight (NLOS) system, heavy mortars and requirements for fire support personnel and facilities.

## Counterfire

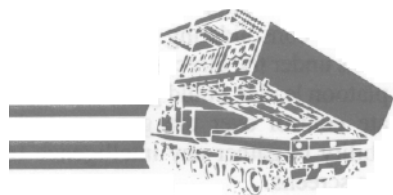
A driving factor behind the Study Group's efforts was the recognition of the importance of achieving fire superiority over the enemy. The Group addressed a number of issues in the area of counterfire and, in particular, the importance of proactive instead of reactive counterfire.

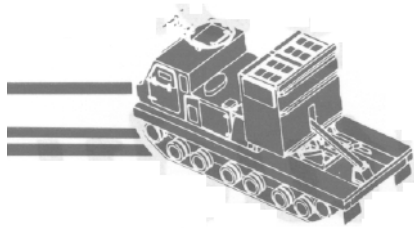
In its report, the Group emphasizes the importance of attacking enemy fire support before the enemy can engage

our forces. It identified counterfire as a shared responsibility, with the division artillery the focal point, and surfaced the importance of developing systems to acquire enemy artillery before it fires.

## Force Design

In conjunction with the AirLand Battle-Future Study Group at Fort Leavenworth, Kansas, and Fort Sill's Directorate of Combat Developments, CSSG IV concentrated on identifying the Field Artillery force design for the year 2004. The AirLand Battle-Future artillery force for the heavy corps proposes a multiple launch rocket system (MLRS) battalion for each division artillery, a reinforcing brigade with two MLRS battalions and a cannon battalion for each division, and a general-support brigade with three MLRS battalions and a cannon battalion for each corps. The cannon units would have the advanced Field Artillery system, cannon (AFAS-C).





## Field Artillery Brigades

The CSSG IV examined the AirLand Battle-Future artillery force design with respect to the distribution of cannon and rocket battalions and the command and control (C<sup>2</sup>) of those battalions. A major issue for the Group was the requirement for Field Artillery brigade headquarters. The Group was directed to look at reducing the number of Field Artillery brigade headquarters in a heavy corps from six to four, based on the assumption that no more than three of the corps' five divisions would be committed at any one time. (The AirLand Battle-Future Study envisions five divisions per corps.)

Although the Group identified various options for employing a corps with a reduced number of Field Artillery brigade headquarters, it concluded that the relatively minimal force-structure savings didn't warrant the operational losses. Having fewer Field Artillery brigade headquarters would reduce the relationship between the division artilleries and the brigades and would drastically reduce the corps commander's flexibility.

## DS Battalion Organic to the Maneuver Brigade

The Group examined an issue surfaced several times in the past—making a direct-support (DS) Field Artillery battalion organic to the maneuver brigade. After considering the pros and cons, the Group and the general-officer steering committee unanimously agreed it wasn't a viable option. The Group identified a number of drawbacks in the areas of C<sup>2</sup>, logistical support and training. It also considered the loss of flexibility associated with decentralized artillery control.

## Dissolve TABs

The Study Group looked at how best to organize Field Artillery target acquisition assets, specifically the target acquisition battery (TAB) and its Firefinder radars. The final recommendation was to dissolve the TAB and organize the required assets under the headquarters and headquarters battery of the division artillery. This restructuring would ease the C<sup>2</sup> problems of the division artillery, which currently has three batteries in its headquarters.

## Firefinders for Corps Artillery

Another recommendation in the area of target acquisition was that we give corps artilleries Firefinder radars. This recommendation took into account the planned replacement of Q37 radars in the division, making the equipment available for employment in corps units. These radars would provide the corps dedicated assets to meet its requirements and robustness for the limited radar assets of the divisions. The combat developments community is looking at the possible implementation of this recommendation, taking into consideration radar maintainability and manpower.

## NLOS

A major portion of the Group's study focused on the non-line-of-sight (NLOS) system. The NLOS is an indirect-fire, fiber-optic guided missile with either a television or infrared sensor in the nose. The gunner controls the missile by monitoring the picture sent back via the fiber-optic cable and sending commands back to the missile.

The NLOS is currently an air defense program but is expanding to include fire support organizations. Both air defense and fire support will use the same basic system, which consists of missiles with antitank warheads. Launchers will be on either light wheeled vehicles for light forces or on tracked carriers for heavy forces.

## NLOS Proponency

The Study Group looked at how and

where to employ NLOS, how to organize it and who should be the proponent for the antitank version. The Group was impressed with the projected capabilities of NLOS and saw a definite need for the system.

Analysis pointed to NLOS as a complementary fire support system with a primary role of defeating high-payoff point targets, such as the lead vehicles of columns, bridging equipment and C<sup>2</sup> centers. Since NLOS employment demands close integration with other fire support assets and management of air space, the Group recommended the Army employ NLOS as a fire support system under the control of the Field Artillery. Considering its range and C<sup>2</sup> requirements, we should employ NLOS as a brigade-level system.

## NLOS Organization

From an organizational standpoint, the Study Group considered alternatives ranging from placing NLOS in "E" Company of the mechanized infantry battalion to a separate battalion in the division artillery. As a starting point, the Group considered 36 antitank NLOS launchers per division, the number of launchers derived during the AirLand Battle-Future (Heavy) Study. The Group concluded we should organize NLOS into one 12-launcher battery for each maneuver brigade and integrate them into the Field Artillery structure.

## NLOS Control

The initial NLOS launcher design calls for the gunner's station to be in the launch vehicle. There was concern that this arrangement might not provide enough control for NLOS attacks and wouldn't capitalize on the intelligence by-product of the system. As a result, the Group recommended consideration of other options or follow-on improvements. These included providing remote video or remoting the gunners' stations to a central C<sup>2</sup> point.

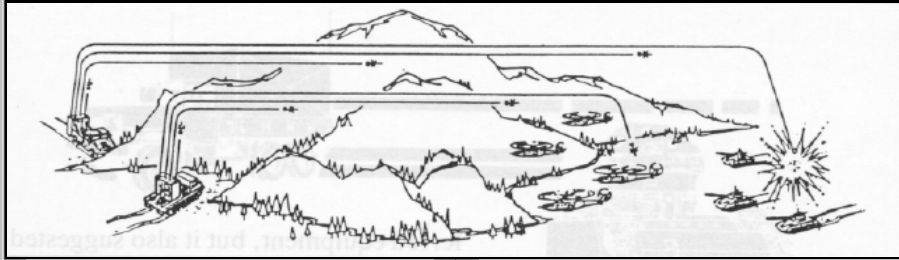
In the case of the remote video, the platoon leader could control his gunners by viewing the same picture as at the launchers and observe and report intelligence information. The alternative of consolidating the gunners' stations under the direct supervision of the platoon leader would give him immediate control over the gunners and the ability to gather any intelligence from the screens.

## NLOS FOG-M

**O**n 28 November 1988, the Army Missile Command awarded the contract for the non-line-of-sight (NLOS) system to the team of Boeing Military Aircraft of Huntsville, Alabama, and Hughes Aircraft of Canoga Park, California. The Air Defense Artillery is the lead proponent for development of the NLOS system. The Field Artillery is the associate proponent with responsibility for fire support applications.

The NLOS fires the fiber-optic guided-missile (FOG-M) to attack enemy helicopters, tanks and other high-value targets, complementing existing and planned weapons. When fielded in the mid-1990s, this system will allow an Army gunner to attack enemy helicopters and armor masked by terrain or hidden from line-of-sight. We can employ the system from concealed positions and launch it vertically to enhance survivability. Additionally, it can fly a route to the target around terrain features below cloud ceilings.

The FOG-M derives its name from the spool of optical fiber that plays



out behind the missile as it travels down range to the target. The operator receives images at his gunner's station through the fiber-optic cable as transmitted from a tiny video or infrared camera in the nose of the missile. The gunner, looking at a TV-like monitor, can guide the missile to attack targets hidden behind hills or a line of trees or simply out of the

field of view of direct observation.

The NLOS, employed in the fire support role, should add significantly to our ability to attack ground targets in support of the maneuver brigade commander's concept of operation. To optimize NLOS, we must integrate it with other fire support systems and use existing target acquisition means.



## Mortars in Heavy Forces

Close Support Study Group IV was charged with looking at ways to maximize the capabilities of mortars and better integrate their fires. The Group focused on the heavy mortars in the armor and mechanized infantry battalions. Each of these battalions has a platoon of six 4.2-inch mortars, which are scheduled to be replaced by 120-mm mortars. Although the Group didn't address the light (60-mm) and medium (81-mm) mortars of the light forces, it did take them into account when examining the heavy-mortar issues.

## Mortar Proponency

One of the primary missions of the Study Group was to recommend whether or not the mortars should be transferred to the Field Artillery. This issue was

generated because of the overlapping capabilities of mortars and cannons and the similarities in employing the two systems. Additional impetus for looking at this issue came from consideration of the relatively low density of the mortar crewman specialty and indications from the National Training Center that mortars were not performing well.

From the standpoint of training, MOS structure and materiel development, the Group concluded there could be some advantages to making the Field Artillery the proponent for mortars. However, in considering the total issue, to include the possible impact on Field Artillery specialties and the turmoil of shifting the training bases, the Study Group concluded mortars should remain an Infantry system.

## Mortars' Heavy-Force Mission

Unquestionably, one of the toughest issues the Group addressed was the mission of mortars in heavy forces. It considered the contribution of mortars to the heavy battle and possible alternatives for meeting mortar requirements.

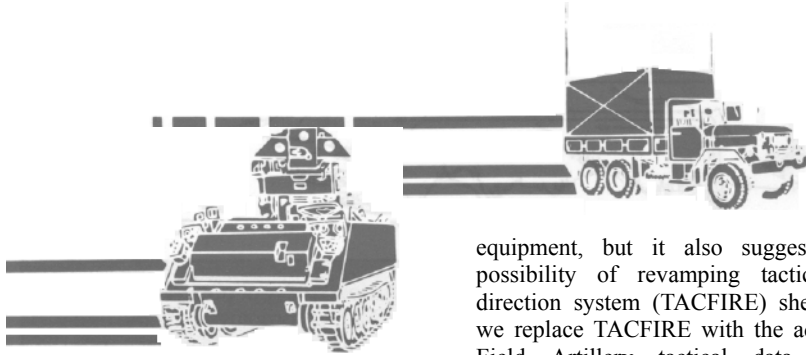
The Group concluded there's a

requirement for heavy mortars on today's battlefield. However, it also recommended that the Combined Arms Center at Fort Leavenworth, Kansas, take the lead in examining the requirement for mortars in heavy forces as we move into the AirLand Battle-Future environment of the 21st century.

## Mortar Effectiveness

In addition to the big issues surrounding mortar proponency and the requirement for them in heavy forces, the Study Group looked at several possibilities for improving mortar effectiveness. These included everything from consolidating mortar platoons in the brigade to improving automation support.

The Group didn't recommend drastic changes to the mortar system; however, it did recommend several fixes, to include developing an improved mortar ballistic computer, buying illumination for the 120-mm mortar and completely reviewing mortar training. On the training issue, the Group recommended a joint Infantry, Armor and Field Artillery study with the Infantry School's taking the lead.



## Requirements for Fire Support Personnel and Facilities

Previous close support study groups had concentrated on the organization and employment of FISTs and fire support sections. Although this wasn't the focus of Close Support Study Group IV, it did identify and address a number of issues in this area.

### Upgrade Heavy Brigade FSEs

Heavy brigades fight with a main command post (CP) and a tactical CP. Although the configuration of the tactical CP varies from unit to unit, it's generally one or two CP carriers accommodating operations and, in some cases, intelligence personnel. Fire support isn't organized to provide support for this tactical CP; we support the fire support element (FSE) at the main CP and have only a limited capability for the fire support officer (FSO) to go forward.

The CSSG IV identified the need for a dedicated fire support capability at the tactical CP. To do this, it recommended adding a tracked CP carrier with automation and communications equipment and increasing the brigade fire support section by three soldiers. The Study Group also recommended providing the DS battalion commander a tracked vehicle to accompany the brigade commander when he goes forward.

### Tactical CP for the Division Artillery

The Group identified a requirement for a tactical CP for the division artillery. Such a CP would provide more mobility and survivability and an alternate CP for the critical division artillery functions. The Group recommended tracked CP carriers as the preferred

equipment, but it also suggested the possibility of revamping tactical fire direction system (TACFIRE) shelters as we replace TACFIRE with the advanced Field Artillery tactical data system (AFATDS).

### Aviation Brigade FSOs

As the Study Group examined fire support in the combat aviation brigades, it reaffirmed the requirement for fire support sections to augment these units. It also identified the need for FSOs to operate from the battalion and brigade commanders' C<sup>2</sup> helicopters.

### Division Rear FSE

Under current plans, there will be a dedicated division rear tactical operations center (RTOC). Manpower and equipment for this RTOC will come from Reserve Component organizations, which join the division when it deploys.

The Study Group recommended, however, that the division artillery man and equip the FSE of the division RTOC. This would provide a full-time rear FSE capability. Upon deployment, Reserve Component assets could bolster the main FSE.

### Scout Platoon Observers

Recognizing the importance of reconnaissance and counterreconnaissance led the Study Group to conclude we need a dedicated, high-technology fire support observation capability for the battalion scout platoons. It recommended a three-man combat observation lasing team (COLT) for a Bradley-equipped scout platoon or possibly two, two-man COLTs if scout platoons have high-mobility multipurpose wheeled vehicles (HMMWVs). Decisions in this area are pending the completion of the ongoing scout platoon tests.

### Mechanized Infantry Company Observers

The Study Group spent a considerable amount of time analyzing options

for providing fire support observation for the heavy company team. Specifically, it took on the challenge of determining the requirement for forward observers in mechanized infantry platoons.

Although analytical models indicate platoon forward observers in mechanized infantry have limited effectiveness, the Group took into account the requirement for these platoons to conduct dismounted operations.

One alternative studied was adding a dedicated four-man COLT to each mechanized infantry company. This COLT would provide a better overall observation capability, permit bounding movement of fire support observation and provide redundancy for the FIST headquarters. The four-man crew, together with the FIST headquarters, would allow us to field platoon forward observer parties, as required. The Study Group didn't resolve this issue, which has been carried forward for further analysis.

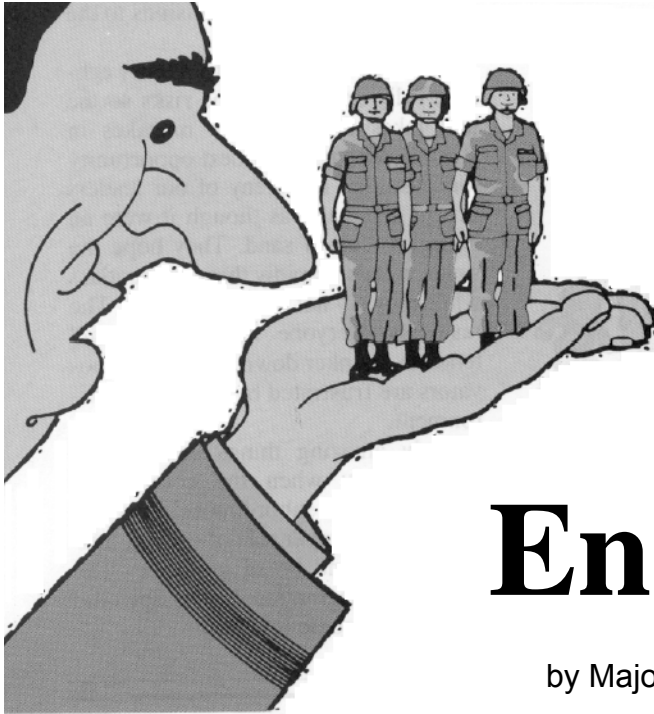
## Conclusion

These are but highlights of the literally hundreds of issues addressed by the Study Group. The results of the Study were presented to the commandants of the Training and Doctrine Command schools in May and to the Commanding General of the Combined Arms Center in June. The issues, findings and recommendations are being published in the final report and will be forwarded to the various schools and centers for use in the combat and training developments processes.

Though the scope of the fourth in this series of study groups was considerably expanded, the goal remained as it has been since the inception of the first close support study group—to provide the best possible fire support to the maneuver commander.



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# Creating the Command Environment

by Major General Robert F. Ensslin, Jr., ARNG

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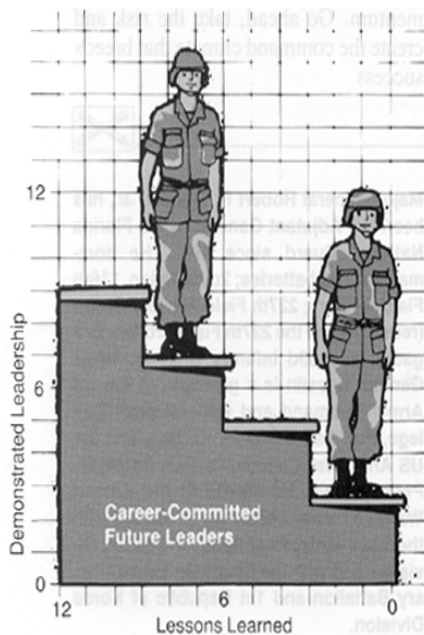
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**Mistakes should be stepping stones, not tombstones . . .**

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**A**s you move through assignments in a military career, you realize how completely the commander is responsible for the leadership environment of the command. Tense or relaxed, ambitious or plodding, authoritarian or persuasive—the personality of a unit usually reflects that of the commander.

A visionary commander should create an environment that allows room for soldiers to fail, one that fosters innovation and encourages people to reach beyond any past accomplishments. A leadership environment that can't tolerate failure makes soldiers timid and reluctant to risk. Mistakes should be stepping stones, not tombstones, for our career-committed future leaders. Those lessons we learn from our mistakes are indelibly scorched on our memory and serve us for a lifetime.

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**A leadership environment that can't tolerate failure makes soldiers timid and reluctant to risk.**

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## Lacking Confidence

Some leaders lack the confidence to suffer a failure of any kind. Those who are comfortable with responsibility know the key to success is to prevent the *recurrence* of mistakes.

The "zero defects" mind-set leads to efforts to reduce exposure. A reduction of ammunition expenditure or flying hours or almost any cut in operations intensity will reduce accidents commensurately, at least in the short-term. Over time, however, skills diminish and safety suffers. The football team that reduces practice time to reduce injuries will not only lose the keen edge of timing, but also will lose the high level of fitness that's the best protection against the "bugaboo" of disabling injuries.

## Learning from Mistakes

When I commanded a separate brigade in 1980, I addressed my officers in the post theatre on the eve of a 15-day training cycle. I explained we were there to make mistakes because that was the way we'd learn. I wanted us to

make those mistakes at a training post, not in combat. After the officers call, my Exec expressed great concern that I had created the impression I'd accept mistakes and tolerate less than a professional standard of performance.

My response was that he heard me perfectly but had understood me not at all. This particular Exec had grown up in an organization of leaders who always performed well but never attempted anything beyond minimum requirements. His leaders did only those things they were damn well sure would make them look good.

## Going for It

On the other hand, I came from five years of commanding an artillery brigade whose greatest motivation was tackling things we hadn't done before and didn't know for sure we could do. One of our battalions was the first to have firing batteries successfully complete an external Appendix "C" Army training and evaluation program (ARTEP), something that was quite intimidating at that time. In fact, we helped to validate the ARTEP as it was being developed.

## The Problem

At about the same time, we were quite concerned about the mobility of our tactical operations center (TOC) as our initial war-plan missions would probably be as force artillery for the covering force. An ability to "shoot and scoot" was vital. We were training at Fort Stewart, Georgia, and asked the 24th Infantry Division Artillery to show us its operations center. It did us one better by setting up its TOC on the parade ground across from our headquarters.

As you might expect in a heavy division, the Div Arty's complex arrangement included several general-purpose medium and small tents and took almost all day to erect. It was well-thought-out and had several nice features, but it definitely wasn't for the covering force.

## The Staff Challenge

My instructions to my staff were to start with a blank page and use their best imaginations to create a system that met our mobility requirements, using only the gear that we had available. Their ideas were coalesced and coordinated by our Senior Army Advisor,

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**. . . challenge the staff and then get out of the way.**

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Colonel Buck Jones, into a field standing operating procedure (FSOP). We used two expandable vans and one standard van joined by fabricated ramps and blackout curtains. One expando became the "jump" TOC when we displaced, and the FSOP identified every displacement task for every soldier. We took our mobile TOC to the field and, in front of everyone from the readiness region commander to the Commanding General of the 24th Infantry Division and the Adjutant General of Florida, gave our operations center a thorough test.

We displaced our TOC 18 times in six days and nights. The first few times were a struggle, but by the end of the week, we were able to displace. We were prepared to meet our covering-force mission requirements and maintain command and control of four artillery battalions while doing it. The key had been to challenge the staff and then get out of the way.

## Accepting the Risk

A micro-management command style that can't tolerate failure leads every echelon of leadership to perform the functions of the echelon below it. The net result is no involvement of lower-grade soldiers and minimum lessons

learned. The concept of "power down" allows subordinates to grow because senior leaders are willing to accept risk. There can be no genuine team building in an organization unless the commander pushes decisions to the lowest level possible.

Power down works only if every echelon fully understands the risks so the unit takes the inevitable mistakes in stride, creating the widest opportunity for learning. Too many of our leaders accept command as though it were an hourglass full of sand. They hope the sands will run rapidly through the glass while they try not to rock the boat. The result is everyone in the command tends to "hunker down," and the innovators are frustrated by a stifling environment.

Truly amazing things can happen very quickly when the commander quits doing his subordinates' jobs and sticks to his proper role of issuing mission orders and broad guidance. The abundant imagination of our splendid soldiers can come into play.

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**Success feeds on success—once you establish the momentum.**

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The excitement of risk-taking compounds the satisfaction of success for those who have the courage to accept the exposure. Success feeds on success—once you establish the momentum. Go ahead, take the risk and create the command climate that breeds success.



**Major General Robert F. Ensslin, Jr., has been the Adjutant General of the Florida National Guard since 1982. He commanded two batteries; 2d Battalion, 116th Field Artillery; 227th Field Artillery Group (redesignated the 227th Field Artillery Brigade); and 53d Infantry Brigade. Major General Ensslin is a graduate of the US Army Command and General Staff College, Fort Leavenworth, Kansas, and the US Army War College, Carlisle Barracks, Pennsylvania. He served in the Korean War as a forward observer in combat with the 32d Infantry Regiment, 7th Infantry Division, and with the Ethiopian Expeditionary Battalion and 1st Republic of Korea Division.**

## I Corps Artillery

The soldiers of I Co support "America's Corps," the First US Corps, providing the Corps Commander the firepower and fire support coordination he needs to win a decisive victory on the modern battlefield. Prepared to fight under multiple war plans, I Corps Artillery may be called on to take charge of one Active and five National Guard artillery brigades in operations in the Pacific or a similar size formation in operations to counter a Warsaw Pact offensive in Europe. Whatever the job, the soldiers of I Corps Artillery stand ready.

Headquarters, I Corps Artillery is part of the Utah National Guard in Salt Lake City and is the command and control artillery headquarters for 24 FA battalions—Active, Reserve and National Guard. Our Field Artillery brigades are located throughout the US, from Wisconsin to Arizona and from Wyoming to Missouri. As a National Guard unit so closely integrated with both Active and Reserve forces, I Corps Artillery is truly the "One Army" Corps.

### Past Year Training

During the past year, I Corps Artillery has stayed busy honing its tactical and technical artillery skills. Elements of the Corps Artillery supported the I Corps exercises Cascade Peak in Fort Lewis, Washington; Yama Sakura in Japan; and Team Spirit in Korea. In addition to these commitments, I Corps Artillery regularly provided support to our associated FA brigades as they conducted CPXs and FTXs. Whether Reserve or Active, the soldiers of I Corps Artillery are professionals and aware of the trust placed in them to make ready a mighty hammer for use in defense of their nation.

### Fire Support Conference

In January 1990, I Corps Artillery will host the Eighth Annual I Corps Fire Support Conference, to be held in Salt Lake City. As in the past, representatives of all I Corps maneuver commands, FA brigades, Div Artillery headquarters and many of the I Corps Capstone trace units will participate. The Conference will address pressing fire support concerns in I Corps, ranging from logistical problems to special weapons employment. Maneuver



CPXs and FTXs keep I Corps Artillery on the cutting edge of fire support development.

and supporting arms commanders will meet to discuss all topics, with the aim of improving all aspects of fire support for the Corps.

### Upcoming Challenges

The upcoming year promises to be a challenging and fruitful one. All I Corps Artillery soldiers are dedicated to their ultimate mission, that of providing timely, accurate and effective fire support for America's Corps. All training will be directed toward refining and sustaining the varied skills needed to accomplish this vital mission.

We also will continue our program of modernizing our brigades and battalions with tactical fire direction system (TACFIRE) equipment, the battery computer system (BCS) and secure-voice equipment as it's passed from the Active to the Reserve Components. As the

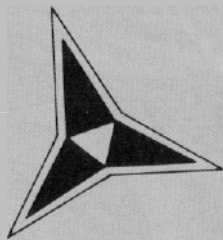
equipment, training and readiness of I Corps Artillery continue to improve, we'll be better able to attack the full range of targets for the Corps with conventional, chemical and nuclear munitions and fight throughout the battlefield with decisive firepower, including attacking deep targets and protecting the rear area.

I Corps Artillery is proud of its accomplishments and looks to the future with vigor and optimism. The soldiers of I Corps Artillery will continue to send the message that we're ready and able to accomplish our wartime mission. Our aggressive approach to training, participation in overseas deployment training (ODT) exercises and Corps-level CPXs and FTXs and the continued support of our associated brigades will keep I Corps Artillery on the cutting edge of fire support development. And, as always, we'll be **On Time—On Target!**



A M109 battalion conducts annual training.

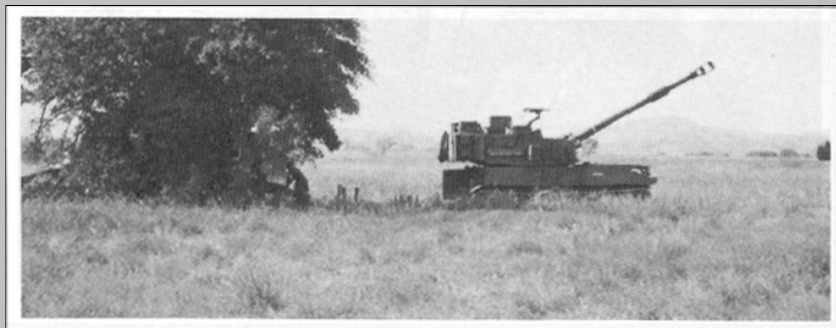
## III Corps Artillery



C/6-32 FA unloads a Lance missile for the annual service practice at White Sands.



HIPs fired up to 250 rounds per tube per day in surge operations testing, even in MOPP4.



The semi-autonomous HIP—no aiming circle, no collimator, no yelling. The *only* way to go!

**T**he III Corps Arty, Fort Sill, Oklahoma, had a challenging and rewarding FY 89. Readiness to deploy, fight and sustain continued as the III Corps Arty's primary focus, but our collocation with the Field Artillery School and Center offered many other unique opportunities.

### Reorganization

The 214th FA Brigade, a previously non-deployable unit, was assigned a wartime mission and given a Capstone alignment. This action generated a reorganization of the Brigade to adapt to this new deployable mission.

### Cannon NTC Rotations

Our cannon battalions continued their deployments to the NTC. Whenever a III CORTRAIN division deployed to the NTC, III Corps Arty was part of the standard support "package." Our cannon battalions participated in 10 rotations with at least a battalion operations and intelligence section. For all of these rotations, our units deployed to CORTRAIN unit home stations to conduct training in preparation for the three-week NTC rotations.

### Rockets and Missiles

The Corps' deep-attack assets have remained equally focused on their wartime deployment mission. The two Lance battalions, 6-32 FA and 1-12 FA, both had successful deployments to annual service practices at White Sands, New Mexico. Corps Arty continued its

support of training and deploying the Volatic Lance Battery to Korea.

The 3-9 FA (Pershing) has fired its last Pershing II missile. The Battalion is currently undergoing a conversion to the second multiple launch rocket system (MLRS) battalion in the Corps. Under the provisions of the Intermediate-Range Nuclear Forces (INF) Treaty, the Battalion has twice been inspected by a verification team from the Soviet Union. Both inspections found the 3-9 FA and Fort Sill completely prepared and in compliance with the Treaty.

### Capstone Conference

The Corps Arty commander hosted the first III Corps Arty Capstone Conference in late 1989. This Conference, held at Fort Sill, was a tremendous success. Commanders and staff officers from every Capstone brigade and battalion attended it. The Corps Arty Staff briefed the most current plans, and experts from the Field Artillery School gave several equipment and doctrine update presentations.

### School and Center

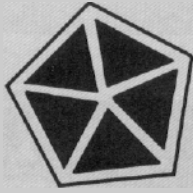
The collocation of III Corps Arty with the Field Artillery School and Center makes us unique. Although our mission to deploy has remained our primary focus, the School has offered us many other training opportunities. These opportunities vary from providing FA TOE support to supporting standard School training exercises, to evaluating BattleKing suggestions submitted by artillerymen throughout the Army, to providing the TOE artillery perspective on new concepts and equipment.

Unquestionably, the most extraordinary training event this year was the M109A3E2 howitzer improvement program (HIP) operational test. Soldiers of the 2-17 FA organized into a HIP platoon and a traditional M109A3 platoon, firing a total of 24,000 rounds in 1,120 fire missions under difficult field conditions. In addition to testing the HIP, lessons learned in command and control of autonomous operations, surge ammunition management and round-the-clock logistical support are providing valuable insight for future battlefield operations.

### Challenges Continue

This year has been a challenging one for the proud members of the Phantom Corps Artillery. *The Phantom Redlegs* stand ready for the continuing challenges in 1990!





## V Corps Artillery

**D**uring 1989, V Corps Arty, with Headquarters in Frankfurt, West Germany, continued to build on our reputation as one of the most technically and tactically advanced corps artilleries in the world.

V Corps Arty remains at the leading edge in the development of corps-level fire support doctrine. Preparation for the use of the Army tactical missile system (Army TACMS) in the corps deep battle was initiated with the development of planning, allocation and employment criteria for the Corps' first Army TACMS-capable battalion, to be fielded in 1990.

Air Force employment in counterfire was practiced during V Corps participation in the 5th Infantry Division's War-fighter exercise at Fort Polk, Louisiana. Of special note was development of an electronic interface between the corps all-source intelligence center (ASIC), the target analysis and planning system computer and the Corps Arty tactical fire direction system (TACFIRE).

The Corps Caravan Guard exercise laid the groundwork for future USAREUR exercises, including REFORGER 90. It tested a new concept that employed the traditional FTX with the command field exercise (CPX) and computer simulation. Caravan Guard consisted of division-on-division fighting in the center sector. The exercise used computers from the Warrior Preparation Center (WPC) to fight the deep-battle and computers from joint exercise simulation system (JESS) and the WPC to fight the battle on the Corps flank. This innovation allowed V Corps to train "smart" while minimizing maneuver damage.

The V Corps Arty provided important input on JESS artillery modeling. These included counterfire techniques, simulation of multiple launch rocket system (MLRS) ablative panel replacement problems and platoon tactics. The JESS is now used by V Corps in all Corps exercises.

Corps and echelons-above-corps exercises were valuable training vehicles, not only for the Corps' organic divisional and non-divisional artillery, but also for

Reserve and Active Component units affiliated with the Corps. Reserve Component artillery participation with the Corps included unit and key personnel training during major exercises.

## 41st FA Brigade

The 41st FA *Railgunners* Brigade, with Headquarters at Babenhausen Kaserne, enjoyed great success during the past year. Through CPXs and live-fire exercises with Div Arty units, the Brigade enhanced the strong counterfire relationship developed with the 8th Infantry Div Arty. Each battalion in the 41st Brigade trained in river crossing operations with the 130th Engineer Brigade. The Railgunners CPX Dark Awakening included all facets of the fire support system and stressed the interface with the Corps fire support element. This training culminated in the Brigade's overwhelming success on Caravan Guard 89.

The soldiers of the 41st Brigade honed their war-fighting skills to a fine edge in 1989 and stand ready to meet the challenges of the future.

## 42d FA Brigade

The 42d FA *Wheelhorse* Brigade, with Headquarters at Depot Kaserne, Giessen, participated in several force artillery firing exercises at Grafenwoehr. These exercises, coupled with the Brigade's support of 3d Armored Division CMTX exercises, greatly enhanced the Brigade's ability to provide timely and accurate reinforcing cannon fires.

The Brigade's two 3x2 Lance battalion's "compressed" to become the Army's first 3x4 Lance battalion. In the spirit of this year's Army theme, the battalion conducted a week-long FTX to develop 3x4 Lance tactics with NCOs in all key leadership positions.

The Brigade implemented a pilot V Corps leadership development program in 1989. "Investment in Excellence" trains section leaders and above on effective leadership techniques.

## New Challenges

The V Corps Arty continues to set the standard for realistic training, technical innovation and responsive fire support. Proud of its past accomplishments, V Corps Arty eagerly looks forward to new challenges in 1990.



SSG Aponte, C/4-18 FA, stencils "Top Gun" on his section's howitzer after winning the 41st Brigade competition.



Soldiers of the 42d FA Brigade move a Lance by Black Hawk Helicopter.



Crewmen simulate MLRS in general support of the Corps.

## Silhouettes of Steel

### VII Corps Artillery

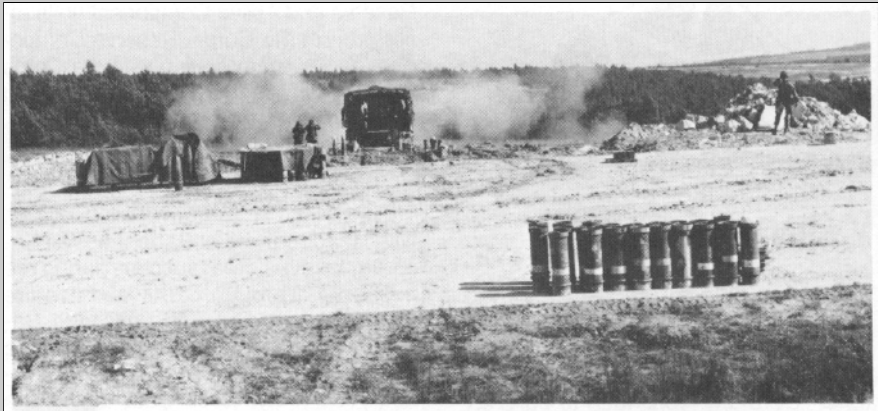


Bubbles Level—8-inch steel is on the way.

**V**II Corps Arty, with headquarters at Augsburg, West Germany, continued on the path toward excellence during the past year. We saw the completion of the 3x8 conversion in all of our cannon battalions and the fielding of the FA ammunition supply vehicle (FAASV) in our 155-mm battalions. The force modernization of the most powerful corps artillery in the free world contributed to an increase in the firepower of the corps of approximately 20 percent. VII Corps Artillery remains on the cutting edge of developing and validating tactics for use in the 3x8 split-battery concept. The result is units are better trained and more survivable units in a combat situation.

