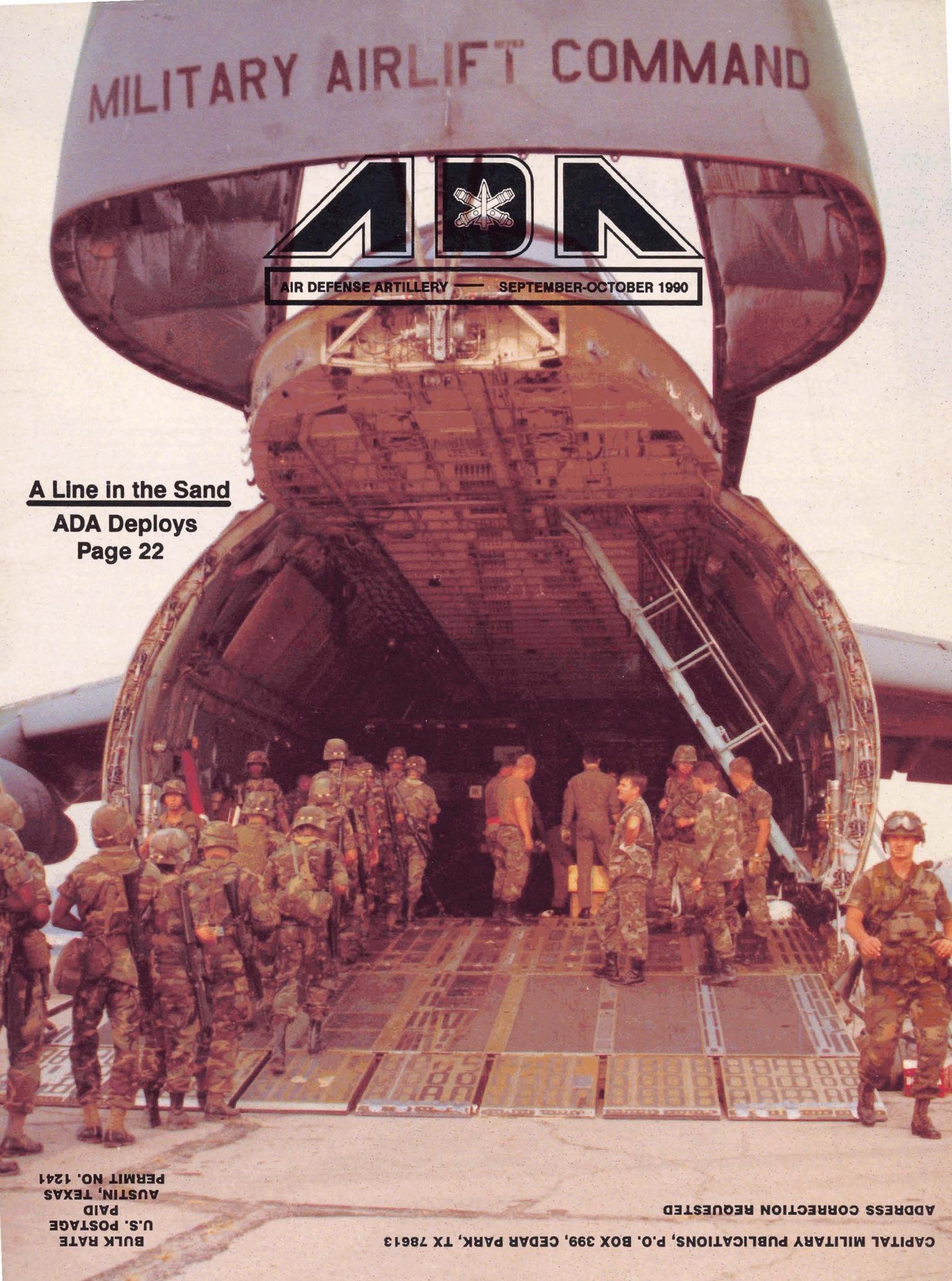


MILITARY AIRLIFT COMMAND



AIR DEFENSE ARTILLERY — SEPTEMBER-OCTOBER 1990

**A Line in the Sand**  
**ADA Deploys**  
**Page 22**



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AIR DEFENSE ARTILLERY

SEP-OCT 1990

## FEATURES

<b>Conventional Force Reductions</b> .....	<b>3</b>
Can Air Defense Artillery control its own future in the era of budget cuts and force reductions?	
<b>Seaborne Chaparral</b> .....	<b>16</b>
Soldier sailors ferry 1st Battalion, 2nd Air Defense Artillery, to Operation Roving Sands '90.	
<b>Chaparral Marches Toward an Uncertain Future</b> .....	<b>18</b>
Chaparral program managers confronted with their own missile gap hope to restore funding for Chaparral missile buy.	
<b>When Ducks Don't Fly at Night</b> .....	<b>20</b>
Vulcan gunners use improved nighttime capabilities to counter nighttime intruders.	
<b>Operation Desert Shield</b> .....	<b>22</b>
Air Defense Artillery battalions respond to the crisis in the desert oil kingdoms.	
<b>Ready...Aim...Shoot!</b> .....	<b>32</b>
The U.S. Army Air Defense Artillery School sponsors a photography contest for ADA soldiers and civilians.	
<b>EPLRS</b> .....	<b>34</b>
Enhanced position location reporting system completes the forward area air defense command, control, communications and intelligence network.	
<b>'Yes Sir, I'm Integrated'</b> .....	<b>37</b>
National Training Center observer-controller offers sound advice on how to integrate air defense with the maneuver task force.	
<b>Wanted: A Name for Non-Line-Of-Sight</b> .....	<b>40</b>
Contest offers soldiers and Army civilians a chance to name new forward area air defense weapon system.	
<b>RAIDES</b> .....	<b>48</b>
Rapid air defense evaluation system offers ADA commanders a clearer view of the air battle.	

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Your association supports our ADA soldiers taking part in Operation Desert Shield. I know I speak for you all when I say how proud we are of air defenders deployed to deal with any Iraqi air threat.

The current year looks like another good one. Revenues are up and we continue to add new members and chapters, the newest of which is the Fort Hood Chapter. Our chapters are constantly growing and adding new programs. We have put more than \$42,000 into our awards programs and plan to increase this effort. Our \$129,326 budget for 1991 will provide continued growth and services.

Effective Jan. 1, 1991, corporate membership rates will change from \$500 lifetime memberships to \$100 annual memberships. Lifetime memberships already purchased will, of course, remain in effect. The new rate will encourage more corporations to join and, in the long run, will increase revenues.

CWO 4 (Ret.) Sam Pignatella, our new membership chairman, is designing a program to increase membership and services across the board. Our 1991 goals are to increase all types of membership and complete the establishment of our Best Soldier, Best Battery and Top Gunner Awards.