### US-French Agreement

One of our highlights of the past year was the signing of a partnership agreement between VII Corps Arty and II French Corps Artillery on 26 May 1989. This agreement was the formalization of a relationship that has been ongoing for quite some time. The II French Corps Artillery has ties with US artillery units that date back to 1918. VII Corps Artillery is very proud to continue this partnership along with its strong ongoing partnership with II German Corps Artillery.



Crewmen of 1-36 FA practice direct fire at Grafenwoehr.

### Deep-Battle Cell

While training is still the number-one priority of the VII Corps Arty, we didn't limit ourselves to training on the tried and proven methods of doing business. Our focus has been the deep-battle arena. Lessons learned from major exercises such as REFORGER 88, Wintex/Cimex 89 and the battle command training program (BCTP) showed that extensive planning and coordination is necessary to commit resources to cross-forward line of own troops (FLOT) operations beyond the fire support coordination line (FSCL). Recognizing this, VII Corps formed a deep-operations cell "out of hide." It brings together the appropriate personnel to work with the deep-battle captain to integrate all fires between the FSCL and the reconnaissance interdiction planning line (RIPL).

The deep-battle cell was first exercised in a corps-versus-corps scenario during REFORGER 88, when VII Corps Arty successfully planned and coordinated the massing of artillery fires into engagement areas far across the FSCL. These missions involved moving entire battalions from one or more brigades into positions within range of the targets. In addition, the deep-battle cell coordinated the attack-air and attack-helicopter strikes within the engagement areas. Committing the traditional deep assets early, such as Lance and AH64 helicopters (possibly under the control of the division commander), to help destroy artillery within the first hours of the battle is proving to be a very successful way to gain the upper hand.

### War-fighting Brigades

The 17th, 72d and 210th FA Brigades that make up the VII Corps Arty continue



A US-French partnership ceremony undergirds NATO's combined strength.

to develop their war-fighting skills through an aggressive program of supporting the maneuver divisions as they participate in exercises, such as BCTP, Wintex and various CPXs. The participation of our brigades and their assigned battalions in CMTC rotations with their associated Div Arty and maneuver brigades at Hohenfels has highlighted our training and honed our doctrine, tactics and procedures. One of the goals of VII Corps Artillery is to train with the maneuver units at every opportunity.

### Meeting the Challenge

Even though 1989 was a very successful year, we don't plan to sit back on our laurels; we still have many challenges to meet. VII Corps Arty, **the Free World's Largest Corps Artillery**, stands ready to meet them in the same professional manner as in years past.

## XVIII Airborne Corps Artillery



**T**he XVIII Airborne Corps Arty, Fort Bragg, North Carolina, as the "Contingency Corps" Artillery, provides fire support for the Corps' worldwide missions. Because of its responsibilities, training is always the primary focus in the XVIII Airborne Corps Arty.

### Training

When the Corps trains, the Corps Arty is close at hand, prepared to provide fire support in response to the full spectrum of conflict from noncombatant evacuation order (NEO) evacuations to high-intensity warfare. In the past year, the Corps Arty has deployed soldiers to the Southern Command area of responsibility for training and throughout the US in support of units subordinate to the Corps. Major exercises included Gallant Knight in California, Caber Dragon at Fort Bragg and Sand Eagle and Solid Shield, both along the Eastern seaboard. As part of both Sand Eagle and Solid Shield, the Corps Arty had (in addition to its tactical and main command posts deployed with the Corps) representatives from the fire support element (FSE) providing fire support coordination from the Airborne Command and Control Center (ABCCC) as well as from aboard the *USS Mt. Whitney*, the joint command and control ship of the Second Fleet.

### Force Modernization

During the past year, the M198 battalions of the 18th FA Brigade converted to 3x8. That added flexibility has increased the challenge for company-grade Redlegs to execute command and control while providing rapid fire support.

The 3-27 FA completed its battery validations during FY 89 and has since conducted a major deployment by sea during exercise Solid Shield. The additional multiple launch rocket system firepower of the 3-27th provides even greater flexibility to the Corps Arty Commander.



A M198 howitzer section, 3-8 FA, conducts an air-mobile raid during Exercise Dragon Fire I at Fort Bragg.

### Battle Command Training Program (BCTP)

The Corps Arty has taken maximum advantage of one of the newest and most realistic and stressful computer-driven training programs in the Army, the BCTP. The Corps Arty participated in BCTP exercises conducted for four divisions in the last year and will be involved in similar exercises for the 82d Airborne Division and our Corps this coming year.

### Employment and Deployment

We continue to press ahead with our active airborne training program to sustain the forced-entry capability of the Corps Arty. Headquarters and Headquarters Battery, Corps Artillery; the 1st FA Detachment (TA); Headquarters and Headquarters Battery, 18th FA Brigade; and the 1-39 FA, the only airborne M198 battalion in the Army, can conduct forced entry by parachute assault. We can deploy the 3d and 5th Battalions of

the 8th FA rapidly and place them on the battlefield by air, land or using the low-altitude parachute extraction system (LAPES).

### Reserve Component Integration

The Corps Arty continues to actively involve its affiliated ARNG brigades in training. Our ARNG brigades have worked with us during BCTP conducted for two divisions and have deployed with us on all exercises.

### Flag Command

This year, the XVIII Airborne Corps Arty was authorized a brigadier general as commander—Brigadier General Richard W. Tragemann. General Tragemann is no stranger to the XVIII Airborne Corps, having served as the Commander of the 101st Air Assault Div Arty. The XVIII Airborne Corps Arty, the ***Fire of the Dragon***, continues to do all things well all the time in support of the US Army's Contingency Corps.



A M198 howitzer from 5-8 FA is delivered to the battlefield using the low-altitude parachute extraction system (LAPES).

## 56th Field Artillery Command

The 56th Field Artillery Command, with its headquarters in Schwabisch-Gmeund, West Germany, continues to provide deep-strike nuclear fires to the theater commander while complying with the provisions of the 1988 Intermediate-Range Nuclear Forces (INF) Treaty. The Command has begun its second year of Treaty compliance and maintenance of combat readiness.

The Treaty went into effect on 1 June 1988, and the Command immediately implemented its compliance plans. That summer, the Command provided the On-Site Inspection Agency (OSIA) the data required under the INF Memorandum of Understanding and all three Pershing sites hosted Soviet verification inspections. The first Soviet visit to a deployed Pershing II site took place at Mutlangen on 5 July 1988. Short-notice or annual quota inspections are permitted for 13 years after the implementation of the INF Treaty.

### Inactivations

After the baseline inspections were complete, the Command began removing its Pershing missiles. On the first movement day permitted by the Treaty, September 1, members of B Battery, 4-9 FA, shipped the components of its nine missiles back to the US for destruction. Nine erector launchers were transported to the Hausen Maintenance Facility, near Frankfurt, West Germany, where they were destroyed in October 1988. The Battery became the first Army unit to inactivate under the Treaty when it retired its guidon on September 27, 1988.

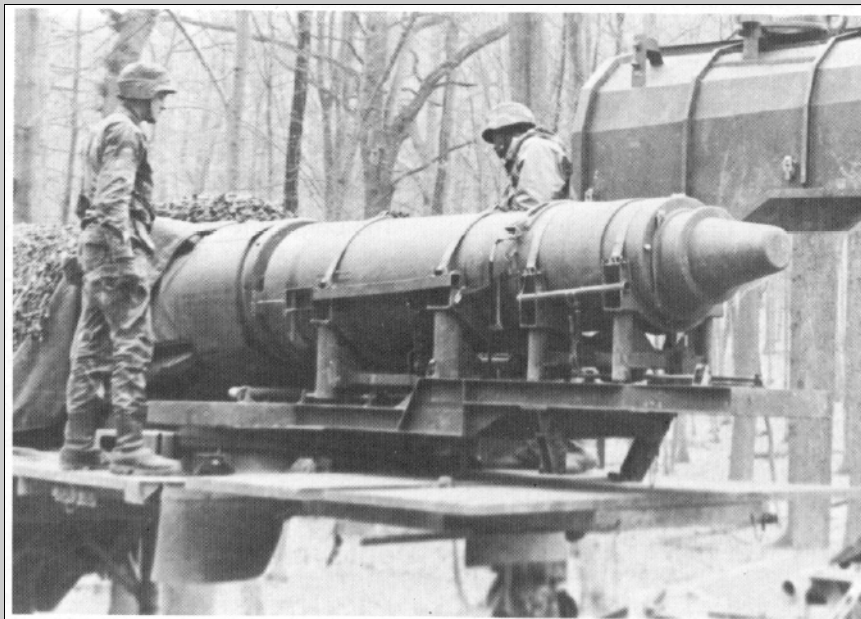
Two other batteries shipped missile components back to the US under Phase 1 of the Treaty. Unlike many moves in the past, not a single demonstrator witnessed the shipment of missiles and erector launchers from D/2-9 FA in Mutlangen on November 15. The Battery inactivated on 31 December, followed by A/1-9 FA on 31 January 1989.

### Training

The Command continues its training program to maintain its combat readiness, conducting two command-level exercises during the past year. Carbon



The last Pershing erector-launcher leaves Camp Redleg carrying an appropriate message.



Pershing soldiers continue to maintain equipment even as units are inactivated under the INF Treaty.

Archer in November 1988 was a command field exercise (CFX) that concentrated on testing war plans and procedures.

Carbon Blazer 89 in June also was a CFX but focused on the evaluation of the Command's mission essential task list. More than 3,000 soldiers and 1,000 vehicles participated in the exercise conducted over five German states.

Our battalions continued training with Pershing missiles in the German countryside, culminating their training with NATO-administered tactical evaluations.

The Pershing system recently celebrated its 25th year of **Ensuring Peace** in Europe. The 56th Field Artillery Command has manned the system with outstanding soldiers, adding to the Pershing's deterrence capability. We'll continue the tradition of combat readiness and Treaty compliance until June 1991 when we complete our mission.



FTXs and NATO Tac Evals help maintain combat readiness throughout the year.

## US Army Field Artillery School (USAFAS)

**R**eorganization of USAFAS, Fort Sill, Oklahoma, into the 30th FA Regiment was completed in April of this year. The Regiment, under a provisional status, consists of the 1st, 3d and 5th Battalions, and the 2d Battalion, a proud member of the Field Artillery Training Center. Students and faculty are now functionally aligned under a single chain of command.

### Doctrine

The procedure for publishing doctrine has been expanded to include war-fighters' input by inviting selected units to review draft manuals and to send an expert war-fighter to USAFAS to help in the final writing process. During 1989, field writing groups reviewed coordinating drafts of the following tactics, techniques and procedures (TTP) manuals: *FM 6-20-1 FA Cannon Battalion*; *FM 6-20-2 Division Artillery, FA Brigade and Corps Artillery Headquarters*; *FM 6-20-40 Fire Support for Brigade Operations (Heavy)*; *FM 6-20-50 Fire Support for Brigade Operations (Light)*; *FM 6-20-10 The Targeting Process* and *FM 6-121 Field Artillery Target Acquisition*.

We also published several manuals now available through normal distribution: *TC 6-40 FA Manual Cannon Gunnery*, *TC 6-60 MLRS Operations* and *TC 6-71 Fire Support Handbook for the Maneuver Commander*.

### Training

The development of Fire Support Trendline Analysis II proved to be an invaluable tool in assessing fire support effectiveness at the NTC and JRTC. The analysis clearly indicates what we're doing well and what areas need improvement.

As a result, we revised the collection instrument used by fire support observer/controllers at the NTC and JRTC. Their assessment of fire support effectiveness now includes how well the maneuver commander's intent was executed by his fire support assets.

The USAFAS provides new equipment training teams (NETTs) to active and Reserve Component units for training and fielding. We provided NETTs for the ground-vehicular laser locator designator (G/VLLD), Copperhead, fire support vehicle (FSV), fire support team digital message device (FIST DMD) and the meteorological data system (MDS). In addition, USAFAS has led the way in the Training and Doctrine Command



(TRADOC) in-residence operator and maintenance training on both mobile subscriber equipment (MSE) and single-channel ground and airborne radio systems (SINCGARS).

### Force Development

The M109 howitzer improvement program (HIP) is on track. Its initial operational test and evaluation was successfully completed in July, demonstrating its ability to perform well under wartime conditions. Test data are currently being authenticated and the final report should reflect favorably on the HIP's operability, maintainability and survivability.

The status of other key systems and their development includes:

- The M119 howitzer continues toward its December 1989 first-unit-equipped (FUE) date.
- The Army tactical missile system (Army TACMS) should meet its programmed fielding in FY 90.
- The advanced Field Artillery tactical data system (AFATDS) received approval in July to enter full-scale development.

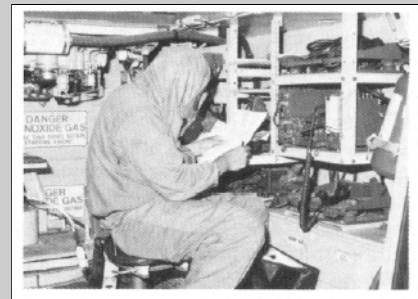
### Leader Development

The USAFAS implemented small group instruction (SGI) in the Officer Advanced

Course (OAC), beginning with Class 2-89 that reported in February. By all measures, this initiative has been a success, and the restructured program of instruction and SGI methodology were well-received by students.

### Field Feedback

You, the Redlegs in the field, are our greatest source of information. Continue to talk with us—we're here to support you. ***We serve as The Free World's Field Artillery School!***



Students train on radios mounted in the fire support vehicle (FSV).



MG Hallada activates the 30th FA Regiment (Provisional).



USAFAS doctrine writers work with expert war-fighters in the field to update tactics, techniques and procedures for new systems, such as the HIP.

## Silhouettes of Steel

### 1st Armored Division Artillery

**T**he 1st Armored Division "Old Ironsides" Artillery, with its Headquarters in Zirndorf, West Germany, strives for excellence in fire support synchronization to provide indirect firepower for the Army's most forwardly deployed division in the European Theater.

Our training culminated in three major exercises for the Iron Gunners: Iron-Star, the interdiction and counterfire exercise (ICE) and battle command training program (BCTP). IronStar focused on the close support mission by evaluating company- through brigade-level fire support, command and control of artillery units, and firing-unit operations in a high-stress, force-on-force CMTC exercise. The ICE exercised the Div Arty staff as a force artillery headquarters, focusing on massed multiple-battalion fires against counterfire and interdiction targets while coordinating joint air attack teams for both the close and deep battle. We used training from IronStar and ICE to ensure our success at both BCTP and REFORGER for Old Ironsides.



A M109 howitzer on the move at the Combat Maneuver Training Center (CMTC).

The Div Arty has recently fielded the meteorological data system (MDS) to improve our fire control, the fire support team digital message device (FIST DMD) to improve fire support and the FA ammunition support vehicle (FAASV) to improve our logistical capability. Our A/94 FA (multiple launch rocket system—MLRS) has replaced its M577 command post carriers with high-mobility multipurpose wheeled vehicles (HMMWVs), which reduce occupation times to zero.

### 1st Cavalry Division Artillery

**T**he Red Team, the 1st Cavalry Div Arty, Fort Hood, Texas, continues to train hard for the European battlefield while integrating many of the newest fire support systems into the Field Artillery scheme of maneuver.

During the past year, the Red Team has participated in many noteworthy

events, not the least of which were three NTC rotations. All Div Arty units, to include A/333 FA (TAB), A/21 FA (multiple launch rocket system—MLRS) and 1-20 FA (203-mm Attached), experienced one or more of these rotations, providing the Div Arty Headquarters excellent command and control opportunities.



A M109 howitzer section moves to support the counterfire effort at the NTC.



REFORGER offers significant leadership challenges for Old Ironsides.

We recently completed a very productive series of conferences with our partnership unit, the German 4th Artillery Regiment. We focused on coordinating supportive fires across boundaries and improving interoperability of fire control.

Our training, force modernization and partnership liaisons combine to provide coordinated, synchronized fire support—the major combat multiplier for the 1st Armored Division. ***Iron Gunners!***

The Div Arty focused its efforts on the counterfire battle at the NTC with tremendous success.

The two DS battalions (1-82 FA and 3-82 FA) of the Div Arty undergo intensive gunnery cycles before each NTC rotation. These cycles begin with section-level training and certification and culminate in a two-week division-level exercise, Cavalry Thunder, which includes both force-on-force and live-fire training with maneuver units.

The 3-82 FA was very successful in our January 1989 NTC rotation in integrating the OH58D helicopters and combat observation lasing teams (COLTs) in support of the 2d Brigade. These new systems can and will be true "killers" on the battlefield.

Other force modernization efforts included fielding the mobile subscriber equipment (MSE), participation in the HIP howitzer test at Fort Sill and fielding the air-ground engagement system (AGES).

Being in the 1st Cavalry Division is life in the fast lane, and we'll continue to be the ***First Team, Red Team—Teamwork First!***

## 1st Infantry Division (Mechanized) Artillery

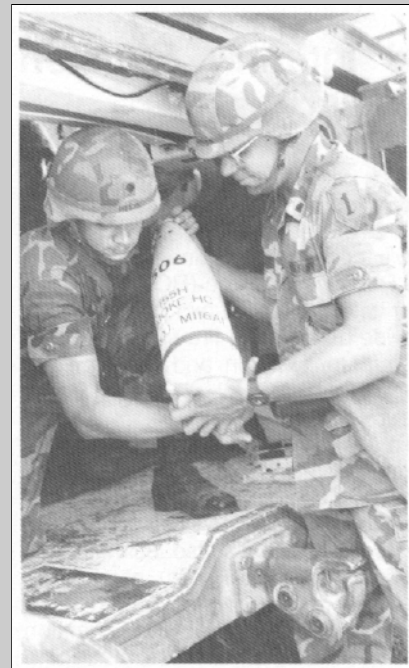
It was another year of innovations in the 1st Infantry Div Arty, Fort Riley, Kansas, as we sharpened our fire support synchronization skills. The fielding of the brigade/battalion battle simulation (BBS) in the Division gave us an opportunity to interact with a highly realistic maneuver scenario.

In May, the Div Arty conducted the first in a series of "Drumfire-TACFIRE" (tactical fire direction system) exercises designed to synchronize fire support at the division level. All of the BBS work stations, to include maneuver, were manned by artillerymen: battery commanders, firing platoon leaders, company and battalion fire support officers (FSOs), multiple launch rocket system (MLRS) and radar platoon leaders and representatives from the Div Arty TOC.

We set up the Div Arty's complete TACFIRE network from the division fire support element (FSE) to platoon fire

direction centers (FDCs). The players at the task-force stations fought the maneuver battle. The fire support teams (FISTs) collocated with them sent fire missions via their digital message devices (DMDs) to the TACFIRE shelters. At the Div Arty station, radar acquisitions were developed and sent to the Div Arty TOC for action.

A BBS-driven exercise is an excellent vehicle for TACFIRE sustainment and fire support synchronization while offering professional development in maneuver tactics to the Field Artillerymen who work the maneuver and fire support stations. As a result, these Redlegs are better able to anticipate the needs of the maneuver commander, ask the right questions and give correct advice during a battle. Our artillerymen are prepared to meet the challenges of battle. **Drumfire!**



Smoke missions challenge Drumfire artillerymen to meet the standards.

## 2d Armored Division Artillery

The 2d Armored Div Arty, Fort Hood, Texas, completed a challenging, successful year of training during 1989. We focused on synchronization of fires in support of maneuver operations. The 3-3 FA began the year with a very successful rotation with 1st Brigade at the NTC. The emphasis on combined-arms training yielded outstanding results for the rotation. During the fall, both our battalions completed demanding SEEs, demonstrating high degrees of skill and combat readiness. Each battalion closed out its technical validation inspections (TVIs) and remained nuclear-mission certified.

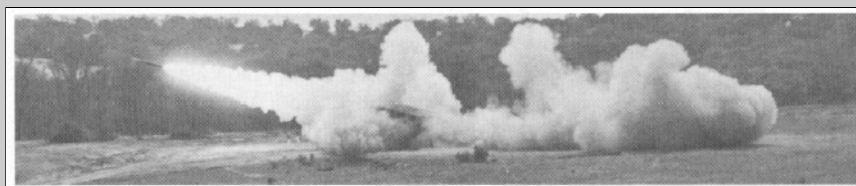
The Division's multiple launch rocket system (MLRS) battery, A/92 FA, conducted quarterly live-fire exercises that were integrated into battalion SEEs to mass fires. When Fort Hood hosted the Joint Civilian Orientation Conference in May, A/92 FA and B/3-3 FA fired a combined-arms, live-fire exercise (CALFEX) for the corporate executives—the highlight of the Conference.

Throughout the year, we concentrated on standardization, particularly emphasizing the development of the fire support execution matrix. We developed standardized load plans for all howitzers, FA ammunition supply vehicles

(FAASVs), platoon fire direction centers, fire support elements and battalion TOCs. Standardized procedures will be a key to continuous, successful combat operations.

We ended the year the way we began, with a trip to the NTC. But this time, we tried a new concept with the DS battalion's

taking only its TOC and fire support officer and the reinforcing battalion's taking its guns. The 1-3 FA was DS, while the 3-3 FA reinforced and fired the live-fire exercise. Using this method, we focused on providing fire support for the maneuver brigade and training as we'll fight. **Hell's Fires!**



A/92d FA conducts quarterly live-fire exercise in support of battalion SEEs.



B/3-3 FA moves to support a CALFEX.

## Silhouettes of Steel

### 2d Infantry Division

#### Artillery

**R**ealistic, tough training to rigorously enforced standards is the cornerstone of the 2d Div Arty's continued readiness to defend the Republic of Korea (ROK). Our mission is to deploy on two hours' notice, provide devastating fire support for the 2d Infantry Division and reinforce the artillery fires of the I, V, VI and VII Corps of our Korean allies.

To sustain our technical and tactical readiness, the Div Arty has quarterly fire support CPXs that integrate division, brigade and battalion fire support elements. These CPXs also include using fire support teams (FISTs), combat observation lasing teams (COLTs), Fire-finder radars, tactical fire direction system (TACFIRE) shelters, TOCs and OH58D helicopters in a two-day warplan scenario.

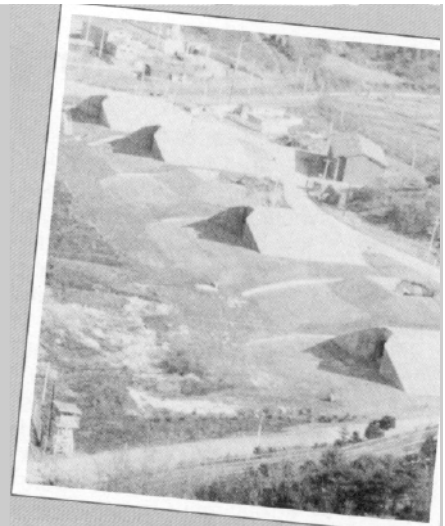
Periodic joint interoperability exercises are conducted by the Combined Field Army. Also, at a minimum, the Div Arty battalions conduct live-fire quarterly FTXs to train to execute the Division's war plans. Our war plans include the early formation of a counterfire force centered on the multiple launch rocket

system (MLRS), which deploys to each ROK corps headquarters.

The Div Arty's training program culminated with the annual Team Spirit exercise last March. It was a two-week FTX with the 9th and 25th Infantry Divisions and the ROK Army and Marines.

The 2d Infantry Div Arty is undergoing dynamic change. Two of our DS battalions are converting to 3x8 this year, and one will exchange its M198 howitzers for M109A2s. Our COHORT units will begin to arrive from CONUS to enhance near-term readiness. The recent addition of a Lance battery provides greater deep-fires capability.

As the largest and most forwardly deployed Div Arty in the Army, we train to high standards as part of a combined-arms team and remain—**Second to None!**



Artillerymen support security troops in the DMZ from hardened positions such as these.



B/8-8 FA "Automatic Steel" crewmen fire from 4P3.

### 3d Armored Division Artillery



An OH58D supports the Division during REFORGER 89.



A/40th FA fires a deep strike in support of the Division.

**D**uring 1989, our Gunners and Dragons of Spearhead Steel, Hanau, West Germany, continued to support the Army's most forwardly deployed division and its defense of the Fulda Gap.

After the 3d Armored Division battle command training program (BCTP) Warfighter exercise, the Div Arty's war-fighting skills were at their highest level as we entered the new year. Thus, the battalions of Spearhead Steel and the 42d FA Wheelhorse Brigade executed a very intensive firing exercise at combat supply rates. This combined live- and dry-fire exercise processed an average of 110 missions per hour, which answered the Commander-in-Chief, Europe's question: "What is the time standard to mass the force artillery while it's engaged in its normal combat missions?" The Spearhead and Wheelhorse force artillery's answer: "Deliver massed fires—a total of almost 500 rounds of 155-mm, 8-inch and multiple launch rocket system (MLRS) rockets—within

five minutes."

Battalions completed a demanding SEE that started with a home-station operational readiness test (ORTP) and required live-firing within six hours of the trains' being unloaded at the Grafenwoehr Training Area. The SEEs culminated with a 100-kilometer road march to Hohenfels Training Area where the Division and battalion fire support slices were integrated into maneuver ARTEPs.

Section Olympics were held with 18 sections, ranging from PACs to radars and howitzers, competing for recognition as the best in their field. Producing section evaluation guides, conducting "no-notice" platoon gunnery exercises and battery ARTEPs and publishing standard battalion field SOPs honed the collective skills of the Steel Battalions into a cohesive team.

Well-coordinated fire support, innovative training techniques and proven agility will continue to be the trademark of **Spearhead Steel** into the 1990s.



### 3d Infantry Division (Mechanized) Artillery

The Mame Artillery, Wuerzburg, West Germany, had an exciting year of training oriented toward providing better fire support. We began with a series of exercises leading up to REFORGER 88 where we concentrated on operational security procedures and the ability to make plans and move quickly while providing continuous fire support in a fluid corps-on-corps exercise.

On our maneuver-rights-area SEEs, maneuver brigade TOCs now drive the scenario, making the evaluation realistic and forcing the DS battalions to perform fire support and operational tasks simultaneously. We have integrated each brigade's mortar platoons into their DS battalion live-fire exercises, enabling us to evaluate company fire support officers (FSOs) and mortar platoons more thoroughly.

We have a tiered approach to tactical fire direction system (TACFIRE) training. Each piece of the system (battalion for close support and Div Arty, multiple launch rocket system, or MLRS, and target acquisition battalion, for counterfire and interdiction) trains and then comes together for synchronization.

### 4th Infantry Division (Mechanized) Artillery

During 1989, the 4th Div Arty, the Iron Horse Artillery at Fort Carson, Colorado, focused on realistic, demanding, mission essential task list-driven training to ensure responsive and accurate fire support to the Division.

Div Arty units underwent major force integration changes. Our DS battalions converted to 3x8 firing batteries while fielding the fire support vehicle (FSV) and ground/vehicular laser locator designator (G/VLLD). The 1-29 FA deployed as our first 3x8 battalion to the NTC. We also fielded the OH58D helicopter and will add the meteorological data system (MDS) soon.

The 3-29 FA completed a maneuver-based SEE. The scenario was jointly developed with the battalion's supported brigade and was based on the battalion's wartime mission. All the DS battalions participated in several fire coordination exercises (FCXs), combined-arms, live-fire exercises (CALFEXs) and training at the Pinon Canyon Maneuver Site, Colorado, leading to the

During Division-conducted maneuver battalion ARTEPs at Hohenfels, the Div Arty executed a fire-marking system that shows fire support is key to success in all operations. Here, evaluation of the entire fire support chain created NTC-like intensity and was the beginning of preparation for the Division's first CMTC rotation.

Last spring, the Div Arty's focus was on the battle command training program (BCTP) evaluation. We successfully refined the Division's targeting process and developed an extremely effective method of fighting the Division's counterfire battle.

We'll continue to emphasize fire support training in all maneuver training. ***Fulfill Your Mission!***



Soldiers of the 5-41 FA in firing position during a winter Graf.



A howitzer section of 2-41 FA erects camouflage.

1-29 and 5-29 FA's participating in force-on-force and live-fire training at the brigade combat team level at the NTC.

The Division fire support element (FSE) deployed with a 4th Infantry Division battle staff to Maastricht, Netherlands, to participate in the NATO-wide CPX Wintex/Cimex 89. The exercise

provided the staff an opportunity to refine the orders process and SOPs and to work with corps and allied staff counterparts. The result was the development of a new corps war plan, which the 4th Division tested during its battle command training program (BCTP) II in October 1989. ***First Rounds—First Class!***



MLRS six-packs of steel fire in support of the Division.

## Silhouettes of Steel

### 5th Infantry Division (Mechanized) Artillery

The 5th Infantry Div Arty, Fort Polk, Louisiana, continued to train for the European battlefield with an eye on worldwide deployment.

The Div Arty again supported two brigade rotations to the NTC with both 4-1 FA and 5-1 FA participating. As one battalion provided artillery fires for its supported brigade, the other conducted tactical fire direction system mutual support (TACFIRE MSU) operations and operated as the reinforcing artillery TOC.

The Div Arty started the year by participating in the III Corps exercise Roadrunner 89 at Fort Hood, Texas. This joint exercise simulation system (JESS)-driven exercise helped prepare the Div Arty for our Division's battle command training program (BCTP) Warfighter in April. The Div Arty played a significant role in the exercise, which culminated the Division's two-year staff training program.

The Div Arty supported the training of the 35th Div Arty (Kansas ARNG) and

its subordinate battalions from Kansas, Kentucky and Nebraska, by conducting SEEs for two battalions. The 1-141 FA, our round-out battalion from Louisiana, continued to sustain TACFIRE training through repeated FTXs and CPXs.

The 5th Infantry Division was alerted in May to send forces to Panama. The Div Arty deployed fire support elements (FSEs) of the 4-1 FA and 5-1 FA and a Q36 radar section to support the deployed

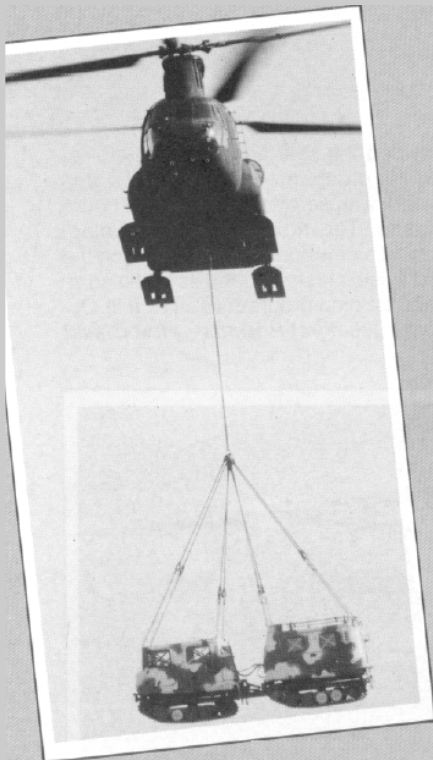
task forces. During their deployment, the FSEs trained with the 193d Separate Infantry Brigade and 7th Infantry Division elements in Panama. They also participated in show-of-force operations conducted by elements of our Division in Panama.

The **Red Devil Redlegs** stand ready to provide fast, accurate fires for the "Red Devil Division."



Finding a firing position at Fort Polk is no easy job.

### 6th Infantry Division (Light) Artillery



The weather often interferes with Arctic Thunder air-mobile operations.

Arctic Thunder were the watchwords as the 6th Div Arty with its Headquarters at Fort Richardson began its first year of operations in Alaska. Given our mission to maintain the combat readiness of FA battalions to defend Alaska and to deploy worldwide, the Div Arty's focus this year was realistic training executed to exacting standards.

In December, the 5-11 FA deployed to Fort Greely for its first Div Arty-run external evaluation. Winds in excess of 45 knots and temperatures below -45 degrees provided a real challenge to the Redlegs from Fort Wainwright.



Even smaller pieces of equipment, such as the ground-mounted G/VLLD, are more difficult to operate in sub-zero weather.

In February, the Div Arty deployed to sites all over Alaska, to include Kodiak, Whittier and King Salmon, in support of joint readiness exercise Brim Frost 89. Some of the elements deployed more than 300 miles from their higher headquarters.

The logistical problems caused by such distances, lack of good lines of communication and temperatures in excess of -60 degrees allowed us to test the limitations of our equipment and soldiers. This exercise provided the maximum training opportunity for the conduct of combat operations in the northern regions of the world. Following Brim Frost, we found ourselves at Fort Greely again for the 4-11 FA's external evaluation.

The spring brought the first of our Div Arty readiness tests (DARTs). These are short, intensive battery evaluations conducted by the Div Arty staff to get a close look at each of the firing batteries. In September, we activated G/11 FA, our USAR M198 battery.

During the next year, we'll continue our emphasis on realistic and challenging training while preparing for the fielding of such exciting systems as the M119 howitzer and lightweight tactical fire direction system (LTACFIRE). **Arctic Thunder!**

## 7th Infantry Division (Light) Artillery

**B**ayonet Artillerymen of Fort Ord, California, focus on their mission to deploy rapidly to support light or mixed forces across the spectrum of conflict anywhere in the world.

In May, the Div Arty demonstrated its readiness when elements of 2-8 FA answered the President's call to deploy rapidly to Panama to safeguard American lives and property. Operation Nimrod Dancer saw more than 200 Bayonet Artillerymen deploy to Panama and conduct extensive live-fire and other highly visible exercises. Before Nimrod Dancer, Div Arty soldiers honed their skills in numerous I Corps and XVIII Airborne Corps fly-away emergency deployment readiness exercises (EDREs) and other exercises in such diverse locations as Florida, Washington, North Carolina, Utah, Alaska, Korea, Honduras and Iceland.

Other training highlights include two battle command training program (BCTP) Warfighters, one at Fort Lewis, Washington, and a heavy-light iteration at Fort Polk, Louisiana; night suppression of enemy air defense (SEAD);

combined-arms, live-fire exercises (CALFEXs); a combined American, British, Canadian and Australian FTX, in which British firing elements were operationally controlled by the Div Arty; heavy drop of howitzers, prime movers and ammunition during a force-on-force FTX; employment of Q36 radar and live-fire at JRTC; firing Copperhead and improved conventional munitions (ICM) during a CALFEX with the US Marines; and a Div Arty-wide base-piece exercise, in which all delivery units massed fires using the light tactical fire direction system (LTACFIRE).

The foundation for training and operational successes remains a solid individual



A/6-8 FA conducts a two-gun artillery raid.

training program, designed and run by a strong NCO Corps. Our NCOs ensure soldiers are competent artillerymen and fully able to meet demanding light-fighter standards in all other areas. The Era of the NCO is in full force and promises to keep **Bayonet Artillerymen** firing into the future.



A FIST Team calls in fires for 6-8 FA.

## 8th Infantry Division (Mechanized) Artillery

**I**n FY 89, demanding, force-on-force, combined-arms exercises were the focus of fire support training in the 8th Div Arty with its Headquarters in Baumholder, West Germany. Pathfinder units trained extensively on mission essential/pacing battle drills during live-fire exercises at Grafenwoehr and Baumholder and division-level tactical exercises in local maneuver rights areas (MRAs).

Fire support employment and integration into the scheme of maneuver were especially evident during the Div Arty's most recent major training exercise, Apache Power (April-May 89). In this general defense plan (GDP) analog exercise, all phases of contingency plans were exercised. This included deploying to local dispersal areas, uploading 100 percent of units' basic load of munitions, conducting road marches to assembly areas with tactical river crossings, occupying initial fighting positions and fighting a three-day covering force and main battles. Fire support and logistical terrain walks rounded-out the Div Arty's exercise of its mission essential tasks.