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## INTERCEPT POINT

Air Defense Artillery soldiers bound for Saudi Arabia and Operation Desert Shield departed with confidence, enthusiasm and grim determination. "It is time to get down to business. There's a serious error that has to be corrected," one soldier said for the television cameras.

As I stood on the runways of departure fields and watched the C-5 and C-141 traffic disappear into the sunrise or sunset glow, I fully shared their confidence in their abilities. They are terrific soldiers — superbly trained, well-equipped and motivated to excellence across the board. They are wonderfully supported by tough Army families — steadfast and supportive wives, daughters, sons and parents . . . yes, some husbands, too . . . who saw them off, sometimes in tears, but in the certain knowledge that Operation Desert Shield is both a noble and a necessary endeavor. With them went the heartfelt good wishes of the nation, expressed in eloquent and often emotional terms. "As you leave our city, your homes and families, know that you will be missed and thought of as you go in harm's way," said one businessman in a letter addressed to an El Paso newspaper. "May you stay safe and in good spirits, knowing that your efforts on our behalf are appreciated. It is my greatest hope that you will never have to fire your weapons in anger, but if so, soldiers, follow your leaders bravely, and leaders, lead your soldiers wisely, so that all return safely with Godspeed."

Should they be called upon to engage in battle, I have total confidence that the ADA soldiers from the 11th Air Defense Artillery Brigade and each of the ADA battalions organic to deploying divisions, and from those units that may yet deploy, will represent the rest of us and the Army with courage leading

to overwhelming success. The image of thousands of other American soldiers from across the country with the same motivation and determination as our own boarding airplanes or climbing aboard ships bound for the gulf states brings home to all of us the full enormity of Saddam Hussein's serious error.

The Iraqi dictator has incurred not just the wrath of the United States, but the moral indignation of virtually the entire globe. As I write this column, it is too soon to tell if the crisis in the oil kingdoms will erupt into warfare or if diplomats will succeed in their attempts to devise a peaceful solution. Certainly there is reasonable cause for optimism that the latter may turn out to be the case. Surely, the unconditional condemnation by the United Nations, not to mention the military might of 21 nations massing in opposition on the Arabian Peninsula, will give the Iraqi leader pause. One wonders how even a ruler as ruthless as Hussein, after contemplating the probable results, could sacrifice his soldiers in what would inevitably be, for them, such a heartless, hopeless and bloody enterprise.

It is to be hoped that the deterrence effect of our buildup in Saudi Arabia will be effective and our soldiers, who today stand poised on the precipice of war, will succeed in accomplishing their mission without bloodshed. When such is the case, what, then, will have been the significance of Operation Desert Shield?

Certainly, Operation Desert Shield, whatever its outcome, will produce far-reaching diplomatic consequences, the enormity of which, at the moment, is beyond measure. But some of the military implications of the world's first post-Cold War crisis are readily evident. This is particularly true for Air De-



# INTERCEPT POINT

fense Artillery. A great deal of the branch's immediate future was determined the moment the first Patriot and Avenger fire units rolled onto airlifts bound for the Persian Gulf. The urgency with which elements of the 11th Air Defense Artillery Brigade were allotted scarce space on some of the very first Desert Shield C-5 and C-141 sorties demonstrates that our planners are well aware that Air Defense Artillery has a vital role to play in contingency missions.

The situation that confronted the paratroopers and air force squadrons who were first to draw the "line in the sand" speaks eloquently for a "first lift" deployment for Air Defense Artillery. They faced not only a robust conventional air threat, but a formidable tactical ballistic missile threat. During the opening days of Operation Desert Shield, their one best hope of stopping Iraq's huge, modernized army, had it plunged across the border, was a decisive victory in the opening air battle — a victory that largely hinged on the ability of rapidly deployed Patriot units to defend Saudi air bases. The situation was, in short, a Third World nightmare scenario that could have been drawn straight out of the pages of FM 44-100, the

capstone ADA manual. It was also a situation that could easily be replicated in other places at other times.

Contingency missions will play a prominent role in our Army's future. With conventional force reductions in Europe underway, even reinforcement missions on the Continent take on some of the flavor and sense of urgency we observe in contingency operations. We must, as we train soldiers, schedule unit training events, create doctrine, devise tactics or establish requirements for new air defense systems, think always in terms of operational readiness and strategic deployability. Air Defense Artillery will play a key role in early deployment of forces, and our fire units must be ready on arrival so our soldiers can be . . . First to Fire!



— Maj. Gen. Donald M. Lionetti  
Chief, Air Defense Artillery

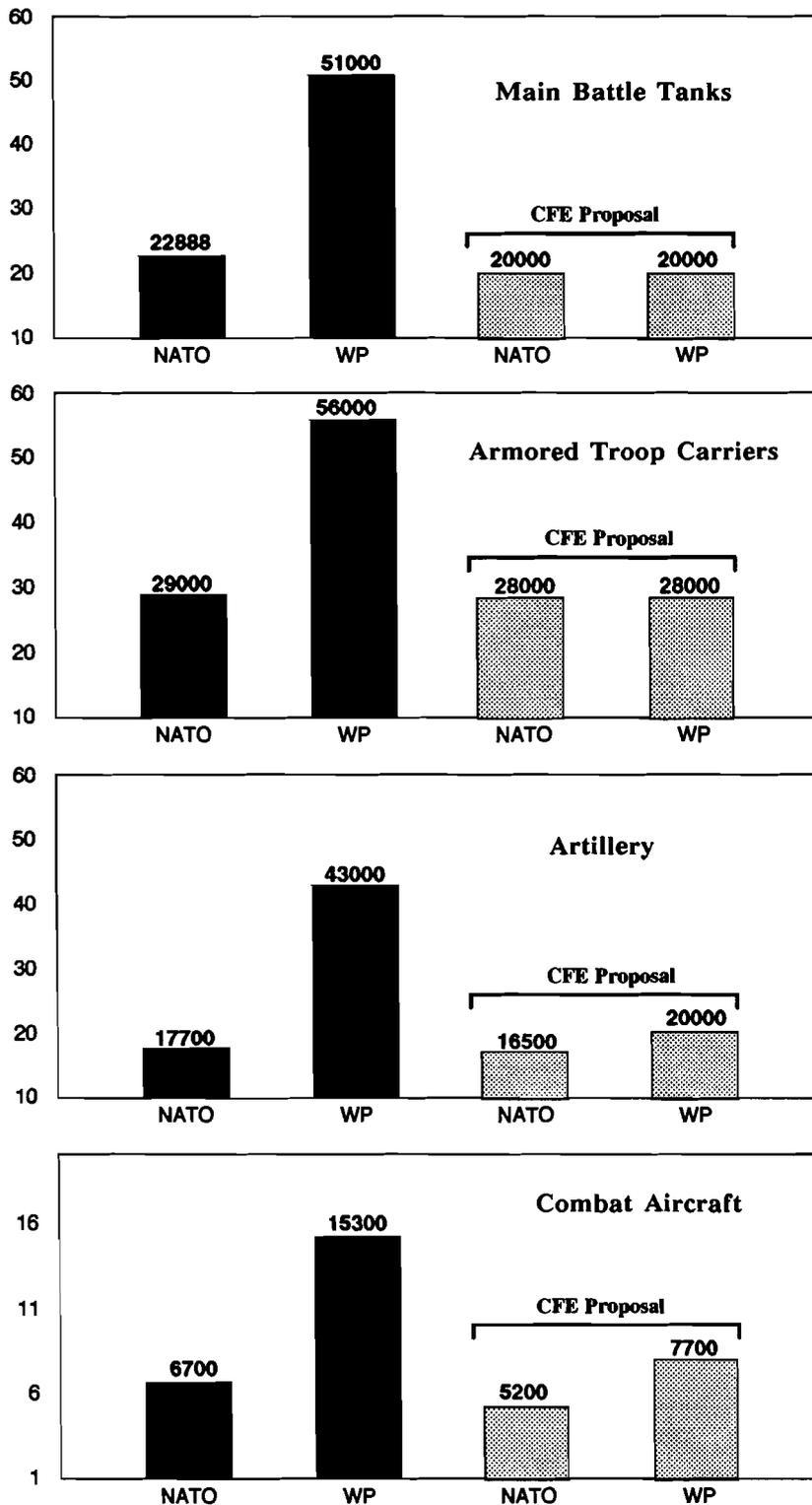
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***"They are terrific soldiers — superbly trained, well-equipped and motivated to excellence across the board."***