The Div Arty NCOs deployed units to Grafenwoehr and conducted live-fire

exercises (LFXs) with the 41st FA Brigade. These LFXs emphasized fire planning and coordination.

The Div Arty also administered aggressive five-day SEEs of the DS cannon battalions reinforced by C/16 FA (multiple launch rocket system—MLRS) in the MRAs and at Grafenwoehr. These realistic evaluations of 3x8 battalion operations incorporated the full maneuver brigade slice support.

Realistic, combined-arms training



A 4-29 FA howitzer occupies an engineer-prepared firing position.

and responsive fire support are the norm in the 8th Div Arty. Our soldiers, the Credentials of the Division, make it happen. **Pathfinder's Power!**



Div Arty units conduct a tactical crossing of the Rhine River using Pioneer Kommando rafting assets.

## 9th Infantry Division (Motorized) Artillery



B/1-84 LAR conducts air-mobile operations at Yakima Firing Center.

**T**he Old Reliables of the 9th Div Arty, Fort Lewis, Washington, had a rewarding year of training in 1989 with primary emphasis on warfighting skills. In January, the 9th Division conducted Reliable Strike II FTX at Yakima Firing Center, Washington, as the final preparation for the 1st Brigade's rotation to the NTC. It involved more than two-thirds of the Div Arty's units and more than half the Division's assets, as well as elements of the Air Force.

The 9th Division's second rotation to the NTC demonstrated that the lessons learned during the previous rotation didn't go unheeded. Elements of 1-11 FA and 1-84 FA (LAR—light artillery and rocket, a composite battalion) provided continuous fire support, while 1st Brigade proved the mettle of a motorized or heavy task force against a mechanized OPFOR.

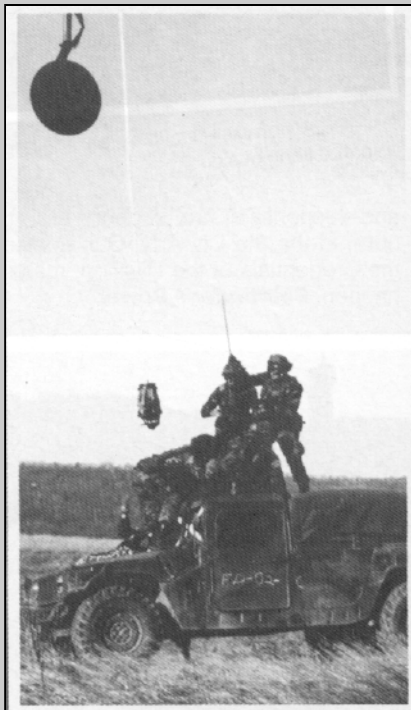
The Div Arty continued to evolve and refine the concept of the integrated brigade

TOC. The integrated TOC is the collocation of the DS battalion's fire control and operations and intelligence sections with the maneuver brigade TOC, thus enhancing responsiveness and coordination. This configuration is now an integral, accepted part of brigade operations. During Evergreen Thunder, a fire control and fire support exercise at Fort Lewis, the 9th Cavalry Brigade (Air Attack) represented the maneuver brigade TOCs and allowed each of the battalions to rotate through an integrated configuration.

During an active summer of ROTC and Reserve Component support, we solidified ties with our round-out battalion, 2-146 FA (Washington ARNG). At annual training, 2-146 FA completed fielding of light tactical fire direction system (LTACFIRE) and conducted a successful training exercise under rigorous battlefield conditions.

The 9th Div Arty looks forward to another year of challenging training with our highly skilled **Reliable Redlegs** providing timely and accurate fire support for the Division.

## 10th Mountain Division (Light) Artillery



Redlegs of the 10th Mountain prepare to sling-load a HMMWV at Fort Indiantown Gap, Pennsylvania.

**T**ough, Proud and Ready, the 10th Div Arty, Fort Drum, New York, stands ready to deploy worldwide within 18 hours and provide fast, accurate fires to the Division.

Recognition by all that a significant portion of the Division's combat power resides in the Div Arty has resulted in strong emphasis by both maneuver and artillery commanders on a series of combined-arms live-fire exercises (CALFEXs). Synchronization takes on added importance for Light Fighters. Redleg participation in task-force rotations to the NTC and the JRTC (as well as the Mountain Warfare Training Center at Camp Ethan Allen, Vermont, and



Gunnery crew from 2-7 FA fire in support of the 2d Brigade.

the Military Operations on Urbanized Terrain or MOUT Facility at Fort Pickett, Virginia) have a significantly enhanced the combat readiness of the 10th Division.

In addition, the Div Arty has been involved in a number of higher-level CPXs, such as Wintex 89 and Caravan Guard 89. The 10th Division's initial experience with the Army's battle command training program (BCTP) at Fort Bragg, North Carolina, demonstrated the decisive importance of timely, accurate and massive fire support in successful light-division operations.

In 1989, the Div Arty continued its dedicated training association with the 26th Infantry Div Arty (Massachusetts ARNG) and 1-156 FA, our round-out DS battalion. The Active and Reserve Component Redlegs trained together at Gagetown, New York; Ontario, Canada; and at Fort Drum. Our mobile training teams helped in monthly training at National Guard units' home stations, while evaluation teams were busy during the two-week annual training period.

The 10th Mountain Div Arty eagerly looks forward to tough, challenging training opportunities in 1990 as it continues its **Climb to Glory!**

## 24th Infantry Division (Mechanized) Artillery

The Victory Div Arty, Fort Stewart, Georgia, took another busy year in stride. Our year began with two battalions, 1-35 FA and 2-35 FA, gaining new designations as 1-41 FA and 3-41 FA. Along with new designations came new doctrine and tactics, as both of these 155-mm DS battalions up-gunned to 3x8.

This year continued fieldings for the tactical fire direction system (TACFIRE) in the 24th Division. We automated our counterfire capability and prepared to go to a single Div Arty TACFIRE-shelter configuration. Other new equipment included the fire support team digital message device (FIST DMD), meteorological data system (MDS) and a digital link to the maneuver through the mortar ballistic computer.

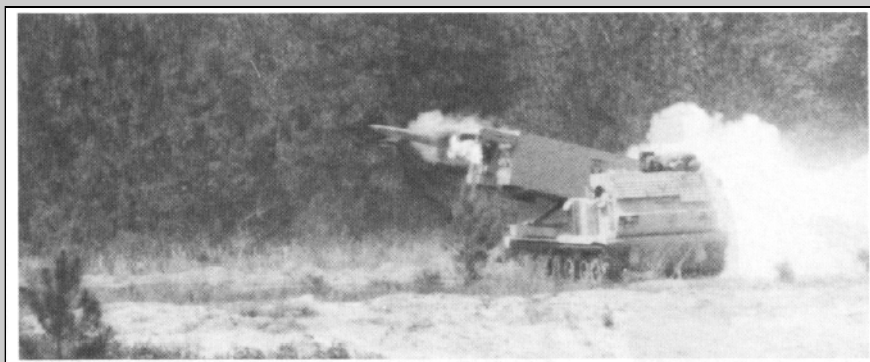
Usual training doesn't stop for new equipment. The Div Arty quickly integrated these additions and remained focused on our busy training calendar. Our emphasis on realistic, combined-arms training continued with corps-level

CPXs, quarterly Division FTXs and CPXs, a Div Arty TACFIRE CPX and several other joint exercises from Fort Stewart to the NTC to Panama to the Eastern Hemisphere.

The Active Component wasn't our only training partner during 1989. The 24th Div Arty helped, trained and worked with an assortment of Reserve

and National Guard units. Units from seven states and Puerto Rico equipped with everything from M101A1 to M110 howitzers proved the 24th Div Arty takes the lead in Total-Army training.

The 24th Div Arty, the heavy punch of the XVIII Airborne Corps, remains prepared to ensure victory, wherever and whenever we're called. **First to Fight!**



A/13 FA fires at Fort Stewart.

## 25th Infantry Division (Light) Artillery

In 1989, the 25th Div Arty, Schofield Barracks, Hawaii, again was one of the most frequently deployed Div Artys in the Army. Tropic Thunder Redlegs traveled throughout the Pacific basin to Korea. Thailand, Malaysia, Australia, Japan and the US mainland. Exercises such as Yama Sakura, Team

Spirit, North Wind, Gonzales West, Cobra Gold, Kangaroo, Cabin Fever and Orient Shield have felt the rumble of the King of Battle, Aloha-Style.

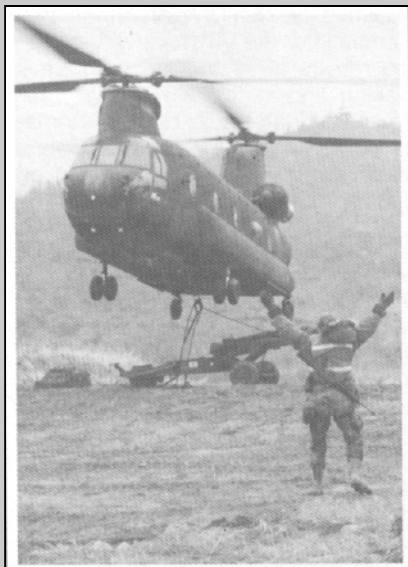
Throughout the year, the 25th Div Arty conducted several joint exercises employing assets from all service branches in Hawaii. Whether it was Marine

Corps artillery, helicopters and F18 attack aircraft, Air Force close air support or Navy surface transports and naval gunfire, the Div Arty exercised every opportunity for realistic, interservice cooperation.

June and July saw the Div Arty's supporting Hawaii and Wyoming Army National Guard annual training, to include evaluating the 1-487 FA (Hawaii ARNG) and 115 FA Brigade.

September was very busy, starting with participation in the Division battle command training program (BCTP) Warfighter exercise. This computer-driven simulation challenged the Div Arty staff to support the Division in a fast-paced, fire support-intensive conflict. Also during the month, the Div Arty headquarters, its four battalions and separate firing battery and the 1-12 Marines deployed to Pohakuloa Training Area on the big island of Hawaii for its annual Thunderex live-fire exercise.

All 80 gun crews of the Div Arty successfully completed a standardized howitzer qualification test, followed by battery and battalion FTXs. The culmination of Thunderex was a five-day Div Arty exercise that emphasized the command and control of massed fires in low-to mid-intensity conflict. The lessons learned were invaluable and served to further improve the combat readiness of **Tropic Thunder.**



A 105-mm howitzer section conducts an air assault in the Republic of Korea on Team Spirit.



A M198 section, 1-8 FA, emplaces during best-howitzer-section competition.

## 26th Infantry Division Artillery

The 26th Yankee Infantry Division Artillery (Massachusetts ARNG), with elements in the Massachusetts, Connecticut and Vermont Army National

Guards completed transition training during Training Year 89. This training, necessitated by last year's reorganization, has gone well and has increased the readiness of the Yankee Artillery.

Currently the 26th Div Arty consists of:

1-101 FA (DS), Massachusetts ARNG, a 3x8 M114A2 battalion.

2-192 FA (DS), Connecticut ARNG, a 3x6 M114A2 battalion.

1-86 FA (DS), Vermont ARNG, a 3x6 M109A3 battalion.

1-211 FA (GS), Massachusetts ARNG, a 3x4 M110A3 battalion.

Battery E, 211 FA (TA), Massachusetts ARNG, a Firefinder battery.

In summary, training during this year consisted of the completion of up-gun training for three battalions; the organization of a training battery, using organic resources to train personnel not qualified in their MOSs; the conduct of a successful SEE for the 1-86 FA; and the continued support of the target acquisition battery for all Div Arty elements in several increments.

Future plans for the Yankee Artillery include continued emphasis on battalion-level operations, continued integration of newly acquired Redlegs into all organizations and increased emphasis on the synchronization of maneuver and fire support operations through mutual training opportunities.

The **Yankee Artillery** is continuing to lead the "Pursuit of Excellence" in the 26th Yankee Infantry Division through innovative training and vigorous execution.



Shot Out! C/2-192 FA fires in support of the Connecticut Army National Guard.

## 28th Infantry Division Artillery

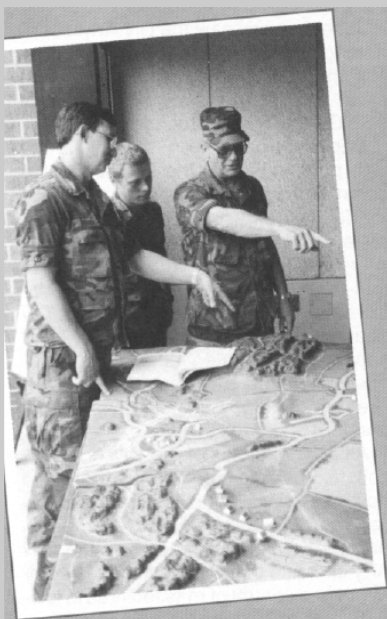
The 28th Div Arty (Pennsylvania ARNG) conducts training year-round and is dedicated to providing "America's Oldest Infantry Division" devastating fire support. From our headquarters in Hershey, the Div Arty commands and controls DS 105-mm battalions in Pittsburgh (1-107 FA), Carlisle (1-108 FA) and New Castle (1-229 FA) as well as a GS composite battalion (155-mm and 8") in Wilkes-Barre (1-109 FA). Targets are provided for these battalions by the target acquisition battery, F/109 FA in York, equipped with the Firefinder radar system.

The Div Arty once again played a major support role in the 28th Division's Annual Reunion, providing an appropriate setting and firepower exercise in honor of our veterans, many of whom fought in the Battle of the Bulge.

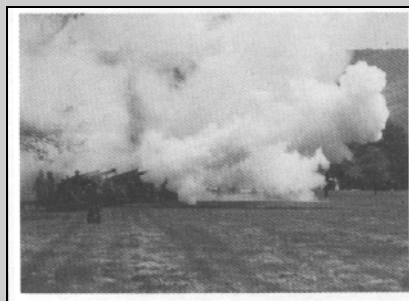
During the 28th Division Annual Skills Competition, the Div Arty demonstrated the results of its training program by placing first in the .45 Caliber Pistol Teams and the Radio Teletype Competitions and also swept the Combat Medic Competition at skill levels one and two.

In 1989, the 28th Div Arty will continue its string of eight successful SEEs with evaluations being conducted on F/109, 1-109 FA and 1-107 FA. Along with the challenges inherent in conducting three SEEs, the Div Arty Headquarters will participate in the battle command training program (BCTP). This corps-level, computer-generated simulation is designed to provide the stress and friction of combat while exercising staff coordination and combined-arms synchronization.

The training program, SOP reviews and revisions and CPXs have honed our fighting skills to guarantee firepower for **America's Oldest Division**.



The 28th Div Arty uses terrain boards to enhance in-armory training.



Cannoneers of 1-229 FA fire a salute in ceremonies at the 28th Division Shrine, Boalsburg, Pennsylvania.

## 29th Infantry Division (Light) Artillery

**B**uilding on fundamentals, the 29th Div Arty (Virginia ARNG) enhanced readiness during the past year. Training in 1989 forged stronger combined-arms bonds within the Division, while improving our overall posture.

Our mobilization readiness was validated by readiness and mobilization exercises (REMOBEs) and deploying two batteries to the JRTC. Units that participated in the REMOBEs were 1-246 FA (DS), Danville; 2-111 FA (DS), Richmond; 29th Div Arty Headquarters, Sandston; and E/111 FA (GS), Emporia. The REMOBEs also processed all soldiers for overseas movement, stressing personal affairs and dependent involvement and establishing family support groups.

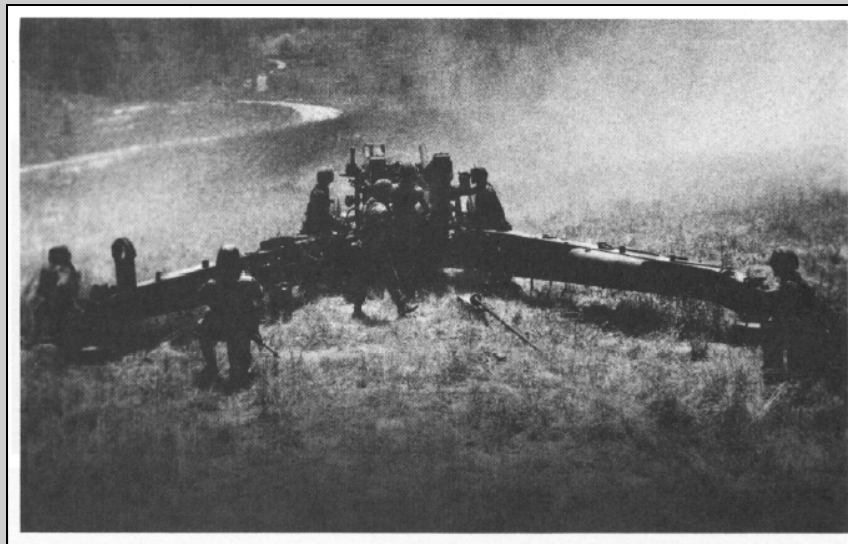
Exploiting the lessons learned by 2-110 FA (DS), Pikesville, Maryland, in its 1988 JRTC rotation, we ably supported Task-Force Razorback during our JRTC rotation 89-6. Battery A and Headquarters Battery of the 1-246 FA deployed equipment by rail and personnel by air to Fort Chaffee, Arkansas. Through proper reconnoitering and timely tactical movements, they had the distinction of receiving no counterfire and no opposition force aggression. The entire fire support community continually

improved through the rotation, receiving high praise on the final phase of Operation Omega Lightning.

Annual training proved equally beneficial for the balance of the Div Arty. Combined-arms planning, integration and live-fire execution with the maneuver and combat aviation brigades fostered better understanding among

commands. Support relationships were changed to reflect realism, taxing all headquarters and providing valuable lessons learned.

When the entire Division is tested at Fort Bragg, North Carolina, next year, the only Reserve Component light infantry Div Arty will live up to its motto—***We Stand Ready!***



E/111 FA conducts a direct-fire exercise during annual training at Camp A. P. Hill, Virginia.

## 35th Infantry Division (Mechanized) Artillery

**T**he 35th Div Arty (Kansas ARNG) enjoyed truly multi-echelon training during Training Year 89. Redlegs trained together at higher levels than any other time in the Division's five years of existence.

At Pinion Canyon and Fort Carson, Colorado, the 1-127 FA worked with its maneuver brigade, although the distance stressed their communications capabilities. The Division fire support element (FSE) at Pinion Canyon was successful in exercising most of its ARTEP tasks, not only with the 35th Division and the 69th Infantry Brigade (Mechanized), but also with the Div Arty TOC, which was deployed with two battalions and a target acquisition battery at Fort Carson some 125 miles away.

The 1-161 FA not only supported the training of the Div Arty TOC and had the Division's collective tasks, but also successfully underwent a SEE. The 2-138 FA also was successful with its SEE at Camp Shelby, Mississippi, in conjunction with the 149th Armored Brigade.

At Fort Carson in June, the 1-168 FA

trained successfully in conjunction with the 67th Infantry Brigade (Mechanized).

The 2-130 FA, which is attached to the 35th Div Arty for training, attended annual training at Fort Sill, Oklahoma. It performed an in-depth mobilization/deployment exercise to Southwest Oklahoma in June, which verified many deployment tasks not previously exercised.



M109 howitzers of 1-127 FA ready to deliver fires during AT 89.

Several days of unusually high rainfall gave them another opportunity to respond to a call for fire, anytime, anyplace.

The 35th Div Arty, the ***Santa Fe Redlegs***, has enjoyed a safe and successful training year and has, without question, advanced the combat readiness of this historic Division.



Rapid displacement assures survivability for 1-161 FA Redlegs during their EXEVAL.

## 38th Infantry Division Artillery

The 38th Div Arty (Indiana ARNG) participated in two major training events this year—Warfighter 89 and Operation Dixie Cyclone. The Div Arty Headquarters supported the Division Headquarters in the Warfighter 89

training exercise held at Camp Atterbury. The 38th Division was the second of 10 National Guard divisions to participate in this exercise. While the 38th Div Arty's staff did its wartime jobs, members of the Div Arty Headquarters



The Avengers of Bataan fire in general support of the Corps during Operation Dixie Cyclone.

## 40th Infantry Division (Mechanized) Artillery

This past year provided the 40th Div Arty (California ARNG) many opportunities to train for its wartime mission of delivering timely, accurate fires and providing fire support to the 40th Division.

The 40th Div Arty continued to develop its command and control capability by conducting each of its live-fire

FTXs with at least two of its cannon battalions and target acquisition battery. This allowed the Div Arty TOC to become proficient at coordinating land use and road movements in a constricted maneuver area. It also allowed the Div Arty TOC to become proficient at assigning counterfire missions and observing the effects of its massed fires in



Desert conditions make maintenance a high priority for this 8-inch crew of the Fighting Fortieth.

greatly benefited from a realistic, real-time simulation of a major battle set in the Fulda Gap of West Germany.

The majority of the 38th Div Arty Redlegs attended annual training at other times and locations. Some traveled as far as 800 miles to train.

Operation Dixie Cyclone was the training vehicle used by the Div Arty to exercise the majority of its battalions. The artillery battalions in Indiana participating included: 3-139 FA (105-mm), 2-150 FA (155-mmT/8-inch), 1-163 FA (105-mm) and E/139 FA (TA). Dixie Cyclone was a joint exercise controlled by the 631st FA Brigade (Mississippi ARNG). Other units that participated in this exercise were 1-114 FA (155-mm SP), 4-114 FA (155-mm SP), 3-83 FA (155-mm SP) and one 8-inch battery from 1-108 ARC. The highlight of the Operation was the Brigade's calling "Homicide" (all available artillery time-on-target), when more than 120 artillery tubes put steel on target with devastating effects.

With the able help of the 101st Air Assault Div Arty, the 38th Div Arty—*The Avengers of Bataan*, trains for combat excellence.

the impact area of Camp Roberts, California.

The highlight of the year was the Div Arty's participation in the "Fighting Fortieth Infantry Division's" command field exercise or CFX. This 72-hour exercise tested the Division's command and control capabilities down to the company level in a demanding tactical scenario. The greatest benefit from the CFX was the close and vitally important working relationships that developed among the Div Arty TOC, Division fire support elements (FSEs) and G2/G3 shops.

The 40th Div Arty provided large fire support evaluator cells to the 2d Infantry Division during Team Spirit 89. We also conducted a successful SEE for one of our DS battalions.

This year, with continued emphasis on fire support and command and control, we'll join with our Division in the battle command training program (BCTP) and culminate our training with the Warfighter exercise. We look forward to another challenging year of ensuring quality *Fighting Fortieth Firepower!*



## 42d Infantry Division Artillery

**T**raining Year 89 marked the end of one era and the beginning of another for the 42d Infantry Div Arty (New York ARNG) as it changed its partnership affiliation from the 101st Air Assault Div Arty to the 9th Infantry Div Arty. Although constrained by requirements to fight forest fires in the Northwest, the participation of 9th Div Arty personnel in annual training indicated the new relationship will be as rewarding as the old one was.

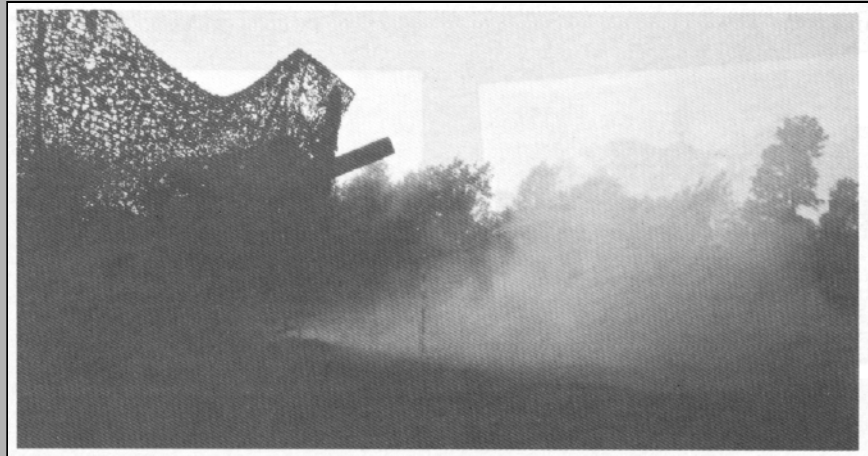
Other highlights of the year included the successful nuclear validation of the 1-209 FA SEE and passage by the 1-187 FA of an informal SEE. Once again, the Div Arty conducted its own schools for fire support and survey personnel.

The 42d Div Arty also participated in the I Corps' Cabin Fever exercise in February 1989, at Camp Williams, Utah, and the battle command training program (BCTP)-oriented CPX of the Division at Camp Smith, New York, in September 1989. In addition, fire support element assistance was provided to the Division's Combat Aviation Brigade during its operations at the Canadian Forces Base Gagetown.

Two important anniversaries were observed by Div Arty units this year: the 1-258 FA (Washington Grays) marched in the 200th commemoration of Washington's first inaugural in New York City, and the 2-104 FA (Old First New York Artillery) celebrated the 45th anniversary of the Battle of Eniwetok, which resulted in its award of the Navy Unit

Commendation for valor in support of the 22d Marines.

Next year, the 42d Div Arty, the Rainbow Redlegs, anticipates the successful completion of nuclear and conventional SEEs for the 1-258 FA and 1-187 FA, respectively, as it continues its effort to ensure the best possible fire support for the "**Rainbow Division.**"



A silhouette of Rainbow Div Arty steel.

## 47th Infantry Division Artillery

**D**uring Training Year 89, the 47th Infantry Div Arty (Minnesota ARNG) developed an aggressive program to provide battle command training program (BCTP) Warfighter 88-3 sustainment training and administer two artillery battalion SEEs.

Warfighter (BCTP) sustainment included several situational training exercises (STXs) and a staff-officer refresher course (SORC) at Fort Sill, Oklahoma, in December 1988, in which all elements of the 47th Div Arty participated.

A 14-day FTX during July 1989 administered successful SEEs for 1-194 FA (Iowa ARNG) and 1-151 FA (Minnesota ARNG). The 2-123 FA (Illinois ARNG) continues to make impressive strides after reorganizing as it completed a very successful FTX during June.

The 1-175 FA (Minnesota ARNG) supported the 47th Aviation Brigade during August and participated in a combined-arms live-fire exercise (CALFEX), emphasizing the importance of fire support coordination.

Battery E, 151 FA, the 47th Div Arty's organic TAB, provides the support needed for all field training. Training Year 89 has been very challenging for E Battery as the Div Arty's exercises have been at several different locations and times. The planning and executing process has been excellent, and the Div Arty has been well-supported. The fielding

process of the new AN/TPQ36 and AN/TPQ37 Firefinder radar has been very successful, and the Division's total fire support system has been greatly enhanced.

For Training Year 90, the Div Arty will be emphasizing procedural standardization at all levels to sustain fast and accurate **Viking Artillery** fires.



Radar planning for E/151 FA (TA).

## 49th Armored Division Artillery

The Div Arty (Texas ARNG) of the Free World's Largest Armored Division, the 49th Armored Division, had a very successful year.

The 2-131 FA, Wichita Falls, converted from a 155-mm DS battalion to an 8-inch GS battalion. The 3-133 FA, El Paso, took the DS role of 2-131 FA, converting from 8-inch to the 155-mm howitzers.



For A/3-133 FA, maintenance is training too.

As a result of the organization of the 36th Brigade, 50th Armored Division, we lost the 1-133 FA. It assumed the DS mission for the new Brigade. To replace the Battalion, the 3-132 FA was reformed after 14 years of service in Armor and Combat Engineer units. The new Battalion, with its headquarters in San Angelo, is progressing rapidly and soon will be fully prepared for its 155-mm



Combined-arms training with the supported brigade is the rule.

DS role. It has a long and distinguished Field Artillery record in both world wars.

The Division participated in both the Golden Saber and Roadrunner III Corps exercises. These exercises allowed the units to work closely with III Corps Arty and its subordinate FA brigades. The 49th Div Arty also worked with the 45th FA Brigade (Oklahoma ARNG) during the 49th Div Arty's CPX. This exercise gave the 49th Div Arty and the 45th Brigade staff the opportunity to train and fight together.

The 49th Div Arty performed its annual training exercise in June, with the entire 49th Armored Division. This year's training allowed the Div Arty to practice command and control over all of its firing battalions and gave fire support elements even more experience in the support of maneuver elements.

The *Lone Star Artillery* will continue to prepare to provide timely and accurate fires in support of the 49th Armored Division—whenever and wherever needed.

## 50th Armored Division Artillery

"Make it Happen!" was the motto that permeated the 50th Armored Div Arty during Training Year 89.

The 50th Div Arty (New Jersey ARNG) has units in New Jersey, New Hampshire and Texas, and, like our active-duty counterparts, is focusing on

integrating fire support with maneuver units. We also concentrated on improving the unit status report by stressing MOS qualifications and training.

The 50th Div Arty Headquarters participated in Operation Laser Warrior II in May with the Division Headquarters at Fort A.P. Hill, Virginia. Laser Warrior II

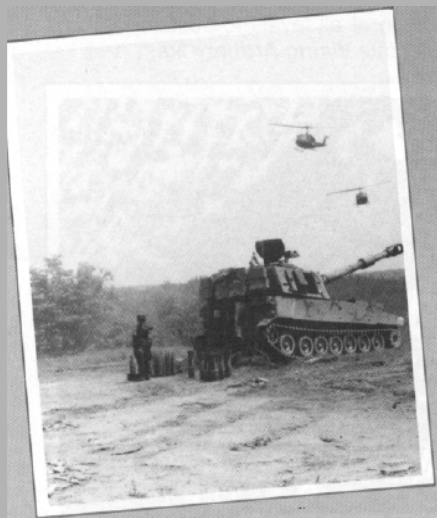
exercised the fire support element and the Division's subordinate major commands in a realistic, III Corps combat scenario.

In June, the 1-112 FA (155-mm SP), 3-112 FA (155-mm SP), 4-112 FA (203-mm), a control cell from the 1-133 FA (155-mm SP), A/197 FA (TAB) and HHB Div Arty came together at Fort Drum, New York, for Annual Training 89. This was the first time in 10 years the 50th Div Arty was able to train together and have the opportunity to function in its secondary role as a FA brigade.

During the training, the 50th Div Arty conducted a competition to determine the best howitzer system in the direct-fire role. It was conducted by the CSM and senior Div Arty NCOs. The winning section of this year's competition was from C/1-112 FA.

The 50th Div Arty also participated in III Corps' CPX Golden Saber XVI. This CPX simulated (through the joint exercise support system or JESS) command, control, communication and intelligence activities down to the brigade level in the operational area of the Northern Army, West Germany.

The 50th Div Arty prides itself in being a proficient member of the Field Artillery community, ready to *Make it Happen!*



VIPs arrive to observe direct-fire competition.



C/1-112 FA prepares for firing.

## 82d Airborne Division Artillery

The "word" comes down, the 82d Airborne Div Arty goes up—chutes fill the sky. Within 18 hours of notification, the lead elements of the US Army's only airborne Div Arty are headed for the DZ, prepared to "Mass the Fire" anywhere in the world.

During 1989, the Airborne Redlegs of the 82d Div Arty proved their rapid deployment skills. In April during the joint operation Solid Shield, the 3-319 FA parachuted into Camp Lejeune, North Carolina, as part of an emergency deployment readiness exercise (EDRE). In September, the entire Div Arty deployed on the joint exercise Market Square III, meeting the challenge of supporting combined-arms operations in four states. During Market Square, the Div Arty not only directed the fires of its organic FA battalions, but also controlled the fires of the 7-15 FA from the 7th Infantry Division, as well as elements of the XVIII Airborne Corps Arty and a battery of Marine Redlegs.

Div Arty units further demonstrated their skills during deployments to Fort Pickett, Virginia; 29 Palms, California; Fort Stewart, Georgia; Eglin AFB, Florida; the JRTC; the Jungle Operations Training Center, Panama; the Northern Warfare Training Center in Alaska; and

the 45th reenactment of the D-Day parachute assault into Normandy, France.

The Div Arty's fire support skills have sharpened with programs that range from the individual standards of precision in the Gunner's Test to the synchronization challenges of Div Arty Base-Piece exercises. Added emphasis on soldier and section proficiency has showcased the critical role of the NCO,

while the development and implementation of the standardized battalion artillery readiness test (BART) have ensured the timeliness and accuracy of each battalion's massed fires.

The 82d Airborne Div Arty's unrelenting commitment to excellence in all endeavors and its no-notice readiness to go "**All the Way!**" uphold the proud traditions of our Army's only Airborne FA Regiment, the 319th.



Time on Target! The All The Way Div Arty commemorates the 319th's Organization Day.

## 101st Airborne Division (Air Assault) Artillery

The 101st Div Arty, Fort Campbell, Kentucky, can provide the fire support to fight and win anywhere in the world. We take pride in our air-assault heritage and train hard to attain the high level of combat readiness requisite to victory as we prepare for the 101st Division's next Rendezvous with Destiny.

The Div Arty battle staffs began the year by excelling as Warfighters during the challenging battle command training program (BCTP). Planning began in April 1988 and included four Division CPXs leading up to a BCTP rotation in February 1989. The 101st Div Arty proved that it could fight the close and deep battles successfully, capitalize on enemy vulnerabilities and sustain itself and other units on the battlefield.

The NTC rotations remain our primary collective training focus, supplemented by battalion SEEs, emergency deployment readiness exercise (EDRE) evaluations and an intensive command inspection program.

Commensurate with the spirit of the Army's slogan for 1989—The Year of the NCO—the Div Arty's NCOs have undertaken more collective training responsibilities. They are an integral part of the planning process and conduct battalion and battery NCO-led FTXs regularly. Div Arty NCOs are also the

authors and trainers of howitzer section certification programs.

NCOs have been a vital part of our initiatives in air-assault tactics, helping to test new load configurations and to set higher standards. The NCO Corps remains the cornerstone of our training, and their leadership and technical excellence help make the **Guns of Glory** a formidable fire support team.



Elements of 1-320 FA conduct a deliberate occupation.



The 1-320 FA conducts the air assault into the deliberate occupation site.

## Silhouettes of Steel

### Field Artillery Training Center

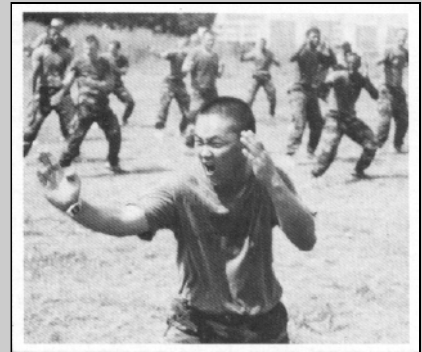
**A**t Fort Sill, Oklahoma, the Field Artillery Training Center's primary mission is conducting initial entry training (IET), consisting of basic combat training (BCT), one-station unit training (OSUT) and advanced individual training (AIT). The Center also provides mobilization training support to the 95th and 84th Training Divisions (USAR).

The Center owns, operates and maintains 126 howitzer systems and 17 range complexes. We fire more than

85,000 artillery rounds each year—two and one-half times the ammunition fired by a corps arty during a comparable period. Our soldiers fire more than 16 million rounds of small-arms ammunition and throw more than 40,000 hand grenades each year.

Our IET Strategy 97 shifted training responsibility from committees to commanders and drill sergeants. Large lectures have given way to small group instruction and focus on hands-on performance-oriented training. Emphasis on FTXs and realism has increased significantly. Our goal is to imbue basic skills so soldiers can perform them later with little or no reinforcement training.