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# Conventional Force Reductions



## Can Air Defense Artillery Decide its Own Future?

by Maj. John Henry Hug

There is a long history of talking about conventional force reduction (CFE), but little action until recently. The negotiators met intermittently from 1973 to 1989 with little to show for their efforts. The process was revived somewhat when Soviet Premier Mikhail Gorbachev addressed the United Nations on Dec. 7, 1988.

During that address, Gorbachev announced a unilateral reduction amounting to about 10 percent of the Warsaw Pact forces. He announced that Soviet divisions would be reorganized to execute a "defensive" mission.

With such a backdrop to the opening of the CFE talks in March 1989, the Soviet Union clearly raised expectations. The initial proposals by both sides proved remarkably similar, although differences in weapon definition and counting procedures surfaced.

President Bush introduced a new proposal at the NATO summit in May 1989. He proposed cuts to NATO forces of 10 to 15 percent below current levels. The President also proposed to cut U.S. forces in Europe by 30,000, a 10-percent overall reduction in personnel and a 20-percent cut in combat forces. A recent proposal by Bush in January 1990 resulted in an agreement to limit U.S. and Soviet troop levels in Central Europe to 195,000 soldiers each. U.S. forces stationed on

the periphery of Central Europe would be limited to 30,000.

The most significant achievement to date has been Soviet acceptance of the concept of parity, despite their large numerical superiority in most systems. However, differences in each side's definitions and counting rules must still be negotiated. For example, the Soviets consider howitzers, guns, multiple launch rocket systems, mortars and anti-tank weapons as artillery, whereas the United States includes only the first three systems as artillery. There are also differences to be resolved in tank, armored combat vehicle, helicopter and aircraft definitions.

Aircraft reduction is the greatest area of contention. The Soviet Union has proposed a ceiling of 4,700 for combat aircraft and a separate ceiling for combat capable trainers and air defense interceptors. NATO, however, has proposed a limit of 4,700 combat aircraft and a separate ceiling of 500 air defense interceptors with the freedom to substitute multi-role aircraft. NATO has also agreed to exclude non-combat capable trainers.

Ground-based air defense systems are not subject to reductions stemming from CFE negotiations. Their purely defensive nature makes ADA systems a stabilizing influence in the prevention of surprise attacks. However, personnel reductions will affect the ADA force structure in Europe.