The Center has made significant



Ha-Yah! Self-defense training demands physical and mental conditioning.

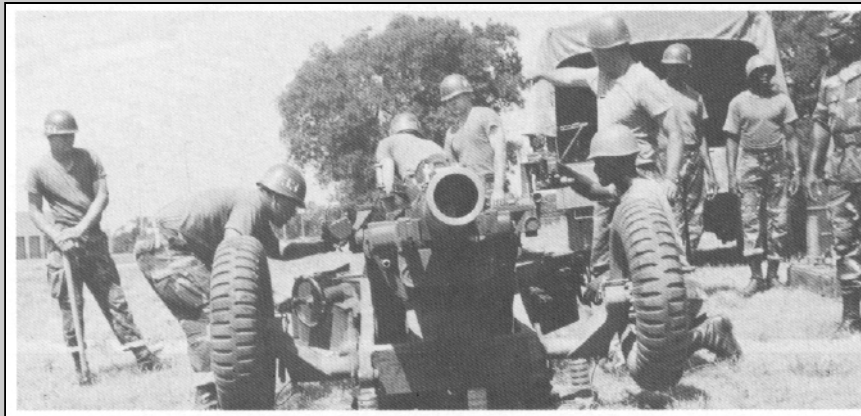
progress in several training initiatives. Most notable is developing a M109 turret trainer to train and reinforce individual and crew skills more efficiently and effectively. The MOS Fast Track programs implemented this year challenge the more talented soldiers in each OSUT or AIT class. Soldiers graduating from these programs are top-quality and usually receive an accelerated promotion to PV2. Finally, we've changed the way we train and test our soldiers, now focusing on a locally produced IET soldiers' job book.

This year, the Center trained more than 17,000 highly motivated and technically proficient soldiers for the total force. The Center continues to accomplish its mission because the Branch depends on us for future Field Artillerymen. **Mission First—People Always!**

In this year of the NCO, our noncommissioned officers have led the way in a renewed initiative to enhance interoperability and war-fighting skills with our Dutch, Belgian, British and German Redlegs. An increased emphasis in joint training, partnership activities and cultural exchanges helped develop total familiarity with host-nation systems and tactics.

Our semi-annual Tactical Operations Tournament pits the best physical security teams in NATO against each other in a realistic mission-specific evaluation and tests basic soldier skills. The Redlegs of the 59th consistently walked away with the honors ahead of other US, NATO and specially trained military police teams.

The Artillery-Ordnance soldiers of the 59th Ordnance Brigade continue to lead, think and train as a cohesive, combat-ready team in harmony with our NATO Allies. We're the largest and most unique Brigade in the Army with **Power to Spare!**



Leadership training starts early as these soldiers prepare a M102 howitzer for firing.

### 59th Ordnance Brigade

**W**ith more Redlegs than a Div Arty, the 59th Ordnance Brigade is the largest and among the most unique brigades in the US Army. Deployed from the Alps to the North Sea, from the inner German border into the Netherlands, the Brigade provides special-weapons and guided-missile support to five NATO member nations and three US corps.

With five artillery groups and three ordnance battalions, the 59th has uniquely meshed the two branches and earned the praise of being called The Backbone of NATO, a title our Redleg-Ordnance team wears proudly. The Redlegs of the 59th have unequalled training opportunities as they live and work with the allied units they support.



A combined-operations MAPEX resolves misunderstandings.



Soldiers of the 59th train Allies for NBC operations.



## Redleg Leathernecks

**M**arine Corps Artillery continues to adapt to the profound changes in structure and orientation necessary to maintain its primary mission of providing supporting fire to the maneuver elements of the Marine air-ground task force (MAGTF).

### Master Plan

Unchanged is that each of the four artillery regiments will provide support to its parent division—three active duty and one Reserve. Within the artillery regiments are three battalions that fulfill the traditional roles of DS to maneuver elements. The remaining artillery battalion in each regiment (self-propelled in the continental US) is to evolve into a 3x8 towed structure as the distinction between DS and GS units is eliminated.

The changes to the indirect-fire community were prompted by the MAGTF Master Plan, which projects requirements through the end of this century. The Plan envisions increasing employment of Marine units in low-intensity conflict in the Third World, a renewed emphasis on the amphibious assault and further development of the Corps' evolving doctrine of maneuver warfare, in which our numerically inferior forces must be prepared to fight and defeat larger ones.

In support of the Plan, the integrity and combined-arms aspects of the MAGTFs are being emphasized for a more expeditionary nature, to make them leaner and more mobile and capable of independent operations.

Accordingly, Marine Corps artillery, as an indispensable ingredient of the MAGTF, will adapt and adjust in both structure and armament to accomplish the evolving mission and adjust to the limitations of available shipping and manpower.

Target acquisition, meteorological and survey units will move from the battalion and relocate in the regimental headquarters battery. Further, regimental survey sections will add one additional survey party for a total of two survey parties and two position and azimuth determining system (PADS) teams. This will provide the fourth-order



Redlegs of E/2-12 Marines prepare to fire their 105-mm howitzer during Korean Incremental Training Package 89-3.

### The MAGTF Master Plan

The MAGTF Master Plan, approved by the Commandant of the Marine Corps in July 1989, provides the basis of force restructure and projects operational requirements through the year 2000. It focuses on the possibility of armed conflict somewhere in the Third World and on the capabilities needed to combat drug trafficking and terrorism. It's a keystone document that provides the "unified field theory" to guide all USMC program decisions.

The self-contained, combined-arms characteristics of MAGTFs needed modifications to enhance their expeditionary role. The revised structure of the Marine Corps envisioned by the Master Plan provides forces that are lighter, more mobile and more capable of conducting maneuver

warfare. Consequently, the improved MAGTF will be more realistically matched to the requirements of combat in the most probable areas of employment.

The MAGTFs will continue to provide fleet and theater commanders versatility and balance in the full spectrum of conflict with the flexibility inherent in the MAGTF organization of air, ground and logistics elements unified under a single commander.

Landing-force doctrine will evolve as equipment available to the MAGTF in the near future will provide a capability to launch a complete over-the-horizon amphibious assault from a range of 25 nautical miles, both at night and in foul weather.

As ever, the Navy-Marine Corps amphibious team will remain an effective means for projecting and sustaining forces ashore.

survey capability of a survey information center (SIC) at the Marine expeditionary brigade (MEB) level.

### Materiel

Under a guiding philosophy emphasizing more expeditionary forces, much of the current inventory of self-propelled artillery will be eliminated, with the possibility of moving some M109 howitzer units to the Reserve regiment for the short term.

Further, the Commandant of the Marine Corps' guidance of August 1989 foresees a "necking-down" of the variety of Marine Corps artillery systems in the inventory. All USMC artillery will be either M101A1 (105-mm) or M198 (155-mm) howitzers in the near term, moving

to all lightweight 155-mm howitzers and multiple launch rocket systems (MLRS) in the long term.



Aiming for accuracy. Cpl Vernon L. Bible (left) checks the setting on his gunner's quadrant while PFC Donnie L. Allen sets the deflection on the Pantel.



Fire! M/4-12 Marines supports Exercise Bear Hunt 89 in the Republic of Korea.

The M198 155-mm howitzer remains the primary artillery weapon because of its range and relative air and sea mobility. In the battalion landing team (BLT), the M198 often is used with the M101A1 105-mm howitzer in a 3x8 split battery to give greater flexibility and ship-to-shore mobility to the attached battery.

In the latter part of FY 90, the Marine Corps will evaluate a lightweight successor to the M198 and the M101A1 howitzers—a 155-mm howitzer that retains the range and firepower of the M198 but one that has improved ship-to-shore mobility. The MLRS will be the



Cannoneers' Hop. Training and more training makes for readiness.

eventual successor to the M109 and M110 howitzers.

Experimentation began this past year with the modified fire support team digital message device (FIST-DMD) and battlefield command terminal (BCT), also called the briefcase terminal by the Army. The growth of fire support automation was enhanced by the Marine Corps' commitment to the advanced Field Artillery tactical data system (AFATDS) as the objective Marine system, making AFATDS a joint Marine Corps-Army project.

Finally, Marines have begun implementing digital communications, from the observer's use of the digital command terminal (DCT) to the fire direction center's battery computer system (BCS), which can process and transmit data to the gunline via the gun display unit (GDU). These systems make possible the complete processing of fire missions without using voice commands.

### Leathernecks

Tactics and doctrine develop as the mission develops, and weaponry changes with technology. But one constant is the mettle of the 11,900 men of the Marine Corps Artillery who continue a proud tradition of serving their country with unmatched professional competency and an indomitable spirit.

### Retooling the Marine Corps

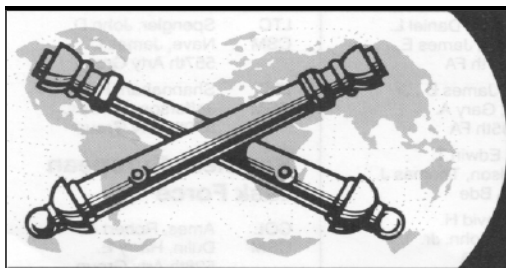
1. Two GS battalions and two M109 batteries have been inactivated from the active force. A third GS battalion was scheduled to be activated, but the activation was cancelled.
2. Target acquisition batteries will be eliminated. The majority of TA personnel and functions will transfer to the counterbattery radar platoon in the regimental headquarters battery. Remaining TA Marines will augment communication, supply, motor transport and personnel sections.
3. The meteorological sections of the DS and GS battalion headquarters batteries will be deleted. Instead, a new meteorological section will be created in the regimental headquarters battery to operate the new meteorological data system (MDS).
4. The survey sections of all DS and GS battalions will be rearranged to a standard configuration with one survey and two PADS teams.
5. The regimental survey section will have one additional survey party. The new structure (two survey parties and two PADS teams) will provide fourth-order survey control to each MEB formed by the regiment, allowing the formation of a SIC.
6. A fourth forward observer team will be assigned to each firing battery, habitually in support of four-company infantry battalions.

Their story—common to all US artillerymen—begins at Fort Sill where more than 2,600 Marines train each year in all levels of artillery, from basic MOS schools to "graduate" seminar courses. Here they work to learn their craft and perfect their ability to place steel on target.

The Marines hone their skills during long hours of arduous and realistic exercises at 29 Palms, California; Fort Pickett, Virginia; Camp Blanding, Florida; and at their home bases of Camp Lejeune, North Carolina; Camp Pendleton, California; and Camp Butler, Okinawa, where the art and science of artillery is validated and refined in a wide range of environments.

And, without regard to the mission of the Marines they support or their geography, the heritage of Marine artillery remains consistent—the delivery of accurate and timely fires. **Redleg Leathernecks!**





# Field Artillery Commanders and Command Sergeants Major

As of 1 October 1989

## Active Army

### Training and Doctrine Command

### US Army Field Artillery School and Fort Sill

MG Hallada, Raphael J.  
Commandant/CG  
Fort Sill

CSM Taylor, David P.

BG Ellerson, John C.  
Asst. Commandant/Cdr,  
Stewart, David P.  
30th FA Regiment

LTC Rawls, Buddy G.  
Gower, George A.  
1st Bn, 30th FA

LTC Berry, Guy A., Jr.  
CSM Carmichael, Kiden E.  
3d Bn, 30th FA

LTC Morris, Charles A.  
CSM Thompson, Donald W.  
5th Bn, 30th FA

COL Scales, Robert H., Jr.  
CSM Edwards, John A.  
USAFATC

LTC Sheridan, Joseph C.  
CSM Cobb, Jesse  
1st Bn, 19th FA

LTC Young, Robert F.  
CSM Camel, Enos  
3d Bn, 22d FA

LTC Cantrell, Alvin D.  
CSM Kermode, William J., Jr.  
2d Bn, 30th FA

LTC(P) Alton, John F.  
CSM Noel, Thomas E.  
1st Bn, 31st FA

LTC Dolton, Henry J., Jr.  
CSM Gaines, Crynell  
1st Bn, 33d FA

LTC Kelly, Edward M., Jr.  
CSM Mull, David L.  
1st Bn, 78th FA

LTC Weidner, Glenn R.  
CSM Stokes, Ellis H.  
2d Bn, 80th FA

LTC Martin, Phillip M.  
CSM Burk, Maxie L.  
3d Bn, 321st FA

### Forces Command III Corps

BG Miller, Frank L., Jr.  
CSM Eldridge, Timothy U.  
III Corps Arty

COL Laws, Jerry L.  
CSM Taylor, Rufus  
75th FA Bde

LTC Greene, Edward E., Jr.  
CSM Jernigan, Paul W.  
1st Bn, 12th FA

LTC Hardie, Ricky E.  
CSM Barwick, William S.  
1st Bn, 17th FA

LTC Arntz, Stephen J.  
CSM McFadden, Joseph J.  
5th Bn, 18th FA

LTC Maples, Michael D.  
CSM Martin, Robert  
6th Bn, 27th FA

COL Benton, David L., III  
CSM Reed, James A.  
212th FA Bde

LTC Williams, Charles M.  
CSM Adams, Thomas S.  
2d Bn, 17th FA

LTC Allin, George R.  
CSM Williamson, Guy  
2d Bn, 18th FA

LTC Rowan, James H.  
CSM Harris, Willie J.  
3d Bn, 18th FA

LTC Snapp, Patrick G.  
CSM Walley, Marion O.  
1st Bn, 20th FA

LTC Sabia, Giacomo R.  
CSM Reynolds, Raymond  
6th Bn, 32d FA  
(Fort Hood)

COL Bishop, Lewis, Jr.  
CSM Royal, Ira J.  
214th FA Bde

LTC Jurchenko, Daniel A.  
CSM Harrison, Eddie L.  
2d Bn, 2d FA

LTC McKenzie, Eugene  
CSM Marable, Joseph L.  
3d Bn, 9th FA

### XVIII Airborne Corps

BG Tragemann, Richard W.  
CSM Elder, Robert E.  
XVIII Abn Corps Arty

COL McFarren, F.E.  
CSM Johnson, Shelton  
18th FA Bde

LTC Edwards, Roy L.  
CSM Melvin, Richard L.  
3d Bn, 8th FA

LTC Lovelace, James J., Jr.  
CSM Eledui, Adalbert  
5th Bn, 8th FA

LTC Drinkwater, John P.  
ISG Epps, Ronald J.  
(Acting)  
3d Bn, 27th FA

LTC Groening, William H.  
CSM Dixon, Donald L.  
1st Bn, 39th FA (Abn)

### Division Artilleries

COL Gass, James M.  
CSM Riggs, Glenn L.  
1st Cav Div Arty

LTC Anderson, John K.  
SGM Davis, Robert K.  
(Acting)  
1st Bn, 82d FA

LTC Knight, Kenneth R.  
CSM Cates, David L.  
3d Bn, 82d FA

COL Roberts, James F., Jr.  
CSM Hill, Tellis R.  
1st IN Div (Mech) Arty

LTC Emerson, Harry M., III  
CSM Manning, Curtis E.  
1st Bn, 5th FA

LTC Gingrich, John R.  
CSM Roberts, Daniel J.  
4th Bn, 5th FA

COL Roberts, William F.  
CSM McNair, Liddell  
2d AR Div Arty

LTC Kerin, James R., Jr.  
CSM Brodeur, Albert J.  
1st Bn, 3d FA

LTC Stricklin, Toney  
CSM McClain, Robert L.  
3d Bn, 3d FA

COL Zimmerman, LeRoy  
CSM Holmes, Timothy L.  
4th IN Div (Mech) Arty

LTC Jackson, James H.  
CSM Smith, Robert C.  
1st Bn, 29th FA

LTC Landrum, J. Michael  
CSM Mason, Henry T.  
3d Bn, 29th FA

LTC Lennox, William J., Jr.  
CSM Cupp, Lonny J.  
5th Bn, 29th FA

COL Ballagh, Robert S., Jr.  
CSM Haynes, Ellis J.  
5th IN Div (Mech) Arty

LTC Martin, Michael C.  
CSM Chittum, Steven W.  
4th Bn, 1st FA

LTC Broadwater, Colby M., III  
CSM Brown, George D.  
5th Bn, 1st FA

COL Hamilton, Mark R.  
CSM McElroy, Robert  
6th IN Div (L) Arty

LTC Leigh, Joseph J., Jr.  
CSM Montgomery, Roger  
4th Bn, 11th FA

LTC Allen, William W.  
CSM Skipper, Wendell  
5th Bn, 11th FA

COL DeFrancisco, Joseph E.  
CSM Shrewsberry, Harold F.  
7th IN Div (L) Arty

LTC Baltimore, Perry F., III  
CSM Bragg, Joseph C.  
2d Bn, 8th FA

LTC Brown, Richard L.  
CSM Perry, William J., III  
6th Bn, 8th FA

LTC Williams, Randall C.  
CSM Vogt, David E.  
5th Bn, 15th FA

LTC McCabe, Bernard J., Jr.  
CSM Kilroy, John F.  
7th Bn, 15th FA

COL Middleton, Douglas J.  
CSM Aguigui, Doroteo Q.  
9th IN Div (Mtz) Arty

LTC Moman, Frankie L.  
CSM Toliver, Ronald E.  
1st Bn, 11th FA

LTC Reitz, John W.  
CSM Phillips, Richard A.  
3d Bn, 11th FA

LTC Ryan, William A.  
CSM Underwood, Johnny W.  
1st Bn, 84th FA

COL O'Connor, William G.  
CSM Sexton, Robert C.  
10th Mtn Div (L) Arty

LTC Nell, Paul E., Jr.  
CSM Howell, John C.  
1st Bn, 7th FA

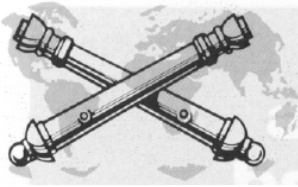
LTC Olson, Russell V., Jr.  
CSM Hartman, Robert  
2d Bn, 7th FA

COL Rolston, David A.  
CSM Crowe, Willie C.  
24th IN Div (Mech) Arty

LTC Allen, Johnny D.  
MSG(P) Sprinkel, Robert W., Jr.  
(Acting)  
1st Bn, 14th FA

LTC Floris, John P.  
CSM Collins, Carl H.  
1st Bn, 41st FA

LTC Lutz, Stephen M.  
CSM Luke, Ashley J.  
3d Bn, 41st FA



COL von Kaenel, Howard J.  
 CSM Acosta, Felix  
 82d Abn Div Arty

LTC Taylor, Jerry A.  
 CSM Austin, Johnny J.  
 1st Bn, 319th FA

LTC Cummins, Gerald, Jr.  
 CSM Dungy, William E.  
 2d Bn, 319th FA

LTC Gottardi, Larry D.  
 CSM Warrick, Ronald  
 3d Bn, 319th FA

COL Anderson, Randall J.  
 CSM Cox, David  
 101st Abn Div Arty (AA)

LTC Lawson, Harlan A.  
 CSM Duggins, Kalub D.  
 1st Bn, 320th FA

LTC Hartsell, H. Lynn  
 CSM Unroe, James P.  
 2d Bn, 320th FA

LTC Pembroke, Wayne R.  
 CSM Norvell, Larry J.  
 3d Bn, 320th FA

### Separate Commands

COL Elder, Robin L.  
 SGM Jennings, Carlton L.  
 TEXCOM FA Board

COL Webb, Myrt W., Jr.  
 SGM Ojeda, Carlos P.  
 US Army Garrison,  
 Fort Chaffee

LTC Engel, William F.  
 CSM Kirchoff, Lyle R.  
 4th Bn, 41st FA  
 (197th IN Bde)

LTC Jones, William A.  
 CSM Colquitt, Bobbie, Jr.  
 1st Bn, 77th FA  
 (194th AR Bde)

### United States Army, Europe

BG Bryde, Walter J., Jr.  
 CSM Covey, William M.  
 V Corps Arty

COL Schulte, David A.  
 CSM Stanislas, Rawle B.  
 41st FA Bde

LTC Resnick, Allan M.  
 CSM Devoe, Walter  
 4th Bn, 18th FA

LTC Faircloth, William R.  
 CSM Yancey, Andrew C.  
 3d Bn, 20th FA

LTC Adams, Lonnie B.  
 CSM Woods, David C.  
 1st Bn, 27th FA

LTC Calhoun, John P.  
 CSM Edwards, Alfred G.  
 1st Bn, 32d FA

LTC Edney, Kermit, Jr.  
 CSM Sexton, Frederick E.  
 4th Bn, 77th FA

COL Boyd, Morris J.  
 CSM Woodley, John L.  
 42d FA Bde

LTC Lucas, Michael D.  
 CSM Adams, Paul C.  
 5th Bn, 3d FA

LTC Hanson, Robert L., Jr.  
 CSM Smith, Walter  
 4th Bn, 7th FA

LTC Henderson, James W.  
 CSM Morales, Jorge  
 2d Bn, 20th FA

LTC Jolissaint, John M., Jr.  
 CSM Mitchell, Sammie L.  
 2d Bn, 32d FA

LTC Denny, Dennis P.  
 CSM Graham, Roger T.  
 3d Bn, 32d FA

### Division Artilleries

COL Michitsch, John F.  
 CSM Carr, Thomas E.  
 3d AR Div Arty

LTC Irick, Edward F.  
 CSM Hawkins, Joseph A., Jr.  
 2d Bn, 3d FA

LTC Absher, Charles W.  
 CSM Young, Richard A.  
 2d Bn, 82d FA

LTC Strom, Stephen, H.  
 CSM Flores, Francisco  
 4th Bn, 82d FA

COL Hicks, Robert R., Jr.  
 CSM Morant, Benny J.  
 8th IN Div (Mech) Arty

LTC Chapman, Raymond M.  
 CSM Parsons, Robert E.  
 2d Bn, 29th FA

LTC Randolph, Stephen C.  
 CSM Eason, Guy R.  
 4th Bn, 29th FA

LTC Gay, Mark P.  
 CSM Allen, Bobby W.  
 6th Bn, 29th FA

### VII Corps

MG Del Rosso, Louis J.  
 CSM Pippin, Larry V.  
 VII Corps Arty

COL Ott, William H.  
 CSM Higginbotham, Walter D.  
 17th FA Bde

LTC Ryan, Sylvester A., Jr.  
 CSM Shimizu, Antonio T.  
 4th Bn, 12th FA

LTC Whittenberg, Stephen E.  
 CSM Mitchell, Joe W.  
 1st Bn, 18th FA

LTC Valenzuela, Alfred A.  
 CSM Wills, Michael W.  
 1st Bn, 36th FA

LTC Durden, Richard L.  
 CSM Kraus, Lawrence  
 2d Bn, 77th FA

COL Clark, William B.  
 CSM Barber, David P.  
 72d FA Bde

LTC Christopher, Paul E.  
 CSM Villines, Kenneth M.  
 3d Bn, 12th FA

LTC Perry, Howard S., III  
 CSM Powell, Twin L., Jr.  
 2d Bn, 14th FA

LTC Morgan, Gary D.  
 CSM Dade, William E.  
 4th Bn, 14th FA

LTC Breitenbach, Daniel L.  
 CSM Strackbein, James E.  
 4th Bn, 27th FA

LTC Godwin, James B., Jr.  
 CSM Duncan, Gary A.  
 3d Bn, 35th FA

COL Vernon, Edwin T.  
 CSM Edmundson, Thomas J.  
 210th FA Bde

LTC Toops, David H.  
 CSM Heritage, John, Jr.  
 3d Bn, 5th FA

LTC Thieme, Thomas N.  
 CSM Boone, Robert L.  
 2d Bn, 12th FA

LTC Griffin, Gary B.  
 CSM Watters, Doyle  
 3d Bn, 17th FA

LTC Williams, Bristol W., Jr.  
 MSG Huff, Michael R.  
 5th Bn, 17th FA

### Division Artilleries

COL Dubia, John A.  
 CSM Hamilton, Delano R.  
 1st AR Div Arty

LTC Unterseher, James E.  
 CSM Howard, Preston B.  
 2d Bn, 1st FA

LTC Starner, Steven G.  
 CSM Smith, James F.  
 3d Bn, 1st FA

LTC Johnson, Alan E.  
 CSM Wright, Daniel E.  
 6th Bn, 1st FA

COL Karr, Thomas W.  
 CSM Calloway, Robert E.  
 3d IN Div (Mech) Arty

LTC Leahy, Michael L., III  
 CSM Riggs, Glenn L.  
 2d Bn, 41st FA

LTC Nelson, Terrance E.  
 CSM McKinney, James C.  
 5th Bn, 41st FA

LTC Bolger, John T., III  
 CSM Lugo-Rivera, Luis A.  
 6th Bn, 41st FA

### 56th Field Artillery Command

MG Bean, Roger K.  
 CSM Tompkins, Ian R.  
 56th FA Cmd

LTC Seay, Stephen M.  
 CSM Irving, Herman E.  
 1st Bn, 9th FA

LTC Bowden, Thomas G.  
 CSM Lopes, Lucio O.  
 2d Bn, 9th FA

LTC Varsolona, Frank L.  
 CSM Smith, Fred F.  
 4th Bn, 9th FA

### 59th Ordnance Brigade

LTC Joiner, Thomas G.  
 CSM West, Joseph C.  
 294th Arty Group

LTC Perkins, Ellis C., Jr.  
 CSM Thompkins, Carroll E.  
 512th Arty Group

LTC Witschonke, Carl F.  
 CSM Carnegie, Guillermo E.  
 552d Arty Group

LTC Spengler, John D.  
 CSM Nave, James C.  
 557th Arty Group

LTC Shannahan, Patrick M.  
 CSM Jefferson, Henry C.  
 570th Arty Group

### Southern European Task Force

COL Ames, Robert A.  
 CSM Dulin, Harry E.  
 528th Arty Group

COL St. Amant, Philemon A., II  
 CSM Brewington, Avan, Jr.  
 558th Arty Group

COL Counts, Edward T.  
 CSM Meredith, Henry R.  
 559th Arty Group

### Separate Commands

COL Harris, Nick C.  
 CSM Rundle, Dennis L.  
 Grafenwoehr TA

LTC Lantzy, Walter P.  
 CSM Holmes, David T.  
 4th Bn, 3d FA  
 (2d AD Fwd)

LTC Bruce, William A.  
 CSM Hill, Jerry A.  
 2d Bn, 5th FA  
 (1st ID Fwd)

### Western Command

COL Lackey, Jimmie R.  
 CSM Graves, Roy L.  
 25th IN Div (L) Arty

LTC Carson, Robert G., III  
 CSM Murrell, Angelo B.  
 3d Bn, 7th FA

LTC Tucker, Ronnie W.  
 CSM Najjar, Joe C.  
 1st Bn, 8th FA

LTC Krebs, Robert G., Jr.  
 CSM Hipp, Virgil L.  
 7th Bn, 8th FA

LTC Churchill, Ralph B.  
 CSM Lunceford, Danny L.  
 2d Bn, 11th FA

### Korea and the Eighth Army

COL Richardson, Sterling R.  
 CSM Caldwell, William E.  
 2d IN Div Arty

LTC Ishii, Melvin Y.  
 CSM Bynog, David L.  
 1st Bn, 4th FA

LTC(P) Butler, Philip R.  
 CSM Thompson, Thomas H.  
 8th Bn, 8th FA

LTC Tetu, William J.  
 CSM Shellman, Garold S.  
 1st Bn, 15th FA

LTC Smith, Davis O.  
 CSM Dunn, Michael A.  
 6th Bn, 37th FA

### Separate Commands

COL Simino, Joseph R.  
 CSM Davenport, Lewis C.  
 Eighth Army Sp Trps Cmd  
 and Area III, Korea

COL Cook, Rollie D.  
 SFC Lesley, Larry G.  
 Cbt Spt Coord Tm 3



LTC Ortenzio, Thomas J.  
 ISG Cone, John H., Sr.  
 Sp Wpns Spt Det, Korea

**Army National Guard**

**I Corps**

COL(P) Ence, Randy J.  
 CSM Nelson, John W.  
 I Corps Arty

LTC Eichers, Brent S.  
 MSG Boyington, Richard L.  
 1st Bn, 140th FA

LTC Craig, Ronald A.  
 CSM Williams, Brook H.  
 1st Bn, 145th FA

MAJ Fuellenbach, Mark  
 CSM Bishop, Kent A.  
 2d Bn, 222d FA

**Division Artilleries**

COL Russell, James W.  
 CSM Brennan, Paul M.  
 26th IN Div Arty

LTC Huskes, Richard W., Jr.  
 CSM Charbonneau, Edward G.  
 1st Bn, 86th FA

LTC Russell, Edward H.  
 CSM Beirne, John E.  
 1st Bn, 101st FA

LTC Huggins, Cleveland P., III  
 CSM Tassone, Vincent J.  
 2d Bn, 192d FA

LTC Sanfason, David B.  
 CSM Barboza, Frank, Jr.  
 1st Bn, 211th FA

COL Babb, Heinrich N.  
 CSM Sheard, James J., Jr.  
 28th IN Div Arty

LTC Zak, Leo P.  
 CSM Honkus, Thomas D.  
 1st Bn, 107th FA

LTC McClintock, Charles F.  
 CSM Stover, Charles V., Jr.  
 1st Bn, 108th FA

MAJ Ormando, John J.  
 CSM Sauer, John J., Jr.  
 1st Bn, 109th FA

LTC Messina, Michael R.  
 CSM Houston, David J.  
 1st Bn, 229th FA

COL Tyler, Terry J.  
 CSM Eldridge, Robert A.  
 29th IN Div (L) Arty

LTC Rodier, Edward A., Jr.  
 CSM Perando, Scott A.  
 2d Bn, 110th FA

MAJ(P) Stevens, Wayne S.  
 CSM Yeager, Thomas E.  
 2d Bn, 111th FA

LTC Fowle, William H.  
 CSM Ferguson, Lowell T.  
 1st Bn, 246th FA

COL Eggleston, Jerry J.  
 CSM Williams, Robert B.  
 35th IN Div (Mech) Arty

LTC Johansen, Forrest R.  
 CSM Gorman, Gerald F.  
 1st Bn, 127th FA

LTC Winter, Brian D.  
 CSM Rudder, John L.  
 2d Bn, 130th FA

MAJ Smith, James L.  
 SGM Bush, Robert J.  
 2d Bn, 138th FA

LTC Frederiksen, Michael A.  
 SGM Stevens, George E.  
 1st Bn, 161st FA

LTC Winchell, Ronald E.  
 CSM Notman, Harold O.  
 1st Bn, 168th FA

COL Henry, Ronald W.  
 CSM Osborne, John D.  
 38th IN Div Arty

LTC Caie, James P., Jr.  
 CSM Pennell, Wayne G.  
 1st Bn, 119th FA

MAJ(P) Montgomery B., Michael  
 CSM Wheeler, Robert B.  
 3d Bn, 139th FA

MAJ(P) Noel, Jack E.  
 SGM Scott, Ronald K.  
 2d Bn, 150th FA

LTC Green, Frank B.  
 CSM Mattingly, James R.  
 1st Bn, 163d FA

COL Schmidt, Eugene W.  
 CSM Marschall, Josef O.  
 40th IN Div (Mech) Arty

LTC Minetti, Gerald P.  
 CSM McGill, Bernis E.  
 1st Bn, 143d FA

LTC Ramsey, Edwin P., Jr.  
 CSM Vacant  
 1st Bn, 144th FA

LTC Kelley, William J., Jr.  
 CSM Morrison, Michael M.  
 2d Bn, 144th FA

MAJ Throckmorton, Richard L.  
 CSM Andrews, Gary W.  
 3d Bn, 144th FA

COL Beck, Richard J.  
 CSM Murfitt, Arthur M.  
 42d IN Div Arty

LTC Alesia, Pasquale A.  
 CSM Smith, Walter, Jr.  
 2d Bn, 104th FA

MAJ Smith, Clifford A.  
 ISG Connor, Robert J.  
 (Acting)  
 1st Bn, 187th FA

LTC Lundell, Carl  
 CSM Santovito, Ronald J.  
 1st Bn, 209th FA

LTC Comstock, Richard H., Jr.  
 MSG Aeinlfi, Albert A.  
 (Acting)  
 1st Bn, 258th FA

COL Bode, Louis O.  
 CSM Benda, Charles J.  
 47th IN Div Arty

LTC Perry, James F., Jr.  
 CSM Egger, Kenneth J.  
 2d Bn, 123d FA

LTC Rahkola, William A. R.  
 SGM Anderson, Jerome H.  
 1st Bn, 151st FA

MAJ Anderson, Boyd W.  
 CSM Hodge, Harold L.  
 1st Bn, 175th FA

MAJ(P) Warnock, Tracy L.  
 CSM Peterson, Leslie D.  
 1st Bn, 194th FA

COL Harvie, James C.  
 CSM Tolbert, Jerry E.  
 49th AR Div Arty

LTC Kreger, John W.  
 MSG(P) Meeks, Bobby L.  
 2d Bn, 131st FA

LTC Powers, Christopher J.  
 CSM Black, Clyde D.  
 3d Bn, 132d FA

LTC Avila, John, Jr.  
 CSM Shamy, Robert G.  
 3d Bn, 133d FA

MAJ(P) Nichols, Richard W.  
 CSM Belyeu, Leonard W.  
 4th Bn, 133d FA

COL Blysak, George J.  
 CSM Wagner, Roy R.  
 50th AR Div Arty

LTC Chiste, Ronald L.  
 CSM Vacant  
 1st Bn, 112th FA

MAJ(P) Moore, Kenneth B.  
 CSM Newman, Frank T.  
 3d Bn, 112th FA

LTC Kasiski, Stanley A.  
 CSM Chiacchio, Charles G.  
 4th Bn, 112th FA

LTC Hafner, John F.  
 CSM Bennett, Joseph S.  
 1st Bn, 133d FA

**Brigades**

COL Martin, Paul D.  
 CSM Clinton, Don C.  
 45th FA Bde

MAJ Haub, Larry D.  
 CSM Spruill, James D.  
 1st Bn, 158th FA

LTC Thomasson, Bobby D.  
 CSM Ahrens, Lewis E.  
 1st Bn, 171st FA

LTC Morford, Jim E.  
 CSM Ray, Robert F.  
 1st Bn, 189th FA

COL Holmes, James W.  
 CSM Koehler, Lowell M.  
 57th FA Bde

LTC Luebke, Ronald A.  
 CSM Paul, James L., Jr.  
 1st Bn, 121st FA

LTC McRoberts, Ronald E.  
 CSM Zins, Howard A.  
 1st Bn, 125th FA

LTC Thompson, David F.  
 CSM Villnow, William W.  
 1st Bn, 126th FA

COL Kanaczet, Richard P.  
 CSM Iannelli, Paul A.  
 103d FA Bde

LTC Charette, Norbert G.  
 SG Macedo, Robert J.  
 (Acting)  
 1st Bn, 103d FA

LTC Zifcak, Dennis J.  
 CSM Wagner, Gerard J.  
 2d Bn, 103d FA

COL Sexton, Paul W.  
 CSM Hoover, Harold W.  
 113th FA Bde

LTC Taylor, Robert E.  
 CSM Barger, Raymond C.  
 4th Bn, 113th FA

LTC Midyette, Jack B.  
 CSM Pulley, Robert E.  
 5th Bn, 113th FA

COL Sharp, Robert G.  
 CSM Daniels, Ralph C.  
 115th FA Bde

LTC Scharp, Robert C.  
 CSM Cash, Jack H.  
 1st Bn, 49th FA

LTC Lowham, James R.  
 CSM Persson, Kenneth V.  
 3d Bn, 49th FA

COL Pearce, Cecil L.  
 CSM Harville, Rodney J.  
 118th FA Bde

LTC Lunsford, James N.  
 CSM Youngblood, Enoch J.  
 2d Bn, 117th FA

LTC Tinley, Henry E.  
 CSM Nicora, Barry D.  
 1st Bn, 214th FA

LTC Reddick, Terrell T.  
 CSM Tant, Kenneth W.  
 2d Bn, 214th FA

COL Hoppes, Ronald A.  
 CSM Blair, Charles M.  
 135th FA Bde

LTC Schrimpf, John D.  
 CSM Heinzler, James J.  
 1st Bn, 128th FA

LTC Courtney, John M.  
 CSM Dew, Larry E.  
 1st Bn, 129th FA

COL McClure, Samuel T.  
 CSM Dermon, Robert E.  
 138th FA Bde

MAJ Smith, John W.  
 CSM Price, Eugene L.  
 1st Bn, 623d FA

COL Armistead, Bobby H.  
 CSM Fondren, Bobby D.  
 142d FA Bde

LTC Meeks, Gary W.  
 CSM McCutchen, Wendell L.  
 1st Bn, 142d FA

LTC Horne, Nathan N.  
 CSM Fagala, Robin F.  
 2d Bn, 142d FA

COL Edwards, Ernest T.  
 CSM Bjerck, Orlo R.  
 147th FA Bde

LTC Goldhorn, Donald J.  
 CSM Vacant  
 1st Bn, 147th FA

LTC Whipple, Frank W.  
 CSM Logan, Richard L.  
 2d Bn, 147th FA

COL Boone, Claude W.  
 CSM Floyd, Lloyd H.  
 151st FA Bde

LTC Demby, Robert E.  
 CSM King, Dewey L.  
 3d Bn, 178th FA

LTC Sipe, Nicholas P.  
 CSM Weaver, Vince C.  
 4th Bn, 178th FA

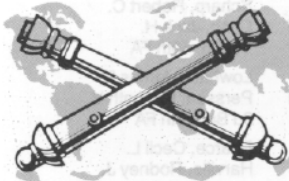
LTC(P) Muller, Felix J.  
 CSM Wright, Gerald A.  
 153d FA Bde

LTC Gordon, Jay P.  
 CSM Lara, Ysabel S.  
 1st Bn, 180th FA

LTC Perrin, John W.  
 CSM Smith, Lawrence W.  
 2d Bn, 180th FA

COL Suhre, William R.  
 CSM Haptonstall, Emmett L.  
 169th FA Bde

LTC Crowder, Ronald G.  
 CSM Curtis, James M.  
 1st Bn, 157th FA



LTC Martinez, Matthew M.  
MSG Craver, Kenneth E.  
2d Bn, 157th FA

COL Wynne, Marion K.  
CSM Davis, Bobby G.  
196th FA Bde

LTC Tipps, Jerry W.  
CSM Pratt, John F.  
1st Bn, 115th FA

LTC Bean, Dennis N.  
CSM Human, Henry C.  
1st Bn, 181st FA

COL Couture, Roland W.  
CSM Ziarko, Stanley W.  
197th FA Bde

LTC Hennessey, Charles K.  
CSM Rice, Michael F.  
1st Bn, 172d FA

LTC Cassady, Michael L.  
CSM Hammel, Leonard D., Jr.  
2d Bn, 197th FA

LTC LeClerc, Joseph G.E.  
CSM Barrett, Stephen W.  
3d Bn, 197th FA

COL Losel, Glenn W.  
CSM Flye, Jerome E.  
209th FA Bde

COL Lorenzo, Leo A.  
CSM Van Kessel, George H.  
227th FA Bde

LTC Wingo, Thomas O.  
CSM Currier, Robert A.  
1st Bn, 116th FA

LTC Bellar, James S.  
CSM Carter, Harry T.  
3d Bn, 116th FA

COL Lipscomb, James H., III  
CSM Jones, Jerry A.  
631st FA Bde

LTC Hyneman, John M.  
CSM Cummings, Ancle W.  
1st Bn, 114th FA

LTC Freeman, William L., Jr.  
CSM Cooley, Donald L.  
4th Bn, 114th FA

### Round-Out Battalions

LTC Carter, Charles M.  
MSG Marshall, Ben A.  
2d Bn, 114th FA  
(1st Cav Div Arty)

LTC Waller, Ronald A.  
CSM Leonick, Gerald J.  
1st Bn, 141st FA  
(5th IN Div Arty)

LTC Read, Richard D.  
CSM White, William T.  
2d Bn, 146th FA  
(9th IN Div Arty)

LTC Hall, Charles H., III  
CSM Gleidman, Jeffrey A.  
1st Bn, 156th FA  
(10th Mtn Div Arty)

LTC Pittman, Garry C.  
CSM Glisson, David  
1st Bn, 230th FA  
(24th IN Div Arty)

### Separate Battalions

MAJ(P) Young, John L., III  
CSM Wood, Kenneth E.  
1st Bn, 111th FA

LTC Taylor, Jerry S.  
CSM Eddins, William H.  
1st Bn, 113th FA

LTC Sweat, Richard H.  
CSM Jones, Robert R.  
3d Bn, 115th FA

LTC Hall, James E.  
CSM Porterfield, Robert W.  
2d Bn, 116th FA

LTC Arabian, Gordon L., Jr.  
CSM Keeney, John D.  
1st Bn, 117th FA

LTC Crutchfield, Jerry  
CSM Snyder, Pugh K.  
3d Bn, 117th FA

LTC Kilcoyne, Robert J.  
CSM Diedrich, Mathew G.  
1st Bn, 120th FA

LTC Cichanski, James B.  
CSM Frazier, Robert L.  
2d Bn, 122d FA

LTC Higgins, John W.  
CSM Woody, Joseph E.  
1st Bn, 136th FA

LTC Green, Dennis W.  
MSG(P) Murphy, Patrick W.  
1st Bn, 148th FA

LTC Bernard, Reginald T.  
CSM Martin, Roland  
1st Bn, 152d FA

LTC Davis, Jerry G.  
CSM Ashcraft, Merritt  
1st Bn, 160th FA

LTC Rosa-Agosto, Antonio  
CSM Rodriguez, Raul  
1st Bn, 162d FA

LTC Sanchez, Franly H.  
CSM Reyes, Ruben  
2d Bn, 162d FA

LTC Geddings, Friendly, R.  
CSM Sexton, Larry D.  
1st Bn, 178th FA

LTC Vadnais, Gregory J.  
CSM Bowman, Eugene R.  
1st Bn, 182d FA

LTC Roleff, Edmund F.  
CSM Harmon, John E.  
1st Bn, 201st FA

LTC Wofford, William D.  
CSM Grisham, Walter E.  
5th Bn, 206th FA

LTC Griggs, John C.  
CSM Stephen, Garvin K.  
2d Bn, 218th FA

MAJ(P) Mau, David J.C.  
SGM Gibo, Raymond M.  
1st Bn, 487th FA

### Army Reserve

#### Brigades

LTC Noirot, George V.  
CSM Vacant  
428th FA Bde

MAJ Reyes, Rosendo C.  
CSM Gregson, Joseph W.  
4th Bn, 20th FA

LTC Lenihan, Robert J., II  
MSG Kimble, David L.  
(Acting)  
4th Bn, 38th FA

LTC Kuruzar, Michael E.  
CSM Edmonds, Ollard D.  
4th Bn, 333d FA

COL Grunewald, Robert E.  
CSM Rogers, William T.  
434th FA Bde

MAJ(P) McDermott, William J.  
MSG(P) Wilson, Elijah J.  
(Acting)  
7th Bn, 1st FA

LTC Kauzlarich, Daniel L.  
CSM Saurez, Frank R.  
4th Bn, 75th FA

COL Kuhar, Edward H.  
CSM Mosier, James A.  
479th FA Bde

LTC Mineweaser, Clarence E.  
CSM Cavanaugh, Charles P., III  
4th Bn, 8th FA

LTC Clark, Robin B.  
CSM Holland, Gregory M.  
4th Bn, 92d FA

#### Training Brigades

COL Koopika, Bruce W.  
CSM Prucha, Edward C.  
3d Bde (FA-OSUT)  
84th Div (Tng)

MAJ(P) Walsh, James M.  
CSM Nordstrom, Royal R.  
1st Bn, 334th FA

LTC Petterson, Mark H.  
CSM Vacant  
2d Bn, 334th FA

MAJ(P) Jenkins, Barry H.  
SGM(P) Pelishek, Daniel L.  
3d Bn, 334th FA

COL Griffis, Louis R.  
CSM Brown, Paul L.  
402d Bde (Tng)(FA)  
95th Div (Tng)

LTC Sloan, Steven K.  
CSM Ross, Jackie L.  
1st Bn, 89th FA

LTC Bradford, Jerry J.  
CSM Laster, Luther L., Jr.  
2d Bn, 89th FA

LTC Burdett, Norman B.  
CSM Duryea, James W.  
3d Bn, 89th FA

LTC Stenger, Thomas M.  
CSM Cleveland, Gerald F.  
4th Bn, B9th FA

LTC Crain, Albert L.  
CSM Wiseman, Dan S.  
5th Bn, 89th FA

LTC Forbush, Terrance L.  
CSM Boufford, James M.  
402d Tng Grp (FA)

LTC Gann, Bruce I.  
CSM Griffin, Gayland V.  
402d Rcptn Bn

#### Separate Battalions

LTC Edin, Joseph H.  
CSM Mari, Daniel J.  
5th Bn, 5th FA

LTC Read, George W.S.  
CSM Walker, William L.  
7th Bn, 9th FA

MAJ(P) Guenther, Jack E.  
CSM Pearson, Andrew L.  
3d Bn, 14th FA  
(Round-Out Bn  
6th IN Div Arty)

LTC White, Ray A.  
CSM McCain, Gilford L.  
3d Bn, 15th FA

LTC Roney, Benjamin E., Jr.  
CSM Commee, William E.  
4th Bn, 17th FA

LTC Hyle, Francis M.  
CSM McKinney, John V.  
5th Bn, 28th FA

LTC Gaffney, John J.  
CSM Tobin, Joseph A.  
3d Bn, 42d FA

LTC Carson, Chester P.  
CSM Lenox, Chester A.  
3d Bn, 75th FA

LTC Thompson, Charles L.  
CSM Kirk, William J.  
3d Bn, 83d FA

LTC Robinson, Burt T.  
CSM Epps, Richard N.  
6th Bn, 83d FA

MAJ Shinn, Roland W.  
CSM Farcalow, David L.  
3d Bn, 92d FA

### US Marines

Col Richard, Ronald G.  
SgtMaj Cooper, Robert S.  
10th Marines

LtCol Flynn, James C.  
SgtMaj Birdsell, George F.  
1st Bn, 10th Mar

LtCol Ford, Walter G.  
SgtMaj Kamerick, Thomas J.  
2d Bn, 10th Mar

LtCol Hughes, Philip E.  
SgtMaj Grady, Ira O.  
3d Bn, 10th Mar

LtCol Evans, Harold W.  
SgtMaj Jimenez, Silvino  
5th Bn, 10th Mar

Col Lloyed, James F., Jr.  
SgtMaj Beal, Mike R.  
11th Marines

LtCol Rogers, Steven G.  
SgtMaj Cunningham, Timothy A.  
1st Bn, 11th Mar

LtCol Katora, Jeffrey C.  
SgtMaj Zacker, Michael G.  
2d Bn, 11th Mar

LtCol Polak, Raymond L.  
SgtMaj Wayne, Bobby L.  
3d Bn, 11th Mar

LtCol Oates, Willard D.  
SgtMaj Pruneda, Sabas, Jr.  
5th Bn, 11th Mar

Col Brosnan, John S., Jr.  
SgtMaj Overstreet, Harold G.  
12th Marines

LtCol Rivers, Robert  
SgtMaj Williams, Paul  
1st Bn, 12th Mar

LtCol Finnerty, Thomas P.  
SgtMaj Hunter, Leroy  
2d Bn, 12th Mar

LtCol Goza, Joel L.  
SgtMaj Aby, Harry C.  
3d Bn, 12th Mar

LtCol Garcia, Dennis O.  
SgtMaj Caldwell, Robert  
4th Bn, 12th Mar  
Col Ressmeyer, John A.  
SgtMaj Alvarado, Gus  
14th Marines

LtCol Maracchini, Gerald A.  
SgtMaj Freels, Gary L.  
1st Bn, 14th Mar  
LtCol Copeland, Larry B.  
SgtMaj Lente, Lawrence R.  
2d Bn, 14th Mar

LtCol Shimonis, Peter J.  
SgtMaj Herbert, Richard D.  
3d Bn, 14th Mar  
LtCol Sawyer, Joseph E., Jr.  
SgtMaj Felton, John F.  
4th Bn, 14th Mar

LtCol Andres, Russell A., Jr.  
SgtMaj Romaine, Robert F.  
5th Bn, 14th Mar



## US Field Artillery Assignment Branches

As of 1 Oct 89

### Army Active Branch Teams

#### Officers

LTC(P) Dennis C. Cline  
Field Artillery  
Branch Chief

MAJ(P) Robert L. Decker  
Colonel  
Assignments

MAJ Stephen G. Abel  
Lieutenant Colonel  
Assignments

MAJ Herbert Wells/  
CPT(P) Philip M. Evans  
Major Assignments

CPT William A. Rigby/  
CPT Stanley F. Austin  
Captain Assignments:  
Functional Area/  
Nominative

CPT Brian T. Camperson  
Captain Assignments:  
Troop/Advanced  
Course Follow-On  
Assignments

CPT Michael A. Byrd  
Lieutenant Assignments/  
Accessions

CPT(P) Thomas J. O'Donnell  
Functional Area Designations/  
Lieutenant Colonel  
Precommand Course

CW3 George B. Chiasson  
Warrant Officer  
Assignments

**Fort Sill Representative** for Officer Basic and  
Advanced Courses follow-on Assignments is  
CPT(P) Stephen K. West, AUTOVON  
639-2861/4970.

#### Addresses and Telephone Numbers

#### Lieutenant Colonels and Below:

Commander, PERSCOM  
ATTN: TAPC-OPE-F  
200 Stovall Street  
Alexandria, VA 22332-0414  
Telephone: AUTOVON 221-XXXX  
Commercial (202) 325-XXXX  
Company Grade: 0187/0116  
Field Grade: 7817/0118

#### Lieutenant Colonels (P) and Colonels:

Commander, PERSCOM  
ATTN: TAPC-OPC  
200 Stovall Street  
Alexandria, VA 22332-0400  
Telephone: AUTOVON 221-7862/7863  
Commercial (202) 325-7862/7863

#### Officer's Microfiche Records:

Commander, PERSCOM  
ATTN: TAPC-MSR-S  
200 Stovall Street  
Alexandria, VA 22332-0460

#### Enlisted

MAJ(P) Patrick M. McMillan  
Field Artillery  
Branch Chief

MSG(P) Leroy A. Bussells  
Branch Sergeant Major

SFC Wallace L. Lookingland  
13N, 13R/Recruiting Duty

MSG Donald R. Givins  
13B(E-7), 13Z(E-8), 82C, 93F/Drill SGT  
Duty

MSG Wayne S. Hashimoto  
13M, 13P, 15E, 21G

SFC Royce D. Huston  
Reclassification

Mrs. Sandra R. Haycraft  
ANCOC

SFC Charles H. Blount  
Qualitative Management/Retirement

SFC Richard L. Woods  
13B (E-6 and Below), 13C  
13E, 13F

#### Addresses and Telephone Numbers

Commander, PERSCOM  
ATTN: TAPC-EPK-F  
2461 Eisenhower Avenue  
Alexandria, VA 22331-0452  
Telephone: AUTOVON 221-0304  
Commercial (202) 325-0304

### Army Reserve Branch Teams Officers

LTC Richard M. Pitts  
Field Artillery  
Branch Chief  
Lieutenant Colonels

MAJ Julius C. Chambliss, Jr.  
Majors

MAJ John G. Kramb  
Captains

MAJ Michael J. Bamber  
Lieutenants

#### Addresses and Telephone Numbers

Commander, ARPERCEN  
ATTN: DARP-OPC-FA  
9700 Page Boulevard  
St. Louis, MO 63132-5200  
Telephone: AUTOVON 693-7871/7873/7351  
Commercial (314)  
263-7871/7873/7351  
Toll Free 1-800-325-4950

#### Enlisted

MSG Frank W. Leisten  
Field Artillery/Air Defense  
Branch Chief

SFC George R. Varner  
Last SSN Digits of 00-18

SFC Johan H. Kohler  
Last SSN Digits of 19-36

SFC Johnny R. Fisher  
Last SSN Digits of 37-63

SFC David L. Sheline  
Last SSN Digits of 64-81

SSG Leroy Fluke  
Last SSN Digits of 82-99

#### Addresses and Telephone Numbers

Commander, ARPERCEN  
ATTN: DARP-EPA-FA/AD  
9700 Page Boulevard  
St. Louis, MO 63132-5200  
Telephone: AUTOVON 693-7614  
Commercial (314) 263-7614  
Toll Free 1-800-325-4730

# Smart Weapons Systems for Engaging Second-Echelon Forces

by Major Andrew G. Ellis



Success on the modern battlefield depends on commanders who see beyond the requirements of the moment and use available assets to extend their operations in time and space. All operations should focus on imposing our will on the enemy by throwing him off balance and disrupting the coherence of his operations. Attacking his second-echelon forces will accomplish this.

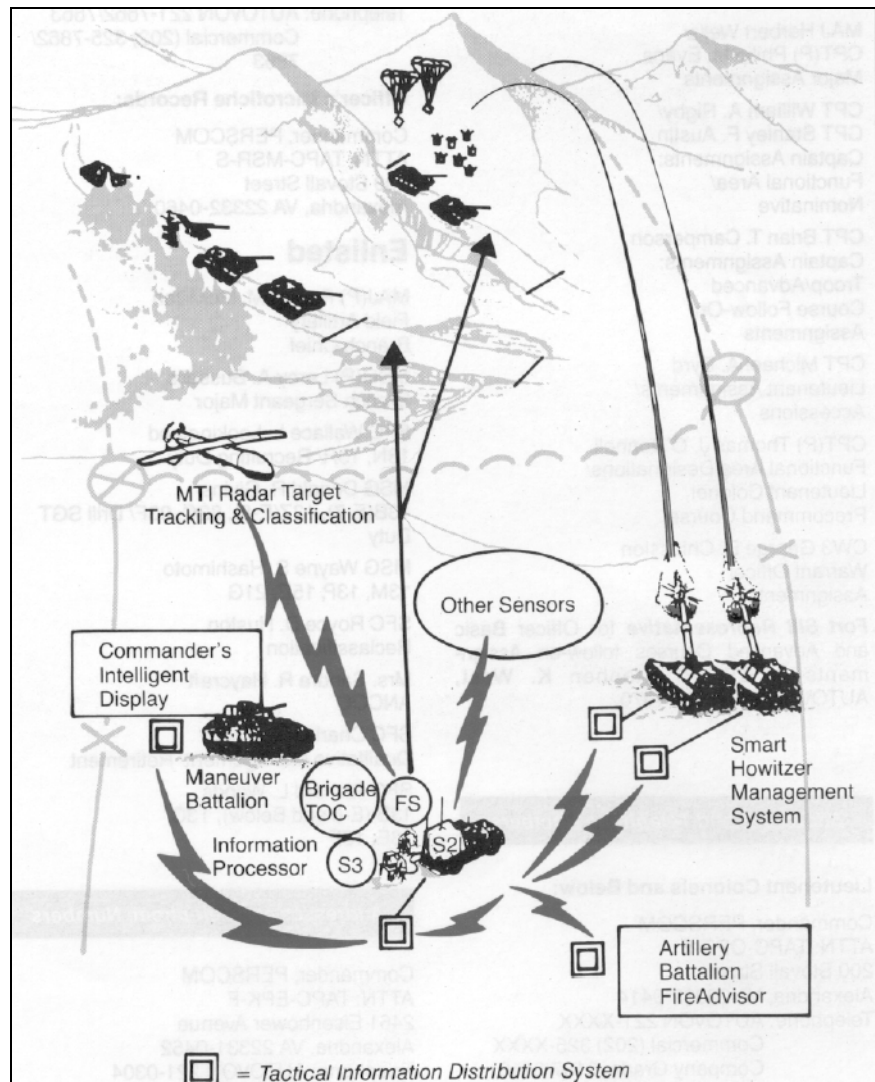
Deep attack to shape the future battle is an integral part of the AirLand Battle doctrine. But what's deep? For the corps commander, it may be hundreds of kilometers; for the brigade commander, it may be less than 10.

Munitions fired by systems such as the Army tactical missile system (Army TACMS) and fixed- and rotary-wing aircraft give the division and corps commanders deep-strike capabilities. But the brigade commander, who has the same requirement to strike deep in his area of operations, currently has a limited capability to carry it out.

The Smart Weapons Systems (SWS) Laboratory Command (LABCOM) Cooperative Program is managed by the Ballistic Research Laboratory at Aberdeen Proving Ground, Maryland. The SWS is a futuristic program that uses emerging technology to give the brigade commander the ability to shape his future battle by attacking enemy forces with artillery before they arrive at the battle's forward edge. The Program looks at the total delivery system from acquiring targets to delivering munitions and applies innovative technology and operational concepts that improve the effectiveness of conventional- and small-footprint smart munitions, such as sense and destroy armor (SADARM).

This LABCOM Program showcases several key technologies under development in Army laboratories and demonstrates how we could integrate these

technologies into a system. Each component of the SWS, however, is a "stand-alone" program we could employ with existing or proposed weapons



The SWS Program demonstrates the brigade's ability to attack moving second-echelon regimental elements using innovative systems and operational concepts.

systems. Therefore, SWS demonstrates a concept rather than sells a particular system.

## The SWS Concept

A forwardly deployed mechanized brigade is decisively engaged by the regiments of an enemy division. As these regiments probe weak points in the defense and force a penetration, enemy second-echelon regiments in battalion column move along high-speed avenues of approach to exploit this penetration.

The enemy commander must reinforce the success of his first echelon before the defense has an opportunity to seal the penetration. For his attack to work, the enemy commander must commit his second echelon at the right place and time.

By doctrine, Soviet regiments in the second echelon will continue to travel on roads in battalion columns until they are within five to seven kilometers of the line of contact. These columns are a lucrative target that, if attacked, could disrupt and delay the arrival of second-echelon forces and destroy the coherence of enemy operations.

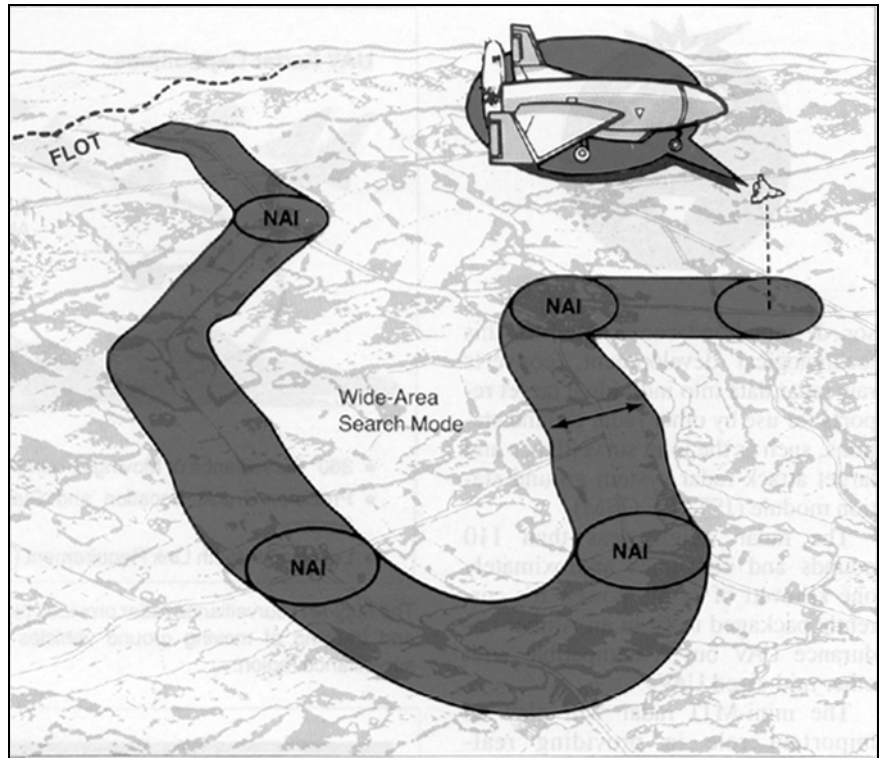
## Targeting

A moving target indicator (MTI) radar mounted on an unmanned aerial vehicle (UAV) detects the enemy column. This radar gives the location, speed and direction of the column.

## Attack Windows

The information from the MTI radar is transmitted to a ground processor where the column's location, speed and direction of travel is compared to the location of roads from digitized map data. We reduce radar target location errors by aiming at future locations along the road, called attack windows. Because we aim at sections of the road and the target is a column of vehicles rather than a single vehicle, we can use conventional and small-footprint smart munitions for the attack.

The radar tracking information, along with digitized map and weather information, is used to predict the arrival of the column in the attack windows, which are selected to optimize the effects of the attack. Restrictive sections of road, such as cuts or passes through heavily forested areas, may be ideal as attack windows.



A MTI Radar Mounted on a UAV Searching Named Areas of Interest (NAIs)

## Computerized Transmissions

Just before the column enters the selected attack window, the radar provides a final update on the column's movement. This update gives the system a refined arrival time.

Because delivery accuracy decays over time, we must distribute the information in a timely and efficient manner. Transmission of this critical information over low-band-width radios is more rapid because computers are used to reduce the amount of data transmitted and the length of radio transmissions.

## Tactical Fire Control

With an attack window specified, an engagement time identified and the information distributed, we need recommendations on how best to attack the target. A tactical fire control program that uses fire-unit information, target values and commander's guidance recommends a delivery system and the number and type of munitions to use against the target.

Selected autonomous howitzers compute the target aim points and times to fire with on-board computers. They fire on the enemy column, now in the attack window.

## Components of SWS

The SWS uses a systems approach to solve the problem of attacking moving targets. It maximizes the system's effectiveness without having any single component excessively costly or complex. In simple terms, each component reduces delivery errors rather than relying solely on "very smart" or "brilliant" munitions.

## Mini-MTI Surveillance Radar for UAVs

Engaging second-echelon forces requires an "over-the-hill" target acquisition capability. The mini-MTI surveillance radar is a joint effort of the Defense Advanced Research Projects Agency (DARPA) of Arlington, Virginia, and Harry Diamond Laboratories of Adelphi, Maryland. It will provide high-performance, real-time target detection, location and tracking of moving ground vehicles and low-flying helicopters within a 15-kilometer surveillance region.

The mini-MTI radar has three distinct operating modes: wide-area surveillance, ground target track and classification, and helicopter track and classification. The radar signal processor,



designed and constructed for this technological development, converts raw radar data into individual target reports for use by other radar ground stations, such as the joint surveillance and target attack radar system ground station module (JSTARS GSM).

The radar weighs less than 110 pounds and consumes approximately one kilowatt of prime power. It's currently packaged to fit in an Amber endurance UAV but is compatible with other mid-sized UAVs.

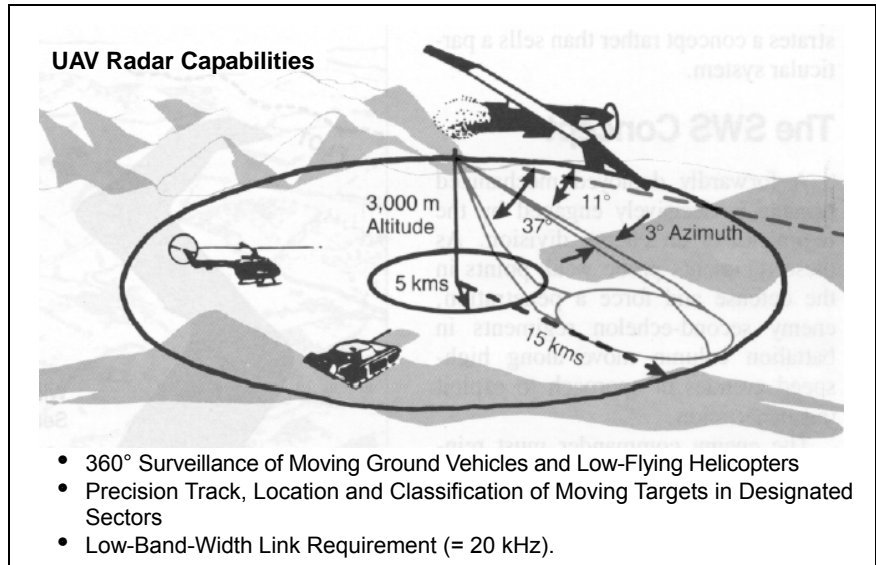
The mini-MTI radar will play an important role in providing real-time target acquisition, location and classification capabilities for commanders in intelligence and electronic warfare as well as fire support mission areas. Future applications may include air defense and maneuver battlefield mission areas.

## Information Processor

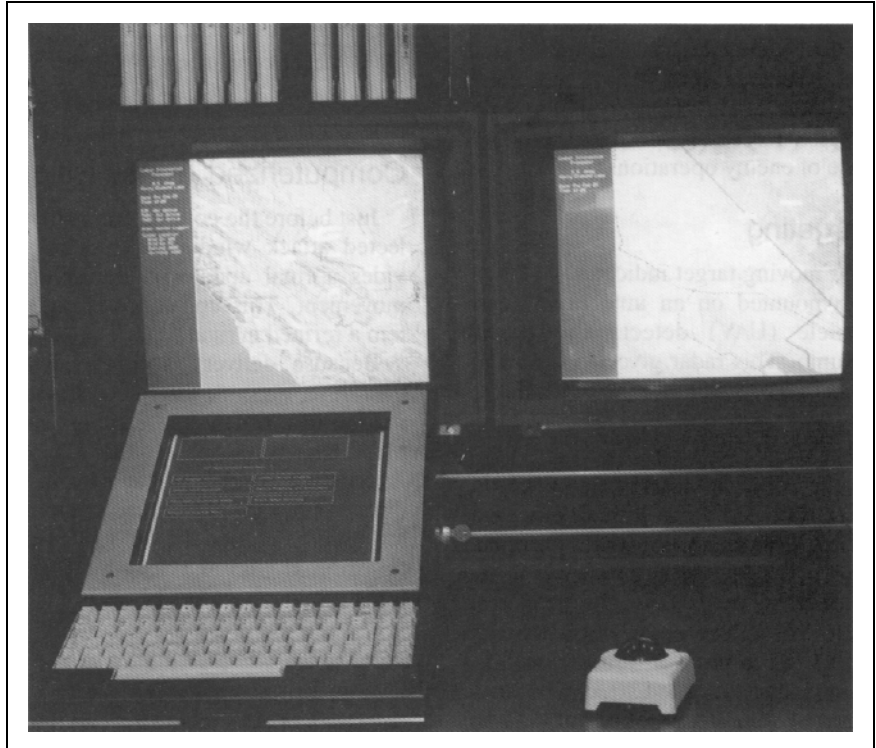
Once we locate moving targets, delivering effective fire requires us to select the best place to attack and predict when the target will be there. The information processor (IP), also a Harry Diamond Laboratories product, integrates the target data with digitized map data, weather and other known tactical information. With this information, we use attack windows for fire support planning and execution.

The IP test bed collects, processes and disseminates time-critical combat information on the battlefield. It integrates information among the intelligence and electronic warfare, fire support and maneuver control battlefield functional areas. It also communicates with automated and manually operated sensors and other tactical command and control systems via standard Army radios.

The IP can automatically track and correlate targets using information from multiple sensors on the battlefield. This function, combined with the ability to use terrain knowledge with doctrine, gives the operator the ability



The Mini-MTI surveillance radar provides high-performance, real-time target detection, location and tracking of moving ground vehicles and low-flying helicopters within a 15-kilometer surveillance region.



The IP integrates target data with digitized map data, weather and other tactical information.

to monitor multiple tactical situations in near real-time. A message storage and retrieval system processes incoming and outgoing messages and helps the operator detect key events on the battlefield.

The IP is housed in an S-250 shelter mounted on a civilian utility cargo vehicle (CUCV). The information processor is a flexible, powerful and mobile

real-time tool for multi-sensor and multi-battlefield functional area integration that gives the commander a unified picture of the tactical situation.

## Tactical Information Distribution System

Agility on the battlefield requires getting the right information to the

right people on time. This is a difficult task, considering the volume of battlefield information we must pass over low-band-width radios. The Ballistic Research Laboratory's tactical information distribution system (TIDS) is experimental software that provides quick and efficient information exchange over the low-capacity radios usually found below the division level. Since the value of moving target information decays over time, we pass it as quickly and concisely as possible.

The basic concept behind TIDS is to use the power of computers to reduce the amount of data transmitted, format the information in its most concise form and send it to those who need it. The TIDS uses innovative command and control concepts and implementation techniques to distribute battlefield information quickly and efficiently. The basic architecture divides TIDS software into two categories: information distribution (common to all nodes) and application programs (such as tactical fire and movement control and other battlefield management functions).

The primary focus of TIDS is information distribution. This distribution system is comprised of three main software modules, each demonstrating a novel concept. First, the security control module supports both automatic information distribution to other users and automatic notification to application programs on the system. Second, a new communications protocol, the fact exchange protocol, minimizes the excessive transmission times of tactical radios.

Finally, we've developed data abstractions of military concepts that represent information in a primitive form suitable for computer manipulation and dissemination. In addition, each piece of information is assigned a tag that uniquely identifies it as it propagates through the system. Together, these features eliminate many of the mundane tasks associated with information manipulation, management and distribution and allows the soldier to concentrate on fighting.

## FireAdvisor

The high-intensity battlefield is often characterized as a target-rich environment. But with limited fire support assets, commanders will face tough targeting decisions—which targets to attack and when, what munitions to use



Housed in a shelter mount on a CUCV, the IP automatically tracks and correlates targets using information from multiple sensors.

and how best to allocate assets against these targets.

FireAdvisor, another Ballistic Research Laboratory project, is experimental software designed to help commanders answer these questions. It integrates target, fire-unit and munitions information with the commander's guidance and recommends plans for using available fire support assets. FireAdvisor focuses on dynamic fire planning and provides traceable recommendations for tactical fire control at the brigade level.

It integrates techniques of operations research and artificial intelligence with realistic tactical rules to develop sequences of fire missions. Fire-unit information, target values and factors concerning weapon-target pairing are combined with the commander's guidance, munition-choice routines and estimates of future missions to produce plans. These plans give the overall "payoff" as well as the number of projectile-fuze combinations to use against various targets.

Explanations of various solutions and rules are available to the operator. He also may modify rules and guidance and examine the feasibility of other attack methods. FireAdvisor, an application program for the TIDS, opts for satisfactory solutions in terms of overall payoff against an expected target array.

## Smart Howitzer Automated Management System

With the advent of autonomous howitzers, functions such as survivability moves, ammunition resupply and fire-mission processing will become the responsibility of the howitzer commander. The smart howitzer automated management system (SHAMS), developed by the Human Engineering Laboratory, Aberdeen Proving Ground, is a software development program designed to help the howitzer commander manage these new responsibilities.