The overall reductions are further complicated by the concepts of "stationing" and "sufficiency." Stationing limits the total number of systems or forces that a country may locate on foreign territory. As shown, the NATO proposal considers only active units in its "stationed" limits, while the Warsaw Pact desires limits on both manned units and stored "stationed" equipment. "Sufficiency" limits the total treaty limited equipment (TLE) that any one nation can maintain



**Subzones have their own limits for tanks, artillery and armored personnel carriers.**

within the Atlantic to the Urals (ATTU) region. The Western proposal limits any one nation to 30 percent of the combined TLE totals in the ATTU.

Overlaid on the total limits are subzones, each with their own limits for tanks, artillery and armored combat vehicles. NATO has not proposed sublimits for helicopters and aircraft due to their mobility and range characteristics. This NATO proposal divides the ATTU into four zones. The Warsaw Pact has tabled two similar proposals, with three zones in each. Subzones are intended to decrease the size of forces close to the inter-German border and thus lessen the tensions in that area. This zonal arrangement would also serve to increase

the amount of warning before attack due to the need to bring additional forces forward to mount an offensive operation capable of achieving strategic objectives.

### **Equity Arguments**

While these proposals seem to have relatively little effect on Air Defense Artillery, underlying pressures will definitely produce some effect on the branch. "Equity" arguments at three levels will eventually influence the final force reduction decisions.

The first equity argument will come from the international level. Each of our NATO allies has stated a desire for a "fair share" of savings that come from force reductions. Using funds freed by military cut-

backs to cut taxes or to increase domestic investment is an attractive economic policy. The funds can also be used for the country's social programs, with the political benefit gained by the governing party.

Force reductions will solve serious demographic problems for our allies. For example, West Germany, like the United States, is experiencing a decline in the number of youths available for military service. Maintaining a large force becomes difficult under those circumstances.

Consequently, it appears that our allies will demand a proportional share of any cuts, while still requiring U.S. linkage to the security of Europe. In the long term, U.S. participation in the defense of Europe might be reduced even further by U.S. budget cuts.

The next equity argument will involve the services. Since the United States is a maritime power with global responsibilities and because CFE excludes naval forces, the Navy does not expect to reduce forces except for land-based maritime patrol aircraft. Moreover, the Navy could argue an increased mission responsibility to protect sea lines of communication vital to the U.S. reinforcement of Europe.

However, the Air Force *will* reduce forces. Like the Navy, they will argue for increased strategic lift capability to transport reinforcement forces to Europe during crises or war. Army competition for limited resources must depend on clear and compelling arguments to offset the strength of both the Navy and Air Force positions.

Finally, equity arguments will arise within the Army. Even though tanks, artillery and armored troop carriers are the prime targets for CFE reduction, other branches will most likely experience some cuts to keep the force structure "balanced." Internal lobbying can be expected to be intense as decision-makers determine the value of each

weapon system. Air Defense Artillery must compete in this constrained environment and justify air defense needs.

The U.S. political process is another factor that will influence CFE. When the public perceives a decrease in the Soviet threat, cut-backs in the defense budget beyond those implemented as a direct result of the CFE process are inevitable. The temptation to use defense savings for social programs and deficit reduction (the "peace dividend") could result in even larger force reductions than required by CFE.

### ***Air Defense Artillery must compete in this constrained environment and justify air defense needs.***

The restructuring in Europe will allow the United States an opportunity to review its role as leader of the Free World. As the Warsaw Pact threat lessens, U.S. concerns with the security of other areas of the world should receive more attention. From a military viewpoint, the emphasis will shift to contingency operations. Indeed, CFE will result in the European theater assuming more contingency theater characteristics.

### **Contingency Operations**

Operations in other theaters present a different set of problems: long-range firepower is no longer the luxury of the superpowers. While the threat may field fewer forces and advanced equipment, foreign military sales can place sophisticated armament in otherwise underdeveloped countries. Tactical ballistic missile capability is only one example of that trend.

Air Defense Artillery's role in

contingency operations has always been a major challenge. Planning to meet all contingencies with a reduced force structure is a difficult process. Strategic transport also limits the amount and size of equipment that can be deployed rapidly into a contingency theater. Meeting these challenges will be another primary task for Air Defense Artillery in the post-CFE environment.

With the likelihood of conflict receding in the European theater, the U.S. Army can at last place deserved emphasis on the ability to fight contingency operations such as Operation Desert Shield, the ongoing defense of Saudi Arabia. Such operations can feature a variety of threat forces, levels of conflict differing from mature theater operations and the joint nature of fighting in a contingency theater.