The SHAMS explores the concept of an automated, interactive howitzer

Functional Areas			
Fire Mission (FM) Tasks	Ammo/Logistics Tasks	Vulnerability Tasks	Crew/Equipment Tasks
FM Bid Response Section Tasks FM Data Base Ballistic Solutions Warnings & Prompts	Ammo Usage Prediction Ammo Re-Allocation Ammo Resupply Automatic Reporting	Data Accumulation Warnings & Prompts Data Entry Automatic Reporting	Status Accumulation Status Entry Warnings & Prompts Automatic Reporting

The SHAMS helps the howitzer commander perform tasks to manage his assets and meet his tactical requirements.



command, control, communications and intelligence distribution system. This effort evaluates a computer-based aid that allows a firing element (two howitzers and two ammunition resupply vehicles) to operate autonomously.

The SHAMS consists of software in an on-board computer that helps the howitzer commander manage his assets. This system provides an interactive planning aid, automatic reminders, prompts for required or desired actions and an automated reporting system. Its software helps the chief-of-section perform tasks to control and meet tactical requirements in four functional areas: fire mission, ammunition resupply and logistics, vulnerability and crew and equipment. SHAMS gives the howitzer commander an interactive tool to help him process information, make decisions and concentrate on putting steel on the target.

## Commander's Intelligent Display

The final component of the SWS Program is the commanders' intelligent display (CID), a prototype flat-panel display developed by the Electronic Technology and Devices Laboratory, Fort Monmouth, New Jersey. It demonstrates command and control application programs for commanders.

The CID computer uses the UNIX operating system with x-windows. With this system, it's capable of several simultaneous tasks. The CID networks with the TIDS through standard tactical radios to access and display near real-time data of interest for commanders. It has an internal data base for the area of interest and will be able to display map and graphic data within five seconds of the user's request. The CID provides a low-weight, low-power, portable interactive display capable of accessing electronically stored data to help the commander prepare for and direct the battle.



The CID demonstrates command and control application programs for commanders.

## SWS Summary

The SWS Program lashes these components together and gives the brigade commander the ability to attack, disrupt and delay second-echelon forces in his area. It uses the decide, detect and deliver targeting approach by prioritizing second-echelon targets, locating them on the battlefield and attacking them in a timely manner.

### Decide

The decide phase examines enemy doctrine and exploits its weaknesses. Once enemy lead elements have forced a penetration in the defense, the enemy commander commits his second echelon before the defense has time to react. Speed and mass are critical when committing combat power.

When the Soviet commander breaks his subordinate units into pre-battle formations, such as second-echelon regiments traveling in battalion columns, he has locked in his portion of the higher commander's plan. In simple terms, he has lost his maneuver flexibility. Attacking these columns between five and 12 kilometers from the line of contact could destroy the continuity of enemy operations at a point where the regimental commander has lost his flexibility.

### Detect

The detect phase confirms projected enemy movements by locating and tracking second-echelon forces with the

mini-MTI radar. This tracking information is transmitted to the IP where it's matched with known road locations. A prediction of when the column will enter the attack window is made. The arrival time of the column in the attack window and the classification of wheeled or tracked vehicles, if available, are quickly disseminated by the TIDS to commanders and fire support planners.

### Deliver

In the deliver phase, FireAdvisor recommends how best to attack the target. A delivery system and the number and type of munitions are selected. The SHAMS computes the howitzers' ballistic solution and time to fire, aims and fires, delivering munitions on time and on target.

## Conclusion

AirLand Battle doctrine states the object of all operations is to impose our will on the enemy to achieve our purposes. To do this, we must throw the enemy off balance with a powerful blow from an unexpected direction and disrupt the coherence of his operations.

The attack must be rapid, unpredictable, violent and executed in such a way as to prevent the enemy commander from taking effective counteractions. Attacking the enemy's committed second-echelon regiments will achieve this, and the SWS concept gives the brigade commander the ability to strike that powerful blow.



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*Field Artillery*





## I Am the Field Artillery

**I** am the United States Field Artillery. I fly the skies with my light forces, sail the seas with my Marines and pound the ground with my heavy forces. I see with satellites, touch with my terrible thunder and taste the sweet glory of victory. I am everywhere—mobile, agile and lethal. **I Deal in Steel.**

**I** was born of necessity in 1775 when the British fired upon our militia at Lexington and Concord. My six-pounder cannons were captured field pieces, drawn by oxen from battlefield to battlefield. I crossed the Delaware River with Washington in Durham boats and wintered at Valley Forge. And at the moment of victory at Yorktown, it was I who fired the decisive rounds. **I am Firepower for Freedom.**

**I** was called to defeat the British again in 1812. I fired for the charge at Chippewa, out-duelling the Royal Artillery and carrying the day. I was there at the Battle of New Orleans with my lethal lanyards pulling devastation down on our enemy. Then in 1846, I stood fast against the superior forces of Santa Anna. The Mexicans came close enough to smell the smoke of my cannons and feel the deadly sting of my "grape" as my Flying Artillery bombarded the battlefield. **I Rule with Thundering Steel.**

**A**nd then in 1861, with my muzzle-loaded guns and my observers positioned by my side, I saw us torn by the War Between the States. I was there on both sides with the Blue and the Gray. My fires decided victory at Malvern Hill, Antietam, Shiloh, Chancellorville, Fredericksburg and Gettysburg. **I am Mind-Numbing, Bone-Shattering Savagery.**

**I** was part of the American Expeditionary Force that, under General Black Jack Pershing, helped defeat the Kaiser and the German Army in 1918. I had larger cannons, but my main arm was the French 75-mm gun drawn into battle position by horses. As World War II approached and the forces I fired for became more mobile, I moved by trucks and became armored Field Artillery. With my Priest 105-mm self-propelled howitzer and my observers forward with the tankers and infantrymen, I adjusted my ferocious fires for our forces. I massed fires by battery, battalion, Div Arty and even dealt my death by corps artillery. **I am the Greatest Killer on the Battlefield.**

**I** was there in the mountains of Korea and jungles of Vietnam. From Pusan and Inchon north to the Yalu, the pounding of my 155-mm towed guns helped bring about the Peace Accord at Panmunjom in 1953. In fire bases in Vietnam and with my airmobile firepower, it was I who brought howitzer hell to the enemy for our maneuver forces, using my multiple field pieces—105, 155, 175 and 203. **I am Death on Call.**

**I** was there for the Cold War as America stood her ground for international democracy. I gave her my Lance and then the mighty Pershing missile, which forced our opponents to the negotiating table. Though I never fired a missile in anger, my Pershing Peacemaker was strategic. **I am Persuasive Power for Peace.**

**A**nd I'll be there when you need me. I am ubiquitous on the battlefield. I can focus my firepower like a flashlight beam, raining death and destruction down upon our foe. My "rockets' red glare" is now white-hot from six packs of steel—rapid, far-reaching and awesome. The autonomous actions of my howitzers can shell out hell to bring our enemy to his knees. And when I'm done, he'll bow before me because—**I am and always will be The King of Battle.**

Patrecia S. Hollis  
Field Artillery Community  
Lawton, Oklahoma

John J. McMahon  
Redleg, World War II  
McLoud, Oklahoma



# Deep-Attack System of Systems

by Colonel Jon C. Schreyach

Today, the Army is operating its materiel development and acquisition process based on a relatively new philosophy—the "system of systems" approach. In short, it means we recognize that the development of, for example, a long-range weapon in isolation from the systems that support it makes no sense. We also must develop appropriate target acquisition systems and provide the means to command and control the combat power we'll be able to generate on the battlefield of the future.

No better example of this system of systems approach exists than that of the efforts currently underway in the deep-fires arena. The purpose of this article is to describe the system of systems being developed to support the corps' deep battle, the reasons for its development and the way the systems interact to provide a potent capability.

In the interest of space, I'll limit the discussion of attack means to the deep-fires capability being developed for the multiple launch rocket system (MLRS). However, because part of

the target acquisition and battlefield surveillance support for deep battle will be provided by sister services and by other non-Field Artillery units, I'll discuss these assets and their planned downlinks.

## The Problem

The object of the Soviet's technique of echelonment is to allow the Soviet commander to generate and maintain the tempo of combat, bringing his follow-on forces to bear at the time and place of his choosing. (See Figure 1.) If such a plan is allowed to be executed unhindered, the Soviets will be able to do two things that will eventually guarantee success. First, they'll choose the point of decision, and second, they'll mass overwhelming combat power at that point.

The defending corps commander's problem is to prevent the execution of the operation as planned, disrupt its tempo, isolate the close battle so he can manage it by using his on-line divisions and prevent the Soviets from using the combat power of their follow-on forces at the time and place of their choosing. (See Figures 2 and 3.)

## Deep-Target Categories

Fires at depth provide the corps commander a significant capability to deal with the Threat. The nature of the target set dictates the characteristics of the systems needed to acquire and attack it. Therefore, we must categorize the targets in the deep-target sets before discussing the system of systems. We can characterize the deep target array in two ways.

First, we can characterize them from a fire-planning point of view: maneuver forces, command and control (C<sup>2</sup>) elements or weapons control nodes and

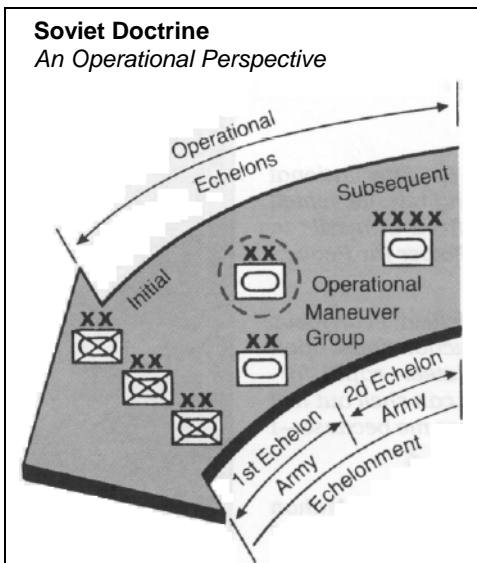


Figure 1: Soviet Technique of Echelonment, A Corps Operational Concept

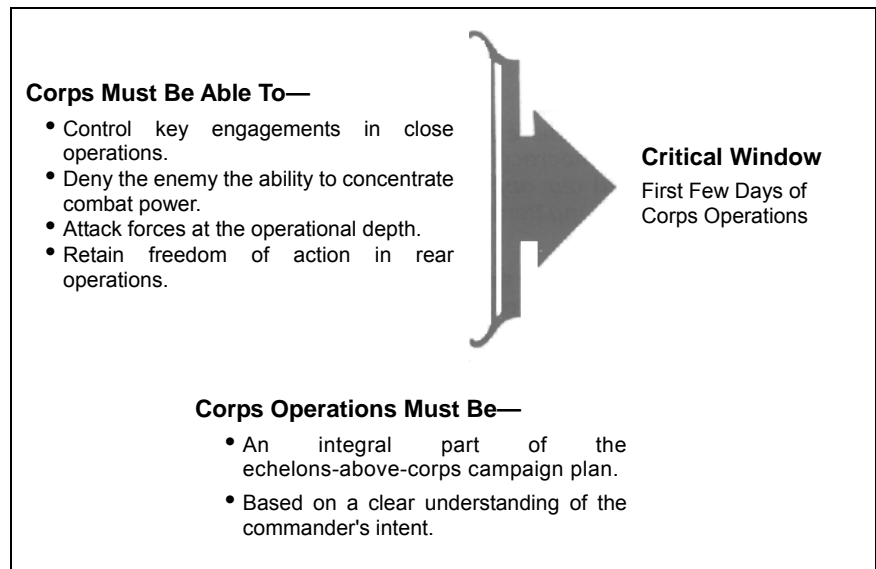


Figure 2: The Corps Commander's Operational Concept to Respond to Soviet Echelonment

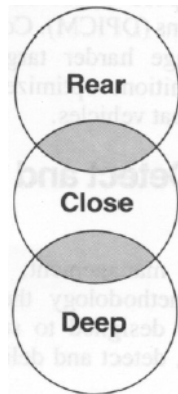
high-payoff targets. Figure 4 shows these, along with reasons for engaging them. The targets are characterized by the function they perform.

The second way we can categorize the target sets is by their physical characteristics and the nature of their signature or behavior. That is, to divide a type of Soviet formation (e.g., Army) into targets that are "hard" versus "soft" and into those that are moving versus sitting. (See Figure 5.)

Both these categories of target array are useful in conducting the battle at depth. The first (Figure 4) considers the kinds of targets we may have to engage to negate or degrade the enemy's capabilities. From the fire support planner's view point, this helps him begin to narrow the target set he'll task (in coordination with the G2) the intelligence assets to find.

### Corps Execution of Deep Battle

The Corps Commander must understand the demands of the rear, close and deep battles and—

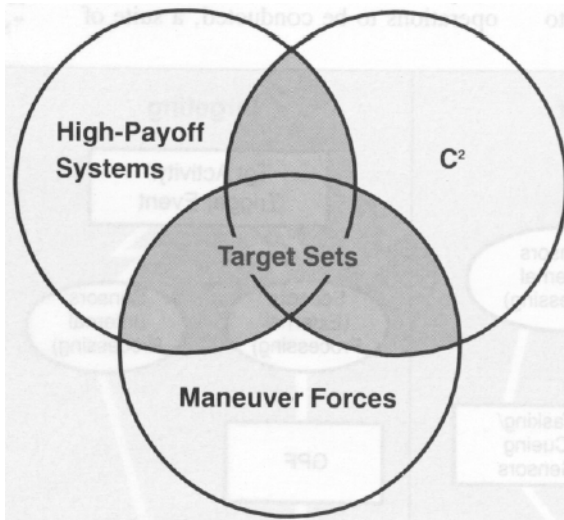


- Retain his freedom of action.
- Provide the means for his on-line divisions to shape the close battle.
- Concentrate his combat power in time and space by synchronizing them.
- Conduct the deep battle to set favorable conditions for future close battles.

Figure 3: The Corps Commander's Execution of the Operational Concept to Counter Soviet Echelonment

### Corps Operational Requirements

- Attack high-payoff systems, such as air defense sites, helicopters staging areas, jammers and short-range ballistic missiles (SRBMs), that are an imminent threat.



- Degrade enemy C<sup>2</sup> systems associated with combat, combat service support and combat support elements that will disrupt the tempo and (or) efficiency of his operations.

- Adjust the rate of enemy maneuver elements at the forward line of own troops (FLOT) by delaying, disrupting or attriting armored combat vehicles consistent with the corps scheme of operations.

Figure 4: Categories of Enemy Targets from a Fire-Planning Point of View

### Corps Target Groupings

	Hard (44%)	Soft (56%)
Moving 43%	Maneuver Regiments Maneuver Battalions Self-Propelled Artillery Battalions	
Sitting/Emitting 57%		Command Posts Air Defense Artillery Helicopter Bases (FARRPs) Logistical Installations Surface-to-Surface Missiles Towed Artillery Multiple Rocket Launchers Electronic Warfare Installations

Figure 5: Categories of Enemy Targets by Physical Characteristics and Signature or Behavior

The second category (Figure 5) is useful to both intelligence and fire planners. It helps them allocate groups of sensors to find targets accurately through fusion, to allocate weapons to effectively attack those targets and to select single sensors to trigger (if needed) the attack.

For example, when one divides the target set of interest into the categories shown in Figure 5, it's obvious that there's a high correlation between things that sit and things that emit an electronic signature. Thus, to locate accurately those targets, communications intelligence (COMINT) and electronic

intelligence (ELINT) systems and imagery intelligence (IMINT) or human intelligence (HUMINT) systems would be useful since the targets present both electronic and visual signatures.

### Sensor Fusion

In addition, we can use the suite of sensors in combination (fusion) to provide a more accurate picture of the target condition and location than would be possible using a single source for targeting. Through manipulation of collection assets, the intelligence staff can use the strengths of one sensor to cover the weaknesses of another—use a source with a gross locational capability to cue one with better fidelity against the target of interest.

### Weapons Match

At the same time, we can match

weapons with given characteristics to appropriate targets. That is, we can engage targets that consist of relatively soft vehicles and (or) those with large numbers of personnel using area-fire and dual-purpose improved conventional munitions (DPICM). Conversely, we can engage harder targets with smart submunitions optimized to kill armored combat vehicles.

### Decide, Detect and Deliver

The battle management, targeting and attack methodology the system of systems is designed to support is called decide, detect and deliver. (See Figure 6.)

#### Battle Management: Decide

In the battle management function, given the corps commander's concept of operations and a projection of future operations to be conducted, a suite of sensors (some of which process data

internally and some of which are supported by external processing facilities) is used to present the commander and his staff a fused intelligence picture of the battlefield. Based on this picture, we can verify or modify the commander's concept and make decisions on the conduct of future operations.

We also can select the targets to engage in support of the projected operation and bend our efforts toward locating these targets in enough detail to attack them. Again, this is done through intelligence fusion and the intelligence preparation of the battlefield (IPB).

Having found the target(s) in enough detail or having this process underway, we can select attack means and a single sensor to trigger (if necessary) the attack. This sensor doesn't have to be able to independently locate the target to "survey" accuracy. What the sensor is

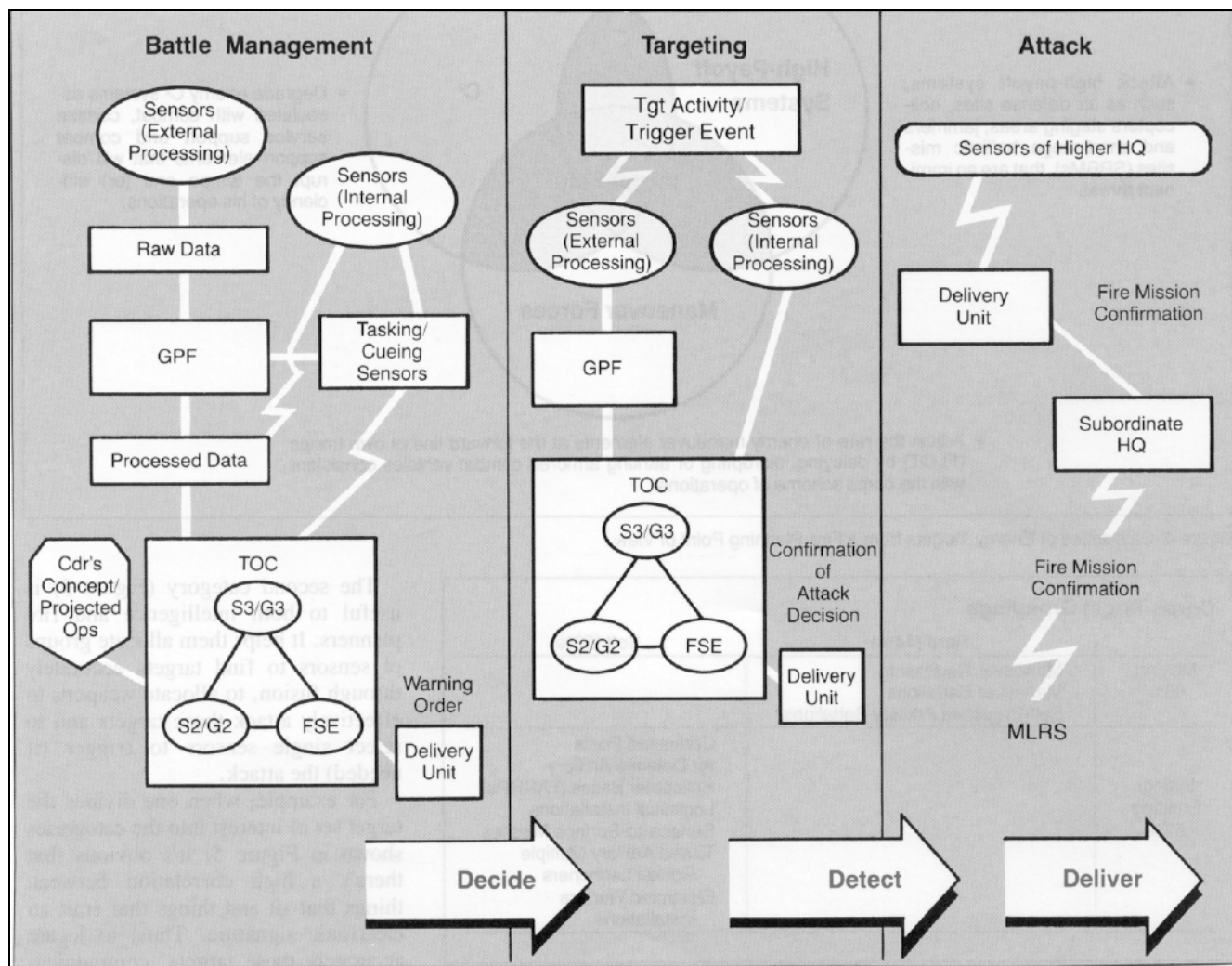


Figure 6: The deep-attack system of systems supports the decide, detect and deliver operational methodology.

for is to confirm target activity and trigger the attack of an already planned (i.e., located) target. The decide step, then, ends with a warning order (fire plan) to the delivery unit and a cue to a single sensor to be alert for target activity in a given time window and at a specified location to trigger the attack.

The last decision made is whether to conduct the attack using centralized or decentralized control. The difference between centralized and decentralized control is the difference between the levels confirming that the attack is still within the commander's attack criteria. This confirmation can come from the corps fire support element or FSE (centralized) or be delegated as low as the MLRS battalion operations element (decentralized).

The sensor downlinks provided by the system of systems support either option equally well. That is, a ground station module (GSM) that downlinks IMINT systems (e.g., joint surveillance and target attack radar system—JSTARS) and a commander's tactical terminal (CTT) that downlinks the ELINT systems (e.g., Guardrail V or Guardrail/Common Sensor) will be at both the corps and battalion levels.

### Targeting: Detect

In the detect step, the selected sensor observes the target activity and provides it to either the corps FSE or the battalion as already cited. The appropriate element confirms that the attack is still desirable and updates fire control data, if needed.

### Attack: Deliver

In the deliver step, the battalion executes the planned mission, triggered either by a higher headquarters or the sensor.

## Deep-Attack Systems Architecture

The deep-attack system of systems includes a suite of sensors, some number of weapons platforms and the command and control system that ties the two together. (See Figure 7.) The communications link between the sensors and the command and control system is critical to the architecture's operation.

### Sensors

The sensor suite for the system of systems includes both those currently

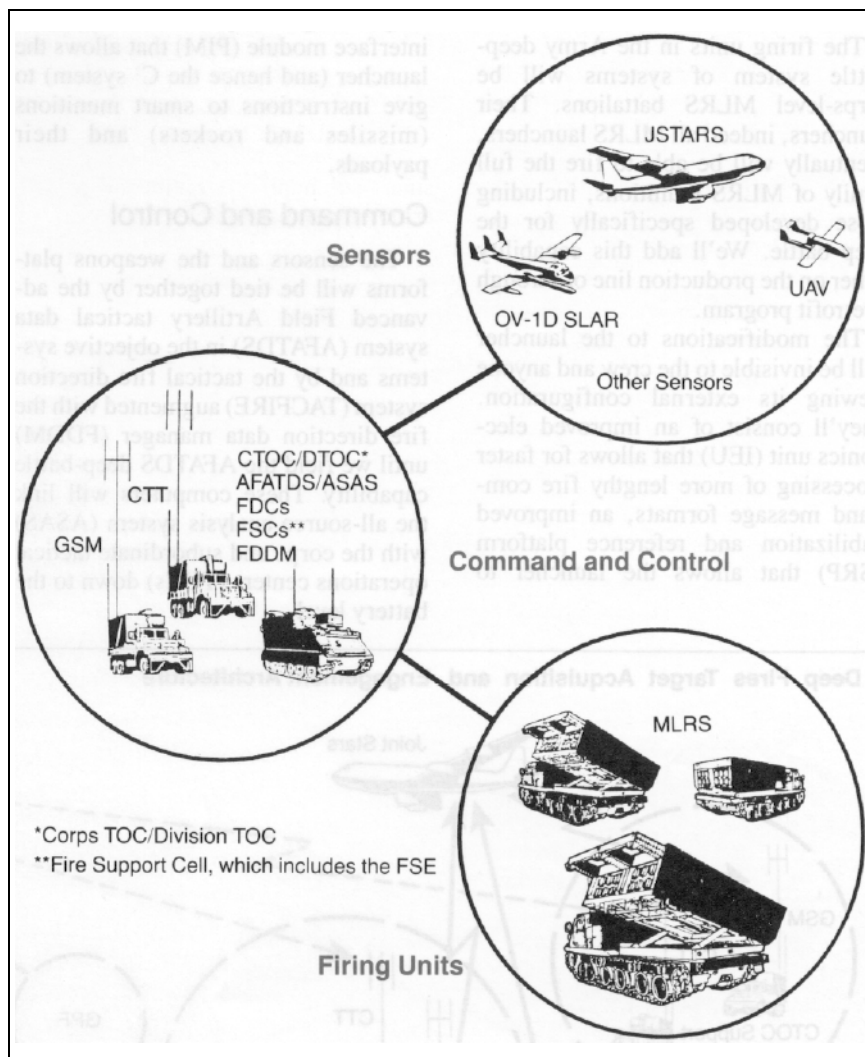


Figure 7: The Architecture of the Deep-Attack System of Systems

Current	Future
<ul style="list-style-type: none"> <li>• National Sources</li> <li>• Army Systems               <ul style="list-style-type: none"> <li>— Improved Guardrail V</li> <li>— Side-Looking Airborne Radar (SLAR)</li> <li>— Long-Range Surveillance Units (LRSU)</li> <li>— Special Operating Forces (SOF)</li> <li>— Aerial Observers (All Services)</li> </ul> </li> <li>• Air Force Systems               <ul style="list-style-type: none"> <li>— Senior Spear</li> <li>— Senior Ruby</li> <li>— Advanced Synthetic Aperture Radar System (ASARS)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• National Sources</li> <li>• Army Systems               <ul style="list-style-type: none"> <li>— Guardrail/Common Sensor (with CTT)</li> <li>— IEW-UAV</li> <li>— Trackwolf (High-Frequency COMINT)</li> </ul> </li> <li>• Air Force/Joint Systems               <ul style="list-style-type: none"> <li>— ASARS II</li> <li>— JSTARS (with GSM)</li> </ul> </li> </ul>

Figure 8: Suite of Current and Future Sensors for the Deep-Battle System of Systems

fielded and those in the development cycle. (See Figure 8.) They range from national-level sensors, providing overhead imaging, through systems operated by other services (e.g., US Air

Force) downlinked to Army units, to sensors organic to the Army corps downlinked directly to user units. The user units include Field Artillery MLRS battalions.

## Weapons

The firing units in the Army deep-battle system of systems will be corps-level MLRS battalions. Their launchers, indeed all MLRS launchers, eventually will be able to fire the full family of MLRS munitions, including those developed specifically for the deep battle. We'll add this capability either on the production line or through a retrofit program.

The modifications to the launcher will be invisible to the crew and anyone viewing its external configuration. They'll consist of an improved electronics unit (IEU) that allows for faster processing of more lengthy fire command message formats, an improved stabilization and reference platform (ISRP) that allows the launcher to achieve the required accuracies

with longer range weapons and a payload interface module (PIM) that allows the launcher (and hence the C<sup>2</sup> system) to give instructions to smart munitions (missiles and rockets) and their payloads.

## Command and Control

The sensors and the weapons platforms will be tied together by the advanced Field Artillery tactical data system (AFATDS) in the objective systems and by the tactical fire direction system (TACFIRE) augmented with the fire direction data manager (FDDM) until we field the AFATDS deep-battle capability. These computers will link the all-source analysis system (ASAS) with the corps and subordinate tactical operations centers (TOCs) down to the battery level.

## Communications Link

The GSM operator will receive only that part of the JSTARS "take" that's applicable to his area of interest and will avoid loading his processor with data that's of no use to him. (See Figure 9.) He also will be able to use the GSM's target prediction routine to estimate the times of arrival for moving targets at specific points on the ground. On the other hand, the Guardrail/Common Sensor (GR/CS) will downlink its data to a ground processing facility (GPF) that processes the signal and then sends it to the appropriate CTTs, using the GR/CS platform as a relay. The C<sup>2</sup> nodes from corps to launcher are linked by combat net radio or multichannel communications.

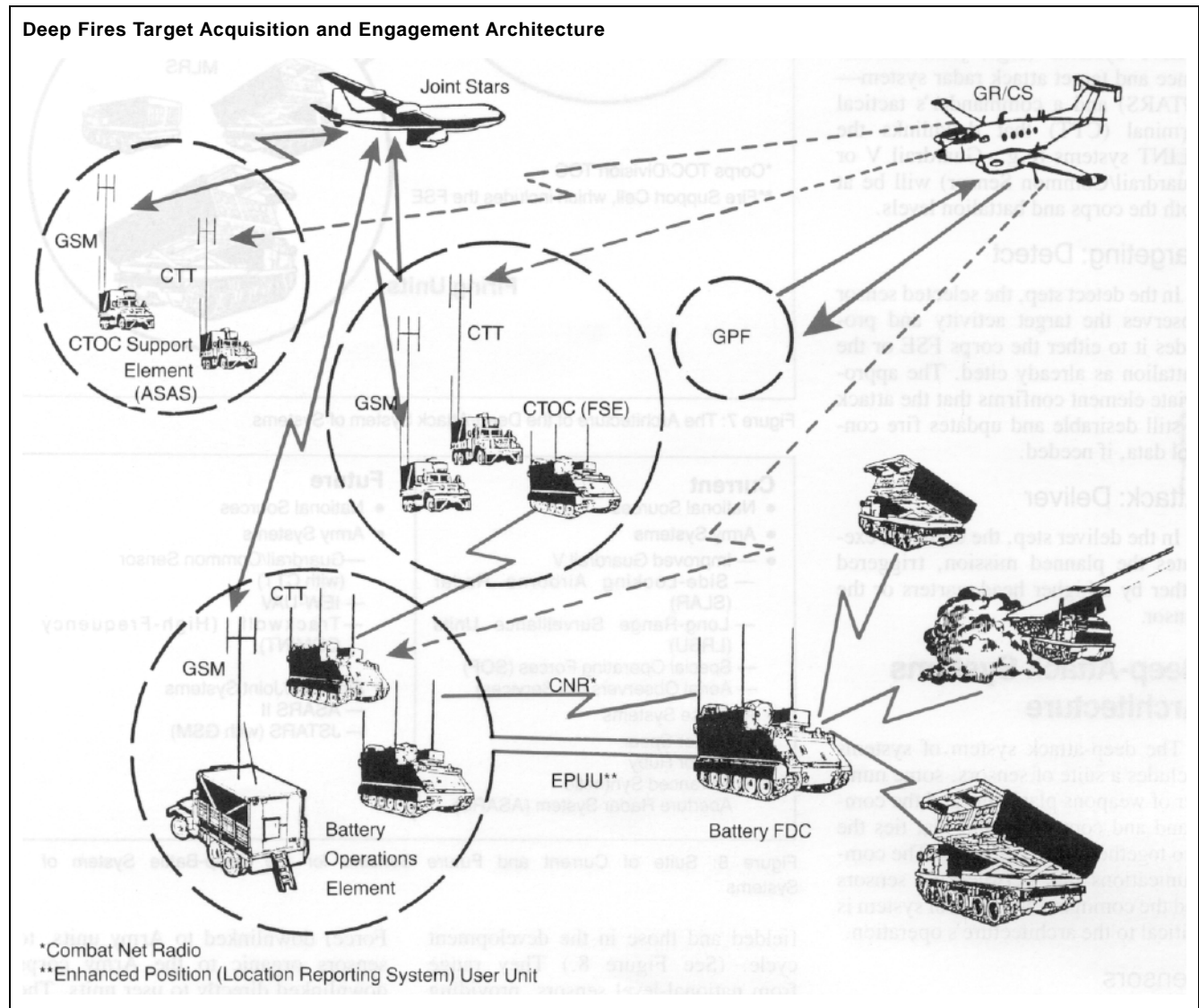


Figure 9: The Deep-Battle System of Systems Architecture with Communications Links

## Deep-Battle Systems Operation

The deep-battle systems operate using the decide, detect and deliver methodology. Mission planning is the decide step and mission execution, the detect and deliver steps.

### Mission Planning: Decide

During mission planning, the decide step of the methodology, the suite of sensors available to the corps searches for targets and target indications in priority zones established by the corps targeting element to support the operation. (See Figure 10.) The mechanisms for establishing the priorities are the collection management plan(s), the priority intelligence requirements (PIR) and the specific orders and requests (SORs). These documents do for the intelligence community what a fire support plan does for the Field Artillery community. They tell who does what to whom and when.

As data from sensors is provided to the ASAS, it's amalgamated and correlated. When a target is located to the degree of accuracy specified in the collection plan, it's provided to the FSE for incorporation in the target list and fire support plan. The fire support plan is then transmitted (or updated) through fire support C<sup>2</sup> channels so the delivery units can accomplish tactical and technical fire control.

### Mission Execution: Detect and Deliver

Mission execution for an attack that requires a trigger event is shown in Figure 11. This Figure illustrates the detect and deliver steps of the operational methodology. The single sensor in the Figure is JSTARS, and both the centralized and decentralized methods of control are indicated. Since no further fusion is necessary, only fire support C<sup>2</sup> nodes are shown.

Of course, while most deep-battle fire missions will be planned, not all

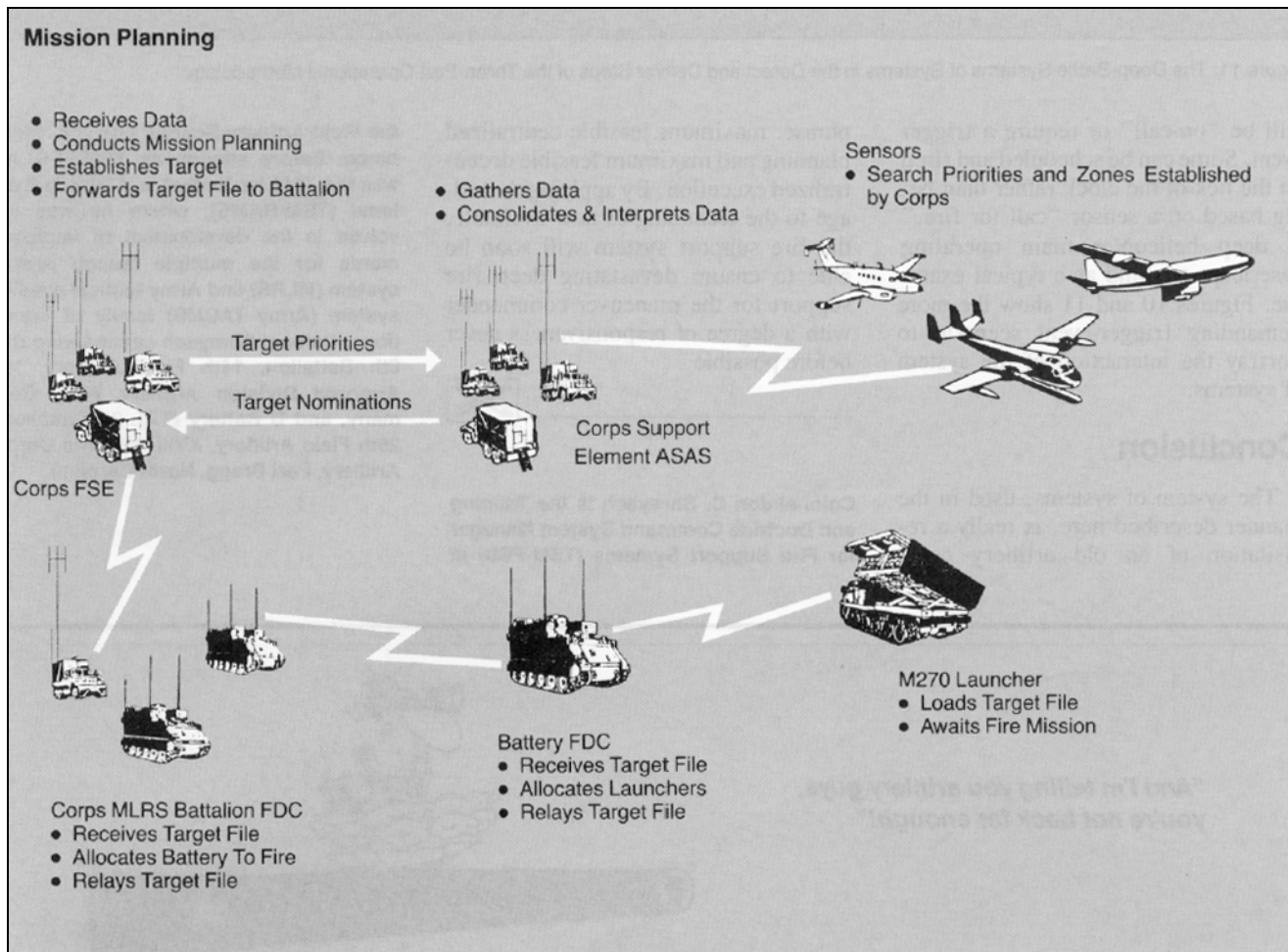


Figure 10: The Deep-Battle System of Systems in the Decide Step of the Three-Part Operational Methodology

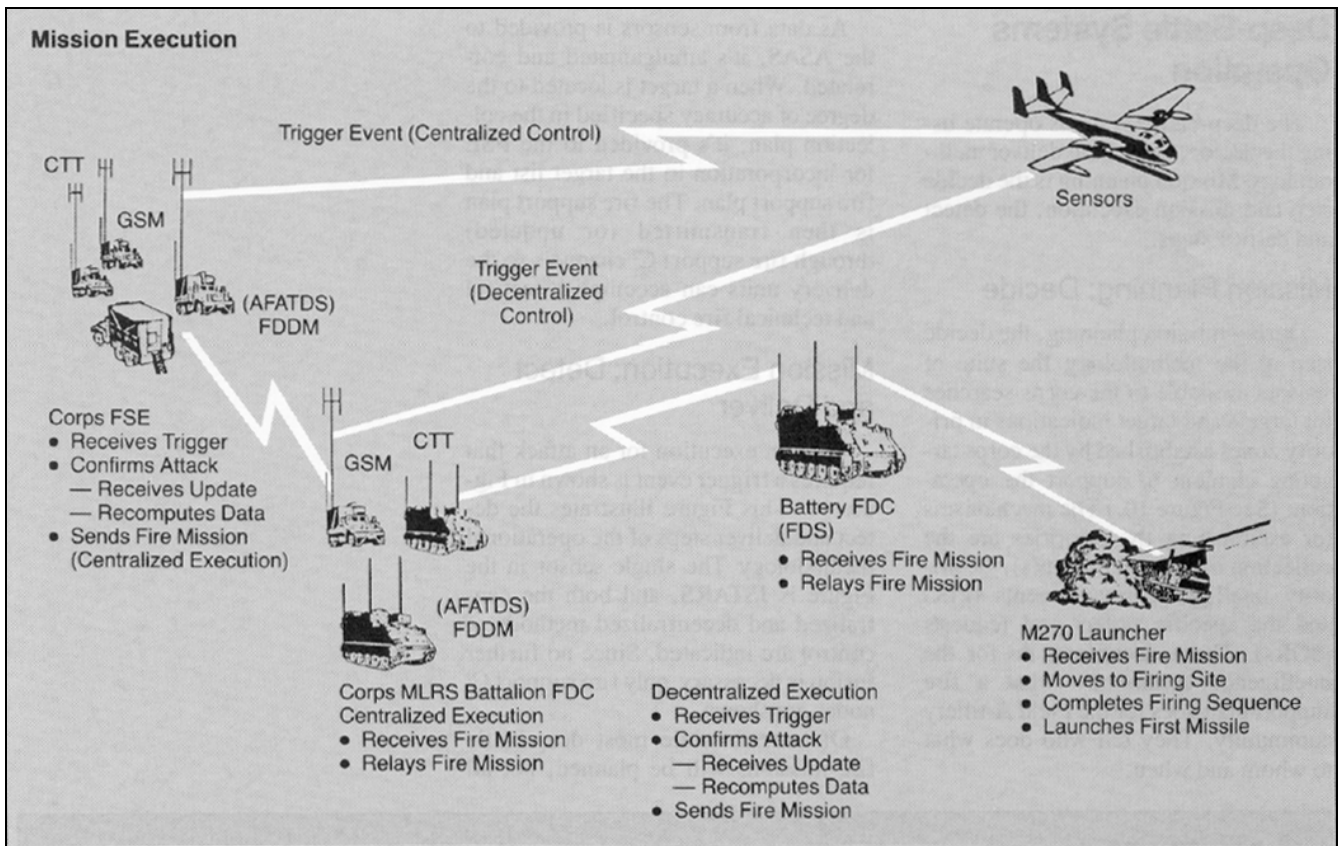


Figure 11: The Deep-Battle Systems of Systems in the Detect and Deliver Steps of the Three-Part Operational Methodology

will be "on-call" or require a trigger event. Some can be scheduled and fired on the tick of the clock rather than being based on a sensor "call for fire." A deep helicopter main operating base leaps to mind as a typical example. Figures 10 and 11 show the more demanding trigger-event scenario to portray the interaction of the system of systems.

maximum feasible decentralized execution. By applying that adage to the technologies now available, the fire support system will soon be able to ensure devastating deep fire support for the maneuver commander with a degree of responsiveness never before possible.



## Conclusion

The system of systems, used in the manner described here, is really a re-visitation of an old artillery catch phrase: maximum feasible centralized planning and

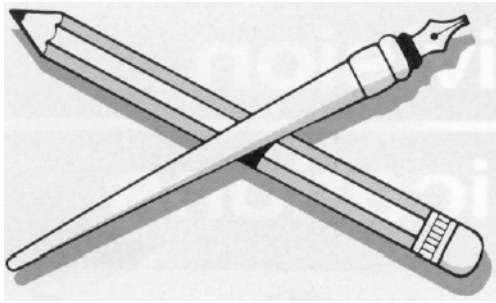
Colonel Jon C. Shreyach is the Training and Doctrine Command System Manager for Fire Support Systems (TSM-FSS) at the Field

Artillery School, Fort Sill, Oklahoma. Before serving as TSM-FSS, he was the TSM for Rocket and Missile Systems (TSM-RAMS), where he was involved in the development of improvements for the multiple launch rocket system (MLRS) and Army tactical missile system (Army TACMS) family of munitions. Colonel Shreyach commanded the 6th Battalion, 14th Field Artillery, 1st Armored Division Artillery West Germany, and B Battery (TA), 2d Battalion, 26th Field Artillery, XVIII Airborne Corps Artillery, Fort Bragg, North Carolina.

*"And I'm telling you artillery guys, you're not back far enough!"*







# Field Artillery Author's Guide

**F**ield Artillery is looking for articles and short features on past, present or future programs, equipment, tactics, techniques, procedures, leadership styles or other issues affecting our Branch. Though we have a theme for each edition, we aren't theme-bound. We publish timely, useful articles, regardless of their relevance to the theme.

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- Be clearly written with your bottom line (article's thesis) somewhere up front.
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- Be accurate, logical and complete.
- Have no classified information in it.
- Promote safe techniques and procedures.

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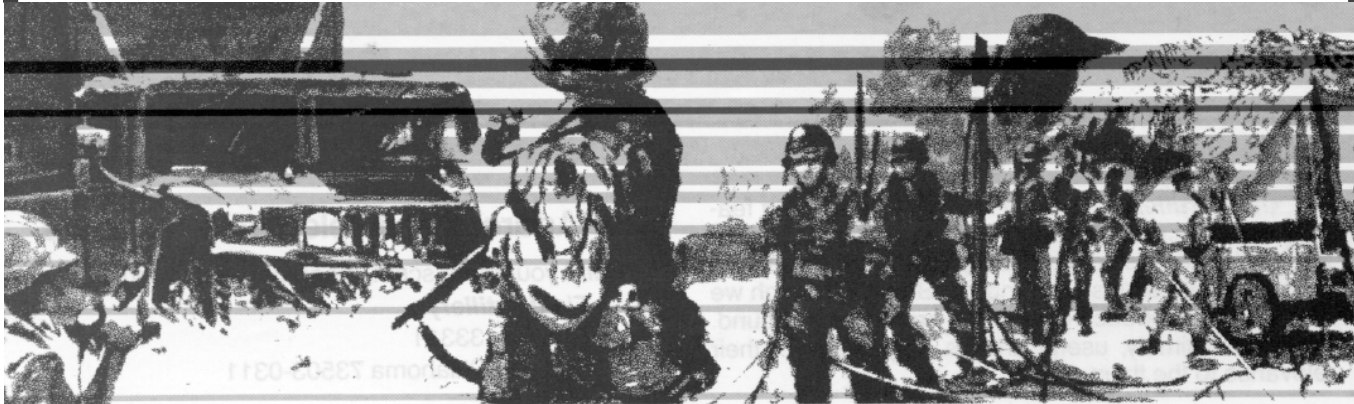
**Field Artillery** serves as your professional forum. We exist to keep you informed about new developments in the Branch and winning ideas from the field—to stimulate you professionally. Help us by sending articles about your field successes so we can share them with Redlegs around the world. After all, **The Future Belongs to the Field Artillery!**

### 1990 Field Artillery Themes

Publication Date	Theme	Article Deadline
February	Allied Artillery	2 Oct 89
April	Low- to Mid-Intensity Conflict	4 Dec 89
June	The Field Artillery Commander	5 Feb 90
August	History of Fire Support for the Maneuver Commander	
	History Contest*:	2 Jan 90
	Regular:	2 Apr 90
October	Army's Theme or TBA	4 Jun 90
December	Red Book	6 Aug 90

\* Rules for the US Field Artillery Association's annual History Writing Contest were in the October 1989 edition, Page 9.

# Mobile-Remote Division Artillery Communications



by Colonel Tommy R. Franks and Captain Victor B. Ayers

Today, as never before, communicating is a prerequisite for successful fire support. A commander must use his communications assets, procedures and techniques to build a **survivable** and **responsive** communications system. The system must give him maximum flexibility to tailor assets to meet mission requirements based on mission, enemy, terrain, troops and time available (METT-T). Successful communications on the next battlefield will be the result of innovative techniques and procedures, coupled with proven methods, implemented by well-trained and motivated soldiers.

The commander's ability to synchronize, integrate and direct fire support assets to the right place at the right time depends on responsive communications systems able to survive on the battlefield. And the fire supporter's ability to do the job depends on reliable communications. Field Artillery and command and control (C<sup>2</sup>) systems in general rely heavily on reliable and adequate communications.

How long and how well a division artillery (Div Arty) can do its job also is affected by communications. A Div Arty tactical operations center (TOC) currently is supported by several radio teletypewriter (RATT) rigs, a multichannel terminal and as many as nine or more FM radio nets. The abundance of antennas, vehicles and a massive radio frequency (RF) signature readily identify its importance anywhere on the battlefield. This adversely affects the survivability of a Div Arty TOC. The problem is further compounded by the

distances encountered in deep and rear operations.

These factors require we carefully consider the communications value of the terrain when selecting a TOC site. An ideal position affords both maximum concealment and effective communications. Since the ideal is rarely available, most commanders have to choose one or the other.

It's possible, however, to have both. By physically remoting radio sets, commanders can effectively site radios and still occupy sound tactical positions. How to remote radios from the Div Arty TOC is the subject of this article.

## Architecture

Communications is the linchpin of war-fighting. Understanding and implementing *principles* of communications can mean the difference between success and failure on the battlefield.

The soldiers of the 1st Cavalry Div Arty, Fort Hood, Texas, came to grips

with these issues and developed an architecture that supports our mission and battle tasks. We work hard at concealment and cover and tailor communications to support survivability, remoting FM radios a kilometer or more away.

We also remote the line-of-sight (LOS) radio portion of the small extension node (SEN), the Div Arty's slice of mobile subscriber equipment (MSE). The only antennas radiating from within 300 meters of the TOC are mobile subscriber radio-telephone terminal (MSRT) whip antennas. (The Div Arty S3 habitually remotes his MSRT into the TOC as a backup to digital non-secure voice telephone, or DNVT, wire line communications. We also use the MSRT to maintain continuous communications during initial site occupation and in the final moments before we displace.)

We remote the FM radios using standard Army equipment assembled

to provide the commander maximum reliability, security, flexibility and, most importantly, survivability. At the center of the system is the FM remote shelter, a camouflaged shell mounted on a standard 1008A1 civilian utility cargo vehicle (CUCV). Inside the shelter we have 10 radios, seven of which are secure-capable.

We use the three non-secure radios primarily for tactical fire direction system (TACFIRE) communications. We also have two TD-1289 multiplexers, 10 KY-57 VINSONS, 10 C-2329 local control units, one DC power supply and one TA-1035 DNVT telephone. A PU-620 five-kilowatt generator set provides the primary power for the system. Vehicle batteries provide automatic DC back-up power if the AC power fails. A small air conditioner and standard military-issue electric heater control the temperature.

## Reliability

Reliability is inherent since the system belongs to the communications platoon. During operations, a 31V Unit-Level Communications Maintainer, a trained 31K Combat Signaler or both man the system 24 hours a day. Since the radios belong to the platoon, pride is an important aspect of maintenance.

Convenience is another. Having a test set AN/PRM-34 at hand makes radio checks, services and routine maintenance simple and fast. The visual tuning indicators on the TD-1289 multiplexers in the system allow the platoon to monitor the transmission of each radio set constantly.

The key is that the system puts radios close to specialists trained to operate and care for them. We no longer have the frustrated, untrained operators "pulling and pushing" the radio sets.

## Security

The KY-57 VINSONS installed in the remote shelter secure the system. A 26-pair cable linked between the TOC and remote shelter meets all the requirements of a protected distribution system (PDS). The only requirement for HYX-57 secure wireline adapters is to remote the radio used for the maneuver control system (MCS).

## Flexibility

A TOC with remoted communications has much greater flexibility in selecting sites. It merely has to be within a kilometer or so of the optimum

communications site. The Div Arty commander can occupy two separate locations—one with optimum communications and with optimum concealment for the TOC.

Flexibility in the communications net structure is important. Since all radios are in one location, we can easily alter the TOC net. For example, if we have to move, we move only the radio control group C-2328 (remote) portion of the AN/GRA-39, not the entire radio and its associated installation kits.

This is a particular advantage when the Div Arty TOC is hit with a chemical attack. Although the S3/S2 expandable van is the main "battle" van, the counterfire van has a chemical protection unit (CPU). In the event of a chemical attack, mission-essential personnel shift operations to the CPU-equipped shelter. We do this by moving key remotes (C-2328) and telephones to the CPU shelter and plugging them into pairs or quads of the J-boxes, J-1077, we've "hard-wired" into both vans. We've rehearsed this and use this procedure on exercises. It works. The average transfer time is approximately 60 seconds.

## Displacement

Timeliness is another important principle of communications. A "hot-jump" capability is always ideal. However, because of limited equipment, this capability isn't always possible. In the 1st Cavalry Div Arty, we use the next best system.

During displacements, the advance party has a wire team, a spare 26-pair cable and two OE-254 antenna systems. Under the supervision of the Div Arty communications chief, this forward communications team installs antennas and a cable at the new site. When the main body arrives, we position the remote shelter next to the already installed antennas and cable.

FM communications is available immediately after, if not before, we set up and turn on the TOC van's power. Recent experience during multiple moves at the National Training Center (NTC), Fort Irwin, California, showed we can set up FM communications in approximately 10 minutes.

## Survivability

Using remoted radios reduces the enemy's ability to target the TOC. We also enhance survivability with the freedom to site the TOC behind hill

masses, in tree lines in Europe or behind dunes and in wadis of the desert.

Using TD-1289 multiplexers greatly reduces the number of antennas required. Each multiplexer combines up to five radios onto one OE-254 antenna. The reduced number of antennas and the small size of the remote shelter, which is positioned to provide best-case line-of-sight, greatly reduces the visual signature of the site.

In situations where it isn't feasible to displace the entire command post, we can move the remote shelter with the LOS equipment anywhere within a one-kilometer radius. We can move the shelter with about 20 minutes or less down time, whereas a complete command post displacement could take an hour or more.

## Proven System

The remote system was first fielded in the 1st Cavalry Division in April 1986. We have tested it on several local field training exercises, including on division and corps exercises and during remotely piloted vehicle (RPV) testing, MSE fielding, several sub-unit evaluations and other tactical exercises.

Our best tests, however, were during return of forces to Germany (REFORGER) 87 and two rotations to the NTC. During REFORGER, the TOC could set up in small villages and remote the radios to nearby hilltops. At Fort Irwin, we could tuck the TOC behind escarpments, silhouette it against hill masses and park it in deep wadis with little regard for communications. At the same time, we positioned the remote shelter and LOS equipment for optimum communications.

## Wiring

The system not only supports FM circuits, but in the heyday of RATT, we also remoted communications terminals AN/UGC-74 into the TOC. When multichannel was the standard means of communication, we collocated the AN/TTC 41 switchboard and AN/TRC-145 with the remote shelter. All circuits were routed through the remote shelter to the main site via the same 26-pair cable. With the advent of MSE and its four-wire circuits and LOS/SES (small extension switch) configuration, we can no longer operate that way.

Today we use only one quad (two

pairs) on the 26-pair cable for telephone circuits. This quad links the remote communication site's DNVT to the small extension switch and the rest of the MSE network. Figure 1 depicts the current communications network for the 1st Cavalry Div Arty.

The LOS V1 is collocated with the FM remote shelter. We can remote the LOS V1 by cable CX-11 7230 up to one quarter mile or up to five kilometers by using the down-the-hill (DTH) super-high-frequency (SHF) radio. Although for distance reasons we prefer the SHF, the choice depends on METT-T. At times terrain will dictate the use of the cable, i.e. when no clear line of sight exists between the two (SEN and LOS).

We use very little field wire. WD-1 or WF-16. The TOC expandable vans and the administrative-logistics operations center (ALOC) shelter are hard-wired for both FM and MSE communications. We wire both vans identically, which allows us to use either van if we lose one shelter en route.

The heart of the pre-wired system is locally fabricated junction boxes. These boxes are connected by 26-pair telephone cables to J-1077 junction boxes, which are bolted to the front of each van. We connect telephones and remotes with locally fabricated extension wires. The wires are WD-1, WF-16 or commercial telephone cords, each with a hermaphrodite receptacle at one end and a telephone jack. C-block or bare wires at the other. Telephones and remotes are mounted in slots and drawers to prevent shifting during movement.

During displacements, all instruments remain connected: we only disconnect the 26-pair cables. We mount two J-1077 junction boxes on each van. One junction box on each van terminates FM communications, the other terminates the 26-pair cable from the SEN. We have two other J-1077s: one mounted on the ALOC and the other at the TACFIRE shelter.

The TACFIRE junction box and cable system is a hybrid in that it carries both FM and MSE digital circuits. The system has quads for two DNVTs and one DSVT and three pairs for FM digital communications. We create the hybrid by strapping quads from the MSE J-1077 over to unused pairs on the FM shelter J-1077. This further reduces



Div Arty TOC telephones and remotes are mounted in slots and drawers to prevent shifting during movement.

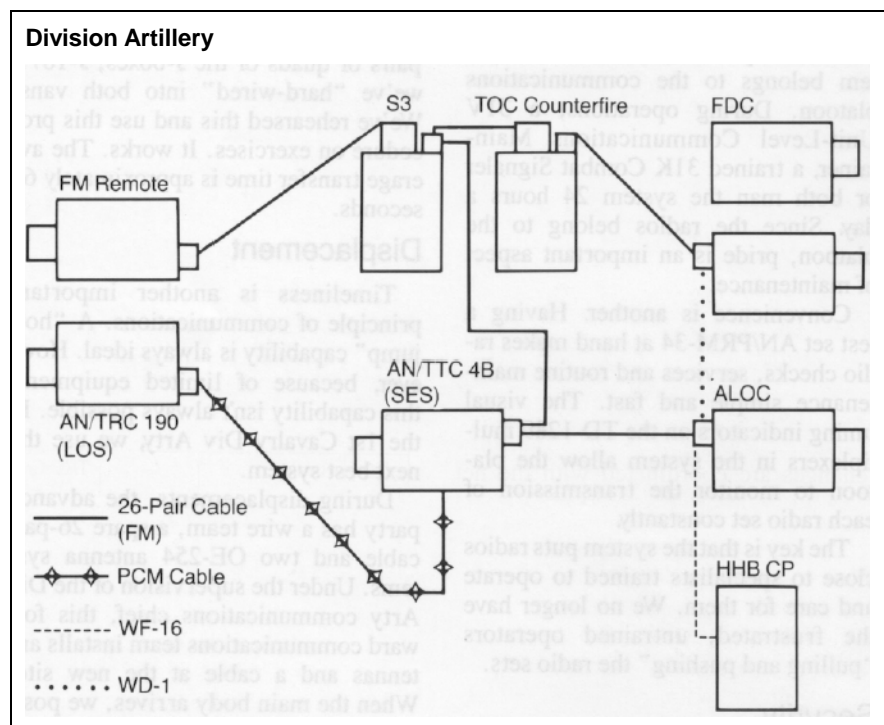


Figure 1: The 1st Cavalry Division Artillery's Command Post SEN Employment

the amount of field wire and cable required.

### Planning

Good communications is the result of detailed planning and coordination and employing resources organized for the immediate mission and terrain characteristics. It requires the attention

of users and communication personnel at all levels. Though trained and motivated communicators help ensure good communications, it's ultimately the command emphasis that determines success or failure.

When planning for communications, you must consider several factors. You analyze the mission to reveal the requirements

and then document and get them approved. Once approved, you establish the means.

Several tools help planning the Div Arty communications system. You can use a matrix to document the nets to be monitored and the units to monitor them (see Figure 2). A cable-pair assignments work sheet establishes the location of radios and wire pairs (see Figure 3). We give copies of the work sheet to the remote shelter team chief, the wire section chief and the TOC NCOIC. Its main purpose is to serve as a guide when troubleshooting.

The final document is a frequency work sheet operators use to establish multiplexer port and radio assignments, based on frequencies (see Figure 4). Multiplexer installation instructions require a minimum of five percent separation between frequencies used on the same multiplexer. This is a "fail safe" mechanism in the system.

It's on this work sheet that you compare frequencies for compatibility. If a problem exists, you bring it to the attention of the signal officer or communications chief who solves the problem. A typical problem is frequencies that don't meet the minimum separation requirements or "harmonics" (frequencies that are multiples of each other). Because of the fail-safe mechanism, co-site interference usually isn't a problem.

Operators complete the work sheet for the next period before the end of the current period. Necessary frequency changes are coordinated with the net control station (NCS) of each net early enough to allow the NCS enough time to notify all subscribers of the changes.

## The Bottom Line

The remote system has received rave reviews by the commanders and troops who set up and use it. From a signal officer's perspective, the control of the equipment eliminates many problems. The "instant" access to the radios and the "instant" response to potential radio problems can't be duplicated. Having positive control over the preventive maintenance checks and services (PMCS) on TOC and TACFIRE radio equipment is well worth the time and effort it takes to identify and put together the remote system. Predeployment checks and post-deployment recovery are also a snap.

Division Artillery FM Nets									
Div Arty Operational Facilities	Div Cmd Ops	Div Intel	Div Arty Cmd Fire	212th Bde Cmd Fire	Ops 1 (DS Bn)	Ops 2 (DS Bn)	Ops 3 (DS Bn)	Admin/Log	TAB Cmd Intel
TOC	●	●	●	●	●	●	●		●
ALOC								●	
1-82			●		●			●	
3-82			●			●		●	
2-114			●				●	●	
A/21			●			●			
A/333			●				●		●
FSE-Main	●						●		
FSE-Tac	●				●				
212th FA (MSU)			●	●	●				

TAB = Target Acquisition Battery  
MSU = Mutual Support Unit

Figure 2: You can use a matrix, such as this one, to document the communications nets and units to monitor them, based on your mission.

26-Pair Cable Assignments						
PR#	Remote J1077	S3 Van J1077	Cmd Fire J1077	ALOC J1077	TACFIRE J1077	
1	Radio 8				Ops 1	01 Remote Radio
2						06 Local
3	Radio 7				Ops 2	02 Remote Radio
4						07 Local
5	Radio 6				Ops 3	03 Remote Radio
6						08 Local
7	Radio 1	D/A CF				04 Remote Radio
8						09 Local
9	Radio 2	Div Cmd				05 Remote Radio
10	Radio 3	Div Intel				10 Local
11	Radio 4	212th				06 Remote Radio
12	Radio 5		TAB Cmd Intel			11 Local
13	Radio 9			Admin/Log		07 Remote Radio
14						12 Local
15	DNVT #1351 Tr					08 Remote Radio
16	DNVT #1351 Rec					13 2-Wire Voice
17					DNVT #1313 Tr	01 Local
18					DNVT #1313 Rec	14 2-Wire Voice
19					DSVT Tr	02 Local
20					DSVT Rec	15 2-Wire Voice
21						03 Local
22						Not Used
23						04 Local
24						Not Used
25			VFMED		Ctrfire VFMED	05 Local
26						Not Used

Tr = Transmit  
Rec = Receive

Figure 3: A cable-pair assignments worksheet establishes the location of radios and wire pairs.

Frequency Assignment Work Sheet					
*1* Net	*2* Frequency	*3* Antenna			
Radios					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Multiplexers					
	1	2	3	4	5
1-5					
	6	7	8	9	10
6-10					
	11	12	13	14	15
11-15					
OE-254 Antenna					
	1	2	3	Whip Antenna	

Figure 4: Operators use this worksheet to establish multiplexer port and radio assignments, based on frequencies.



An officer checks to assure his antenna is tightly mounted before his radio is remoted into the TOC.

## The Future

Future plans call for a new shelter mounted on a high-mobility multipurpose wheeled vehicle (HMMWV) to improve mobility over rough terrain, although we have considered mounting all the equipment in a trailer to avoid down time caused by prime mover failures.

Challenges include working with single-channel ground and airborne radio systems (SINCGARS) in the frequency hop mode. This will cause problems for the current family of multiplexers. However, there are systems in the works that will alleviate this problem.

In the interim, we'll still have Div Arty TOCs, and these TOCs will still have radio nets. Whether the antennas and their accompanying signatures are towering above the TOC or silhouetted against a distant hill will always be the commander's decision.



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Captain Victor B. Ayers, a Signal Officer, is the Assistant Secretary of the General Staff for the 1st Cavalry Division. He also served as the Communications Electronics Officer for the 1st Cavalry Division Artillery. Captain Ayers is a graduate of the Radio Systems Officers Course, Fort Gordon, Georgia, and the Marine Corps Advanced Communications Officers Course, Quantico, Virginia. He was a platoon leader and commanded C Company for the 1st Signal Battalion in West Germany.

# Field Artillery Equipment and Munitions Update

## Cannon

### M109 HIP

The M109 Howitzer improvement program (HIP) is modernizing the Army's fleet of M109A2 and M109A3 155-mm self-propelled howitzers. First fielded in the 1960s, the M109 family of howitzers fires in direct support of all armored and mechanized divisions and in general support of the Marine divisions.

The M109A3E2 HIP howitzer fielding should begin in FY 91 and continue for seven years. The program will improve 1,700 M109A2 and M109A3s, including those in all active M109 battalions and round-out National Guard units.

#### HIP Program Status

The HIP's initial operational test and evaluation (IOTE) was conducted at Fort Sill between 11 June and 28 July 1989. It demonstrated major improvements over the M109 howitzer in survivability and its ability to emplace rapidly and fire. During the IOTE, the HIP—

- Fired 11,444 rounds during 17 days of live-firing.
- Used 5,376 M119 charges and 902 M203 charges.
- Averaged 16 moves per

day for a total of 1,496 miles traveled.

- Started and finished the test with all four HIPs in a ready status (i.e., C-1 readiness status).
- Had all required crew maintenance actions easily accomplished by crew and mechanics.
- Used "shoot and scoot" tactics, proving to be a more survivable weapon system than the M109A2/A3 howitzer.

#### HIP Improvements

##### Survivability

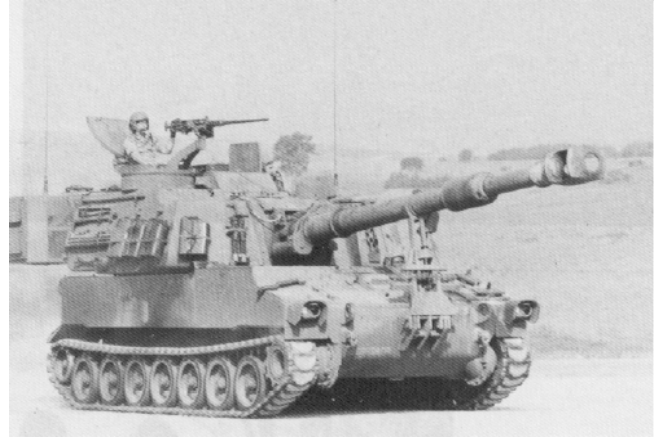
- New Turret for Improved Ballistic Protection
- Nuclear, Biological and Chemical (NBC) Collective Protection and Micro-Climate Conditioning System
- Remotely Operated Travel Lock
- Modular Azimuth Positioning System (MAPS)
- Reduced Vulnerability

##### Responsiveness

- Automatic Fire Control
- AN/VRC89 Single-Channel, Ground and Airborne Radio System (SINCGARS)
- Gun Drive Servos

##### Reliability, Availability and Maintainability (RAM)

- Prognostic and Diagnostic



#### Systems

- Upgraded Hydraulic and Electrical Systems
- Desert Engine Cooling System
- Modified Armament System (MAS)

#### Capabilities

- Increased Range
- Compatibility with all 155-mm Munitions

#### NBC/RAM and RCMAS PIPS to the M109A2/A3s

As currently projected, 737 Reserve Component (RC)

M109 howitzers will not convert to HIP. However, all 737 of the weapons will receive the nuclear, biological and chemical (NBC) RAM product improvement program or PIP, (making them M109A4 howitzers) and the RC modified armament system (RCMAS) PIP (making the M109A4 howitzers M109A5s). The RCMAS PIP is the same armament system upgrade as the HIP's. Currently, the NBC/RAM and the RCMAS PIPs are scheduled to be completed during FY 92 and FY 93.

### AFAS-C

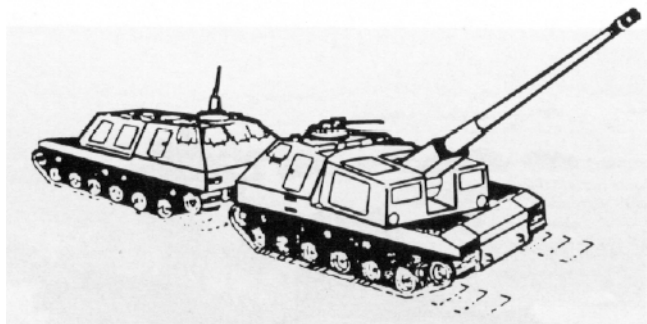
The advance Field Artillery system-cannon (AFAS-C) is the howitzer system of the future. It's composed of a two-vehicle system, which includes a weapons platform and ammunition resupply vehicle, the Field Artillery resupply vehicle-ammunition (FARV-A). State-of-the-art technology allows the commander to employ the AFAS-C in either an autonomous or semi-autonomous mode. This system will enhance spontaneity of fires and better enable the fire support community to perform the standard Field Artillery missions.

The AFAS-C will modernize the US howitzer fleet. As it's

fielded to units most critical to national and strategic defense, it will cause a ripple replacement effect: ultimately, more modern howitzers will replace the less-capable, aging howitzers in the total Field Artillery force, some of which will be more than 50 years old. First unit equipped (FUE) with the AFAS-C is scheduled to occur in FY 99. The AFAS-C improvements include:

#### Survivability

- Enhanced Armored Protection
- Reduced Firing Signature
- Autonomous Operations
- Shoot and Scoot Tactics
- Crew Self-Defense Decision Aids



#### Responsiveness

- 300% Increase in Rates of Fire (12 Rounds Per Minute and Four-Round Time-on-Target Missions).
- Automated Fire Control
- Automated Ammunition Handling

#### Capabilities

- Increased Range to 40 Kilometers
- Compatibility with all Standard Geometry 155 Projectiles
- Commonality with Maneuver Units in Mobility and Supportability



#### M198 PIP

A 1984 fielded-system review (FSR) identified shortcomings of the M198 155-mm towed howitzer. In 1985, the Army began the PIP to increase the reliability and maintainability of the M198.

The PIP adds or changes 39 parts and improves the howitzer in eight general areas. These improvements are in the brake system, equilibrator adjusting assembly, locking devices and attaching hardware, trail accessories, moisture accumulation system, bottom carriage, equilibrator-recuperator valve and the transverse-angle drive unit. The Army expects to modify

the first howitzers by FY 90 and finish within three years.

The M198 fires in general support of non-mechanized divisions and in direct support of motorized and Marine divisions and replaced the M114A1 in most units. More reliable than its predecessors, the M198 has a greater range—up to 30 kilometers with rocket assisted projectiles (RAP). Although 20 percent heavier than the M114A1, the M198 is still light enough to be airlifted by CH47D and CH53E helicopters.

The Army and Marine Corps will begin evaluating candidate lightweight howitzers to replace the M198, beginning in late FY 90.



#### M119

The Army is currently buying the M119 105-mm lightweight howitzers from the United Kingdom. They are replacing the M102 and M101A1 howitzers and are being issued to light infantry divisions and rapid deployment forces, beginning this month. The Army plans to buy and deploy 548 howitzers by 1996.

The 4, 100-pound M119 fires all conventional 105-mm ammunition as well as RAP and dual-purpose improved conventional munitions (DPICM). It can be towed by a high-mobility multipurpose wheeled vehicle (HMMWV), carried by the UH60 helicopter or parachuted from C130 aircraft.



#### FAASV

The Field Artillery Training Center at Fort Sill, two battalions at Fort Hood, Texas, the 2d Armored Division's prepositioned stocks in Germany and 155-mm howitzer units in Europe have received the M992 Field Artillery ammunition support vehicle (FAASV). Fielding to units in Korea will be completed in FY 90.

The FAASV provides crews ballistic protection and incorporates ammunition handling devices. It's built on an extended M109 chassis with a large armored housing replacing the turret. The FAASV has—

- Racks to store 90 rounds horizontally.
- A conveyor to deliver rounds directly to the howitzer.
- An X-Y stacker to load and

unload ammunition into the storage racks.

- Simplified test equipment for the internal combustion engine (STE/ICE).
- An auxiliary power unit (APU) to run the ammunition handling equipment (AHE) in the FAASV and power the howitzer in the firing mode.
- A collective NBC system to protect four crew members working in a contaminated environment.
- An automatic fire suppression system to extinguish hydrocarbon fires.



## Rockets and Missiles

### MLRS

Fielding of the multiple launch rocket system (MLRS) continues to be the cornerstone of Field Artillery force modernization. Beginning in the summer of 1990 with the fielding of the first deep-attack Army TACMS-capable MLRS battalion, the Army will begin the second phase of its MLRS fielding strategy. As the Field Artillery modernization plan is implemented, Lance and 8-inch battalions will be re-equipped as MLRS battalions.

The Army plans to field MLRS to all active, National Guard and Reserve units by 2016. All heavy divisions and all five corps now have MLRS. The Marine Corps plans to replace its aging 8-inch howitzers with MLRS launchers.

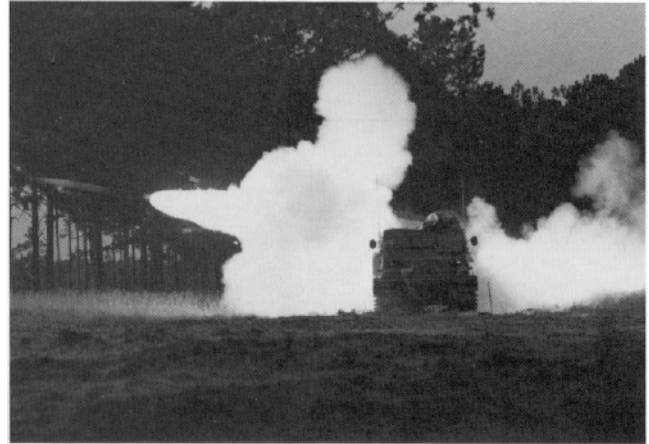
The MLRS is a highly mobile, free-flight rocket system. Each MLRS battery has nine M270 launchers and enough command, control and logistics assets for limited autonomous operations. Infantry, mechanized

and armored divisions have organic MLRS batteries. Corps currently have one MLRS battalion, each with three firing batteries.

Each MLRS launcher can receive a fire mission, locate itself, compute firing data, orient itself and fire up to 12 rockets. The rockets can range out to more than 30 kms.

The MLRS rockets carry M77 DPICM. The Army is developing other warheads for MLRS, such as the terminal guidance warhead (TGW) being developed multi-nationally, sense and destroy armor (SADARM) and the binary chemical warhead (BCW). NATO nations may adapt the MLRS to carry the German-made antitank (ATII) scatterable mine.

The Army TACMS, with a suite of conventional warheads, also is being developed. Collectively, the new rockets and Army TACMS missiles are called the MLRS family of munitions (MFOM).

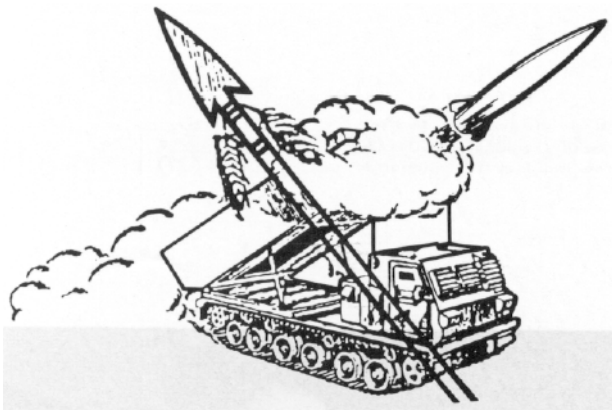


### Army TACMS

The Army tactical missile system (Army TACMS) will replace conventional Lance, beginning in FY 91. Fired from the M270 launcher, this semi-ballistic, guided missile engages targets at operational depths. As of July, there have been 16 successful test flights of the new missile. Army TACMS improves on Lance by firing faster, farther and using less manpower.

Planners envision a two-block family of warheads for the system. Block I will be anti-personnel, anti-materiel (APAM) munitions. Block II has smart warheads designed to kill hard moving targets. The M270 launcher with Version 6 software will be able to fire the Army TACMS missile as well as other MFOM.

Army TACMS allows the corps commander to engage second-echelon targets beyond the range of cannon and MLRS fires.



**Lance SLEP**

The Lance service life extension program (SLEP) continues to ensure the reliability and readiness of the Lance missile system into the mid-1990s. Since 1984, this program has improved the main missile assembly (MMA), warhead and supporting hardware.

Lance is a deep-attack missile that allows the corps commander to attack targets well beyond the range of cannon and rockets. Lance can attack soft targets using conventional munitions at ranges of up to 91 kms. Using nuclear munitions, Lance can attack targets at ranges of up to 133 kms.

The follow-on-to-Lance (FOTL) is a nuclear missile launched from a MLRS M270 "deep battle" launcher. The FOTL will provide the land forces commander a nuclear capability to put at risk the high-priority targets of the enemy's second-echelon units.

The FOTL will be issued to FA units as a completely assembled round. The missile will be stored and fired from a launch pod container.

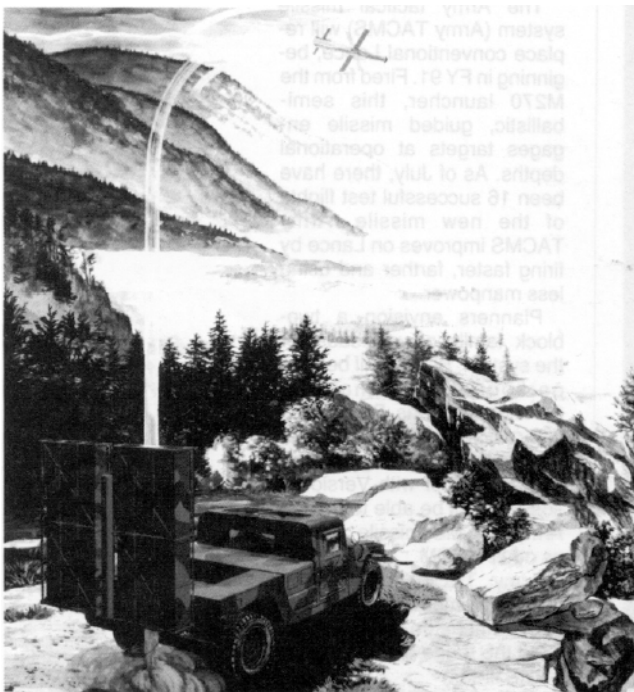
The FOTL system will be compatible with current and future Field Artillery fire control systems. It's projected to be fielded in the mid-1990s.



**Pershing II**

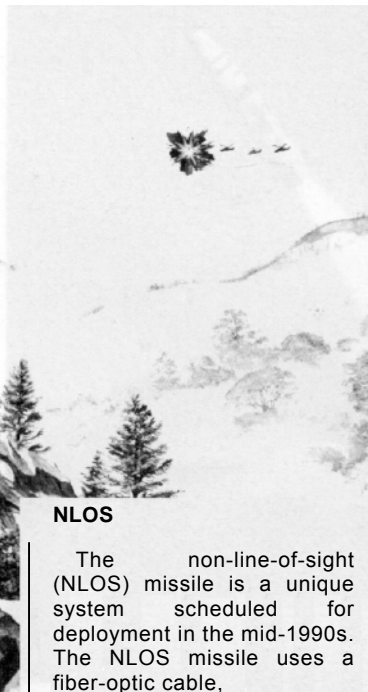
The Intermediate-Range Nuclear Forces (INF) Treaty signed by the US and USSR in 1987 eliminates the Pershing II (PII) and other intermediate-range nuclear missiles by June 1991. In turn, the Soviets will destroy their intermediate-range nuclear systems.

The first Pershing missile, a track-mounted system with a 400-mile range, was fielded in 1961. Pershing IA (PIA) improved the older system in 1968. The PII replaced the PIA in 1985. It has a 1,000-mile range and much greater accuracy.



**NLOS**

The non-line-of-sight (NLOS) missile is a unique system scheduled for deployment in the mid-1990s. The NLOS missile uses a fiber-optic cable,



not only for control, but also to relay visuals from the TV or infrared seeker in the nose back to the gunner's station. The gunner actually flies the missile into the target by use of a "joy stick." The two variants of launchers planned are base HMMWV (light) and base MLRS (heavy) vehicles.

The joint proponentry of the Field Artillery and the Air Defense for NLOS signifies its dual mission. The NLOS can engage rotary-wing aircraft as well as armored vehicles.

The NLOS is a brigade commander's weapon. Its role in Field Artillery is to bottleneck and delay the follow-on forces and to eliminate high-priority nodes. The NLOS also has a secondary role as a seeker while en route to the target.

The NLOS survivability is enhanced by firing from a secure-point, nonballistic trajectory and having a non-traditional flight path.

## Command and Control

### FIST DMD

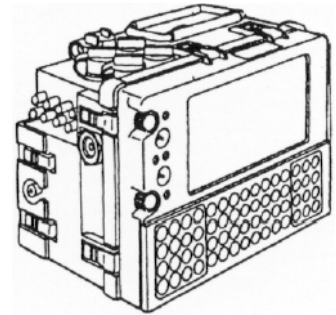
The fire support team digital message device (FIST DMD) began fielding in September 1988. The Army plans to give one FIST DMD to each FIST headquarters and maneuver battalion fire support element (FSE) in the heavy divisions. The light divisions will receive one for each battalion and brigade FSE.

The Marines are modifying a few FIST DMDs for greater

capabilities and use by their artillery regiments. They'll accustom Fleet Marine Force to automation and help Marine units when they receive the advanced FA tactical data system (AFATDS).

The FIST DMD can display, store, edit, monitor and forward fire missions from platoon forward observers' (FOs') DMDs. It's similar to the standard DMD

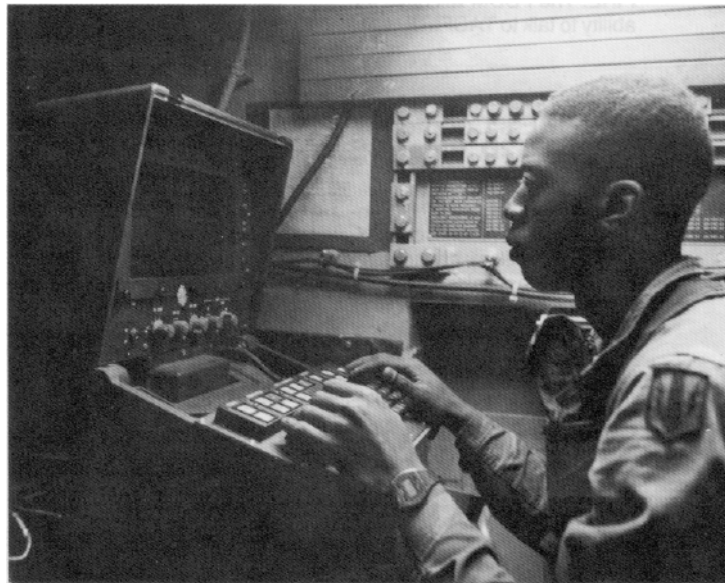
in design and format but "talks" on four channels to up to 20 different subscribers. Its message buffers hold 20 received messages and its copy file stores the last 16 messages transmitted. The FIST DMD can store and automatically update data for 36 missions. It can process two fire missions at once and hold seven off-line for later use.



### BCS

The memory capacity of the battery computer system (BCS) has recently been upgraded from 128K to 256K, 24-bit words, which allows the BCS to use improved software. The Version 9 software currently is being validated and certified. Units should begin receiving Version 9 software in FY 90.

The BCS is the Army's fire direction computer for cannon batteries. The BCS consists of the battery computer unit (BCU) configured with one gun display unit (GDU) per howitzer. It controls the fires of up to 12 weapons at once, applies non-standard ballistic parameters, performs basic survey routines and stores mission data and fire plans. It also works with the automated fire control system (AFCS) on the HIP howitzer.



### BUCS

Revision 1 to the backup computer system (BUCS) will update cannon, Lance and survey software. The updated chips speed up fire mission processing; add munitions, including Copperhead; and allow BUCS to compute gunnery solutions for all US howitzers, including the M119. The Army expects to field the Lance and survey chips in early FY 90. The cannon chips also will be available sometime in FY 90.

The Army is also introducing a new nuclear target planning (NTP) chip to be fielded in early FY 90.

The BUCS, a handheld computer, calculates gunnery and survey solutions for cannon and Lance units if their BCS fails. Units with no BCS use BUCS as their primary computer.



**FDS**

The fire direction system (FDS) performs fire direction in Lance and MLRS units. The FDS is built around the same basic component as the BCS. It consists of a BCU configured with the AN/UGC74A printer,

secure communications equipment and radios. The FDS digitally links the battery and battalion fire direction centers (FDCs) to the tactical fire direction system (TACFIRE), MLRS M270 launcher fire control systems

(FCSs), and MLRS platoon leaders' and other target acquisition assets.

The Army Materiel Command (AMC) will release FDS Version 9 software in FY 90, which will have both MLRS and Lance programs.

**FDDM**

The fire direction data manager (FDDM) improves the MLRS FDS by increasing the battery computer unit's (BCU) processing, storage and communications capability. The FDDM will give the FSE tactical fire control of rockets and missiles not possible with TACFIRE. The FDDM will have the ability to talk to TACFIRE or the

new Army tactical command and control system (ATCCS).

Plans call for the FDDM to reach the field in conjunction with MFOM and Army TACMS fieldings, and it will remain until replaced by AFATDS. In Europe and Korea, the Army will start issuing FDDM to MLRS batteries, battalion FDCs and division and corps FSEs in

early FY 91.

The FDDM hardware fits into the M577 command post vehicle. It consists of a modified BCU and a communications and data processing unit (CDPU). Two mini-vax computers make up the CDPU, which forms the heart of the product improvement. One mini-vax processes data; the other handles communications.

**TACFIRE's Counterfire and L3212D PIPs (CP 1822)**

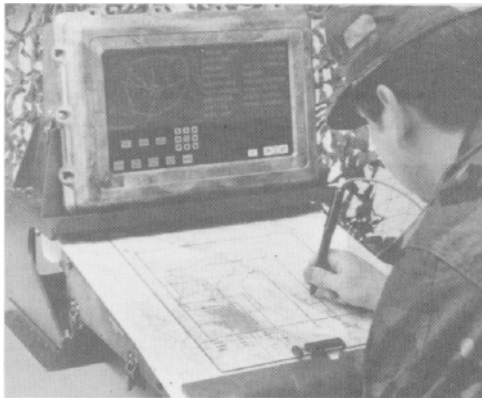
The counterfire PIP improves the operational capability of Field Artillery brigade and Div Arty tactical operations centers (TOCs). The program moves the electronic tactical display (ETD) and one of the two electronic line printers (ELPs) from the TACFIRE

shelter to the section's expandable van. Counterfire information will come directly into the van where there's more space to work. The PIP continued through FY 89.

The L3212D PIP will replace the central processing unit (CPU), input-output unit (IOU) and four mass core memory units (MCMU) with the L3212D emulator in all Field Artillery

brigade, Div Arty and Corps Arty TACFIRE sets. This reduces the number of circuit cards, power requirements and weight and size of the system. The program places all the TACFIRE components in one shelter for brigade and Div Arty computers.

Fielding began in September 1989 and will be completed in seven months.



**LTACFIRE**

Lightweight TACFIRE (LTACFIRE) gives selected Field Artillery centers in the light divisions tactical fire direction and fire planning capabilities. The LTACFIRE Version 9 software can do everything TACFIRE Version 9 does, except nuclear and chemical fire planning.

The LTACFIRE's main component, the briefcase terminal (BCT), is lightweight (35 pounds), portable and rugged. It processes, formats, communicates

and displays data. The FDCs at battalion and Div Arty use a dual BCT configuration. Some fire support cells use a single BCT, called an intelligent terminal.

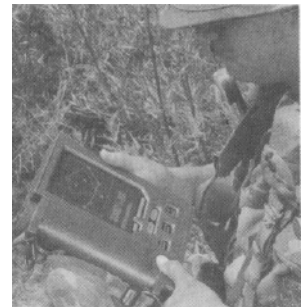
Fielding of LTACFIRE to the light infantry divisions begins in FY 90. The Marine Corps also will use BCT (calling it the battlefield command terminal) to further the introduction of automation in the Fleet Marine Force. It has bought limited numbers of BCTs for experimentation.

**DCT**

The digital communications terminal (DCT) is a lightweight, hand-held device that performs the same functions in the light divisions as the DMD does in the heavy divisions. The message processor can compose, edit, address and check messages for errors.

In September 1990, the DCT

will be fielded in two light divisions: the 7th Infantry and 82d Airborne Divisions. It will be issued to those divisions' FOs, FISTs, battalion and brigade fire support officers (FSOs) and Field Artillery battalion and Div Arty commanders. The Marines are fielding DCT throughout all echelons of the Fleet Marine Force.



## FED

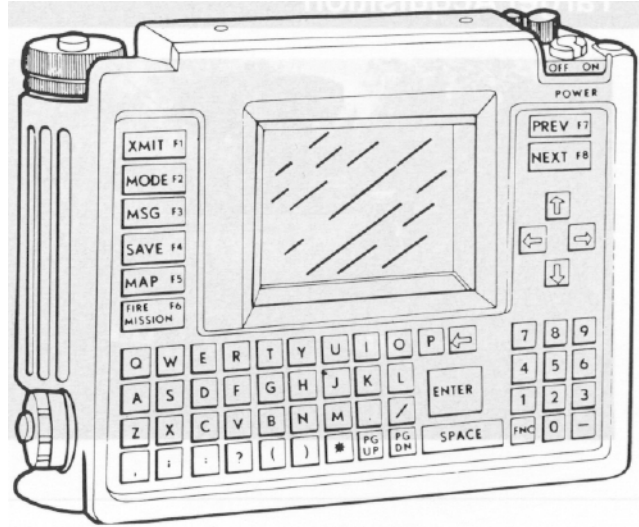
The forward entry device (FED) is a small, lightweight, hand-held, digital message entry device that has a single communications port and a ground-vehicular laser locator designator (G/VLLD) interface. The primary user of this device will be the FO. The FED also will be employed by FISTs, liaison officers (LNOs), Field Artillery survey planning and coordination elements (SPCEs), survey teams and moving target location radar (MLTR) sections.

The FED will replace the DMD (AN/PSG-2B) and, at selected locations, the FIST DMD (AN/PSG-5). Hardware for the FED is provided by ATCCS and is a full military-specification

device with a keyboard tailored for fire support.

The FED software is being developed in a block approach, using the Ada programming language. The first software will provide a capability closely resembling that found in the currently fielded FIST DMD. Future software versions will provide graphics and survey functions.

Starting in FY 90, light infantry divisions will start receiving FED with Version 1 software, which will provide a capability equal to that of the FIST DMD software. The Version 1A software and FED will go to all Field Artillery units, starting in late FY 92. Version 1A will be fielded in conjunction with AFATDS.



## AFATDS

The advanced Field Artillery tactical data system (AFATDS) uses emerging technology to automate control and coordination of fire support. The AFATDS will help the commander and FSO integrate all types of fire support into the maneuver plan and attack the highest-payoff targets with the most effective munitions at the critical time.

The AFATDS replaces TACFIRE and its variable format message entry device (VFMED) with a system of interconnected computers. Battlefield data can then be processed at various locations for more continuous operations.

The AFATDS successfully completed a conceptual evaluation in April 1989. The Marine Corps has decided to buy the AFATDS, making it a multi-service system. Testing on AFATDS is scheduled to be completed in FY 93 with fielding to the total force scheduled for FY 94.

The AFATDS uses state-of-the-art hardware common to ATCCS. The hardware can grow with the needs of the system.

The software is written in standard Department of Defense programming language, Ada, and is modular, making upgrades easier. The AFATDS will work with current and future fire control systems, ATCCS and some allied support systems.



## Target Acquisition



### FSV

The fire support vehicle (FSV) program is modifying M113-series armored personnel carriers (APCs) to M981 configurations for artillery observers in mechanized and armored forces. The M981 FSV is already used in many locations worldwide. Each FIST and brigade COLT in heavy divisions will have the FSV. The Army should complete fielding to continental United States (CONUS)-based units in FY 90.

A versatile target acquisition vehicle, the M981 FSV can "talk" to artillery command posts or firing units by voice or digital message. The operator can raise or lower the FSV's top-mounted "hammerhead," which houses a G/VLLD, the AN/TAS-4 night sight and a north-seeking gyrocompass. The 14-ton FSV can transport its four-man crew at speeds of up to 35 mph. It cruises up to 300 miles on a tank of fuel.



### G/VLLD

Selected units in Europe, Korea and CONUS already have ground-vehicular laser locator designators (G/VLLDs). National Guard fielding will continue into 1991.

The G/VLLD finds the range, azimuth and elevation of targets and reports the information through the FIST DMD, saving time and ammunition. It also can project an invisible, coded laser spot to guide munitions such as Copperhead, Hellfire and Maverick on to targets. The laser spot tracker in close air support aircraft helps pilots find the target and attack it on the first pass with either conventional or precision-guided munitions (PGMs).

The G/VLLD can be mounted on the FSV, a HMMWV or a tripod for ground operations.



### OH58D

The current fielding plan calls for the 12 active divisions to each receive six OH58D observation helicopters. The plan also gives additional aircraft to separate artillery brigades supporting V Corps, VII Corps and the XVIII Airborne Corps.

The OH58D is a fully integrated aerial platform for target acquisition, designation and handoff. The OH58D can perform these missions during day or night operations.

An aerial fire support observer (AFSO) and a pilot man the helicopter. The AFSO uses the aircraft's mission equipment to coordinate all fire support,

gather vital intelligence and assess tactical damage.

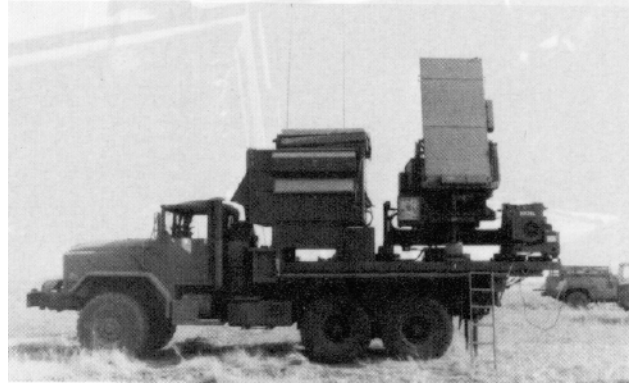
The OH58D carries impressive equipment. An attitude heading and reference system (AHRS) constantly displays aircraft position, attitude, altitude and heading. A laser rangefinder-designator (LRFD) calculates eight-digit grid coordinates accurately enough for first-round fire-for-effect. It allows Hellfire, Copperhead and other laser-guided munitions to be pinpoint accurate. An airborne target handover system (ATHS) communicates digitally with TACFIRE and other digital message devices.

### Firefinder

The Firefinder improvement program will increase the survivability of the radar. The Block II program will downsize the AN/TPQ-36 section to a single 5-ton truck for heavy forces and two HMMWVs for the lights. Block III will include improvements such as faster emplacement and displacement times, increased target throughput, reduced crew size and the ability to transmit data while moving. The Army will begin fielding the improved Block II Firefinders in 1992.

Block III will follow in 1998.

The Firefinder radars, AN/TPQ-36 (Q36) and AN/TPQ-37 (Q37), detect and locate artillery and mortars quickly and accurately. Both can locate 10 weapons firing at the same time and store up to 99 targets. The Q36 has a maximum range of 24 kms and a normal search sector of 1,600 mils. It can cover a 6,400-mil sector in the extended azimuth mode. The Q-37 has a maximum range of 50 kms and a 1,600-mil search sector.

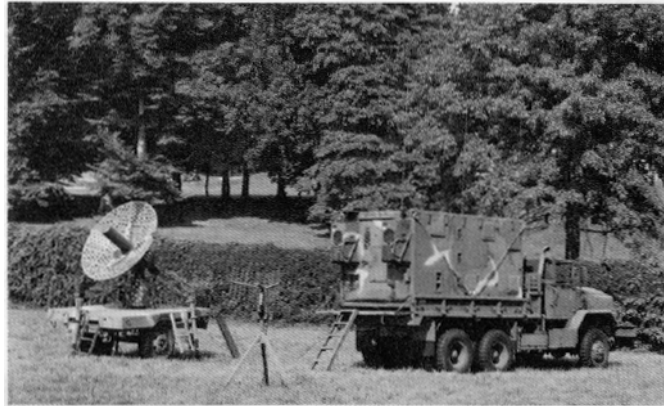


## Meteorology and Survey

### MDS

The Army began fielding 55 meteorological data systems (MDS) in FY 88, with fielding to continue through FY 90.

The MDS is a mobile, automated system that collects, processes and transmits meteorological data to FDCs. It operates digitally with TACFIRE, BCS and AFATDS. The MDS also provides information to predict radiological fallout and forecast weather. A 5-ton vehicle with a S280 shelter carries the non-radiating ground acquisition and processing station.



### MMS

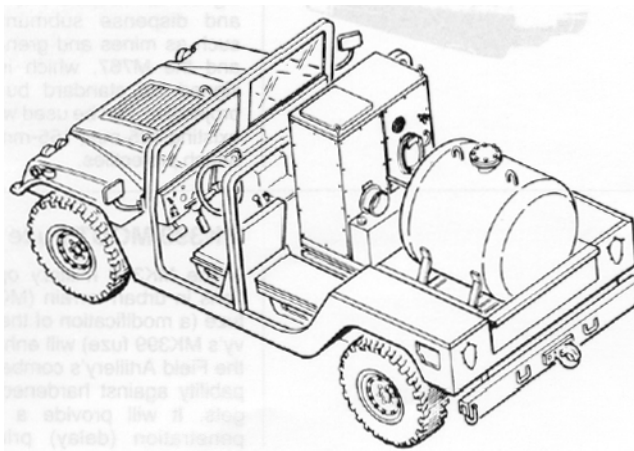
The meteorological measuring set (MMS) AN/TMQ-38 (formerly called LAMS) will consist of a non-radiating ground acquisition and processing

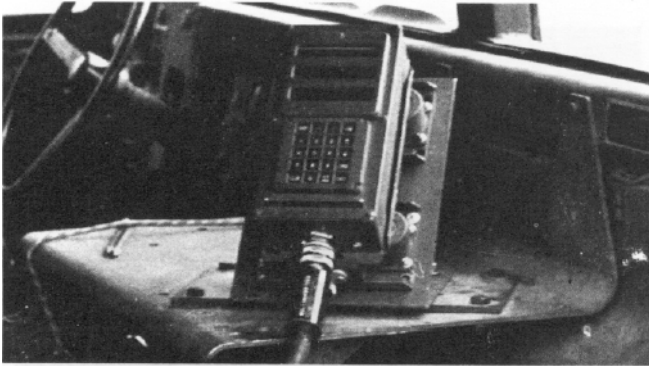
system. The Army will buy the system off the shelf to support light airborne and air assault divisions. The MMS is tentatively scheduled for fielding in FY 92.

### MHG

The meteorological hydrogen generator (MHG) will replace the AN/TMO-3 hydrogen generator set in all artillery meteorological sections. It will generate 150 cubic feet of hydrogen gas per hour and store up to 300 cubic feet.

The Army approved the operational and organizational (O&O) plan on 17 November 1986. Cost and operational effectiveness analysis studies are ongoing. Fielding of the first MHG is tentatively set for FY 92.





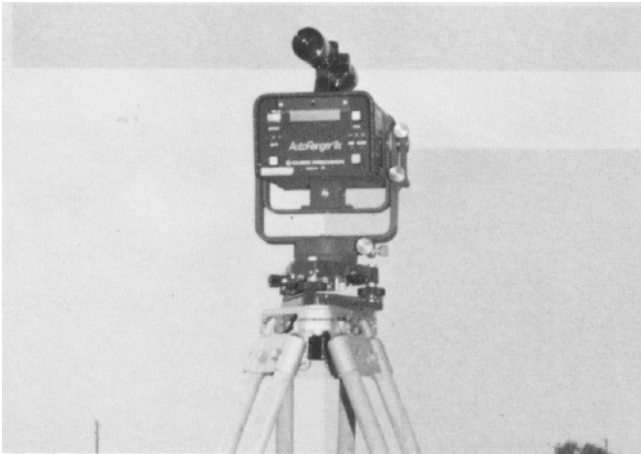
### MAPS

The modular azimuth position system (MAPS) will constantly inform combat vehicle crews of their location, even when they are "buttoned up." It can be integrated with the fire and sensor control system standard in many vehicles.

The MAPS currently depends on position and azimuth determining system (PADS) or other survey control points for initialization and update data. Research is being conducted

on the MAPS hybrid, integrating MAPS with a NAVSTAR global positioning system (GPS) receiver; one test of such a configuration has been successfully conducted. The GPS will permit autonomous initialization and updates.

Currently, only the HIP howitzer and Firefinder radar have been approved and funded as MAPS users. Other systems designers are considering incorporating it in their systems.



### SEDME-MR

The survey electronic distance measuring equipment-medium range (SEDME-MR) is a military version of lightweight commercial equipment. It measures distances from 30 to 7,000 meters in a few seconds. Operating day or night, it allows conventional survey parties to provide fast, accurate survey control. When used with other conventional survey equipment, it adds flexibility to PADS operations.

The SEDME-MR is replacing the distance-measuring microwave

system and the DM60. Each conventional survey team/party in Active or Reserve Component artillery units and the survey platoon headquarters of the light forces will receive one instrument.

All units, except those in Forces Command (FORSCOM), have received the SEDME-MR. The Army will resume the fielding of SEDME-MRs in FORSCOM, beginning 31 December with fielding to be completed by 2d Q, FY 90.

## Fuzes and Munitions

### M762/767 Electronic Time Fuzes

The M762/767 electronic time fuzes are easier to operate, can be inductively set and are more accurate and more reliable than their predecessors. The M762, which is designed for rounds that carry and dispense submunitions such as mines and grenades, and the M767, which is designed for standard bursting projectiles, can be used with all existing 105-mm, 155-mm and 8-inch projectiles.



The fuzes will be easier to operate because, unlike their predecessors, they can be hand set without tools, allowing Army gunners to set them by simply adjusting a liquid crystal display (LCD). Although not a required near-term capability, both fuzes can be inductively set by slipping a magnetic coil over the fuze's nose. Fielding for the M762/767 is scheduled to begin in FY 91.

### MK399 MOUT Fuze

The MK399 military operations in urban terrain (MOUT) fuze (a modification of the Navy's MK399 fuze) will enhance the Field Artillery's combat capability against hardened targets. It will provide a hard penetration (delay) primary

function and also will have a point-detonating (super quick) backup.

The MOUT fuze will replace the M78 series of concrete piercing fuzes. Fielding for the MOUT fuze is scheduled to begin in FY 92.



**XM773 MOFA Fuze**

The Field Artillery currently uses 17 different fuze types and models. The XM773 multi-option fuze artillery (MOFA) will provide the inductive fuze-setting capability to support the automated AFAS-C.

The XM773 MOFA will perform four fuze actions now provided by 12 fuzes used with burster-type projectiles. It will provide up to a 199.9-second electronic time fuze, a proximity fuze, a delay function and a

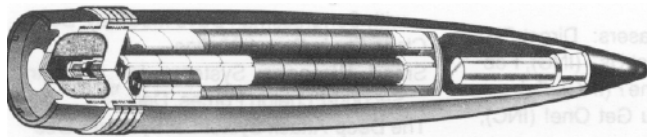
point-detonating (super quick) function.

The MOFA will replace the following fuzes: mechanical time super quick (MTSQ) M564, M582, M557, M739 and M739A1; proximity (VT) M513, M514, M728 and M732; and electronic time M767. It will be compatible with all fielded and developmental bursting projectiles for the 105-mm, 155-mm and 203-mm howitzers. Fielding for the MOFA is scheduled to begin in the middle of FY 97.

**M864 ERDPICM**

The M864 extended-range, dual-purpose improved conventional munitions (ERDPICM) projectile takes advantage of base-bleed technology to achieve a 20 to 30 percent increase in range over the M483 DPICM. The base-bleed element ignites upon firing and

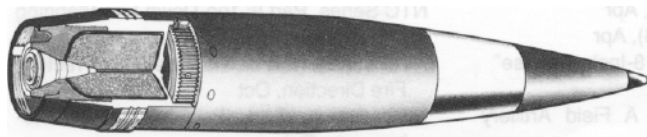
creates a positive pressure behind the base of the projectile, which reduces atmospheric drag. It reaches ranges of up to 22 and 27 kms when fired with the M119 and M203 propelling charges, respectively. The M864 is scheduled for fielding in the FY 92-93 time frame.



**XM785 Nuclear RAP**

The XM785 nuclear rocket assisted projectile (RAP) will be more reliable, range farther and produce higher yields than the current M454. All US and

NATO 155-mm howitzers will be able to fire the XM785. Developers are now testing the projectile, with fielding two to three years away.



**Field Artillery Hotlines**

- Unit Training Hotline—AV 639-5004 or (405) 351-5004: ARTEP, AMTP, SQT, MQS, TEC and ACCP.
- Redleg Hotline—AV 639-4020 or (405) 351-4020: NTC, JRTC and Other Artillery Subjects.

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PS Form 3526, Dec. 1987 (See instructions on reverse)

# 1989 Redleg Reference

The following is a list of articles and selected items from "On the Move" (OM), "View from the Blockhouse" (VB), "Incoming" (INC), "Redleg News" (RN), "Right by Piece" (RP), "Fragments" (FRAG) and "Fire for Effect" (FFE) appearing in **Field Artillery** during the calendar year 1989. The entries are categorized by subject and listed by title and issue.

## Ammunition and Fuzes

A Primer on a Simple, But Effective Training Device (RP), Feb  
Response to "Field Artillery Ammunition Resupply Solutions" (INC), Apr  
Author's Response (INC), Apr  
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Ammunition Distribution in Corps Operations, Jun  
How to Win With Artillery Logistics: A Platoon Leader's Observation, Jun  
Ammo Log Day (VB), Jun

## Combat Support and Combat Service Support

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The Evolution of Ammunition Distribution, Jun  
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Logistics Release Point (RP), Jun  
LFORM: The Linchpin of MEU (VB), Jun

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Response to "The Flying Box" (INC), Feb  
3x8: Our Force Multiplier (OM), Feb  
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3x8 Matures for Pathfinder's Power, Feb  
3x8 Strategy: A Product Improvement, Feb  
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NTC Series, Part I: Top-Down Fire Planning, Jun  
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NTC Series, Part II: Fire Support: Parts and Means, Aug  
Response to "A Counterfire Concept for Light Divisions" (INC), Oct  
Another Response to "A Counterfire Concept for Light Divisions" (INC), Oct  
Fire Support in the Light Infantry Division (INC), Oct  
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## Equipment and Technology

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BCS-ITS: How Do I Get One? (INC), Feb  
BCS-ITS: Here's How You Get One! (INC), Feb  
Mortars—A Field Artillery Weapon (INC), Feb  
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OH58D: Sending Refinement Data and Eliminating False Failure Advisories (VB), Feb  
Fight the 8-Inch Howitzer's Demise (INC), Apr  
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Why We Formed Division Artilleries (INC), Oct  
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PERSCOM: Drill Sergeants Needed and Transfer Article 15 (RN), Oct  
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The 141st Field Artillery: Roundout (RP), Aug  
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