*Third World Threat.* With the wide range of possible contingency scenarios for the employment of Army forces comes an equally diverse threat. While the quantity and quality of the enemy's armed forces can vary widely, recent trends show many Third World countries buying state-of-the-art missiles and aircraft weaponry in significant quantities.

For example, at least 30 countries now have tactical ballistic missiles (TBMs). Countries as diverse as China and Argentina already manufacture their own TBMs. Coupled with a proliferation of chemical warheads and a decreasing inhibition against using them (as shown in the Iran-Iraq conflict), this TBM capability presents a contingency force commander with a clear and compelling threat. Many Third World countries might consider investments in chemical TBMs a "cheap" deterrent against superpower intervention.

Weapon quality in the Third World armed forces will increase with reductions in superpower arsenals. Foreign military sales of advanced aircraft and missile

systems will accelerate. Both the United States and the Soviet Union will sell excess aircraft to countries with capital reserves and the national desire for increased prestige. In addition to defense against such long-range firepower, contingency force commanders must cope with problems of aircraft identification when both sides use similar or identical aircraft.

**Phases.** The predominant characteristic of contingency theater operations is the fundamental requirement to introduce the forces into the theater. Comprehensive planning is essential to produce a smooth predeployment phase. Such planning must consider the requirement for air defense in mission accomplishment, the deployability of air defense forces and the sustaining of those forces.

The deployment phase must deliver the forces into the theater while providing protection during the operation. ADA forces must be a part of the initial forward deployments and debark ready to fight. Light weight, portability and lethality against both TBMs and air-breathing threat aircraft are essential characteristics of that force.

The sustaining base is most vulnerable during the lodgement process. Successful enemy air and missile attacks against that base could cripple operational plans at an early stage. The early deployment of the 11th Air Defense Artillery Brigade during Operation Desert Shield dramatically illustrates the Army's awareness that Air Defense Artillery is especially critical for defense of the sustaining base and the safeguarding of the future offensive operations dependent on that base.

The employment phase presents the contingency force commander with a variety of air defense situations. Potentially, not only must he defend maneuver forces over long distances, but he must also provide protection for advanced operating

bases, critical airfields and sustaining bases. Air defense capabilities against all aircraft at any altitude is needed. Also, sustaining of the air defense force is a necessity.

The transition to a mature theater or withdrawal from the theater concludes the operation. Air defense must still protect the force during this phase. The success of the earlier phases will determine the level of air defense required.

**Joint Aspects.** Many of the joint problems a mature theater com-

### ***Air Defense Artillery must be a part of the initial forward deployment and debark ready to fight.***

mander faces are also certain to be present in the type of contingency operations that promise to dominate the future of our Army. However, the distances, compressed time frames and variety of geographic areas make such joint operations even more challenging. Air Defense Artillery will likely integrate with a combination of Air Force, Navy and/or Marine Corps forces in a given contingency theater. The *ad hoc* nature of arrangements and large corps areas require flexible, long-range communications equipment.

Air Defense Artillery participates in a variety of joint functions. The joint nature of the defensive counterair mission is well covered in the ADA operational concept. Close cooperation with the Air Force and the air components of the Navy and Marine Corps must be assured for success in that mission.

Other joint functions also require ADA participation. The active defensive portion of tactical missile defense is clearly an ADA mission,

but Air Defense Artillery can also provide computed launch point data useful in counter-launch operations. Air Defense Artillery must participate in airspace management with the other services.

### **The Changing Army**

One probable result of CFE will be a further shifting of the posture of the U.S. Army from forward deployed forces to CONUS-based forces. Such forces must fulfill contingency missions, whether in reinforcement to Europe or in a Third World region. What must the Army do to fulfill these missions?

In the near term, the Army must follow the Army chief of staff's commitment to balance heavy, light and special operations forces. The experiments in the 1980s with the motorized division validated the need for heavy forces in contingency missions against a heavily armored force. Increasing the strategic deployability of such heavy forces becomes a priority issue.

Expanding the pre-positioned organizational material configured in unit sets (POMCUS) concept to other strategic areas of the world would alleviate some heavy force deployability problems. Procuring additional fast sealift assets would also help. A combination of these approaches coupled with the use of strategic airlift could emerge as the objective solution.

In the far term, the Army must evolve into a lighter, more deployable force while maintaining the necessary firepower and survivability. In the past, increased capabilities in firepower and survivability were at the expense of weight and size.

The future Army must leverage technology and produce forces better suited to the various reinforcement missions.

For example, survivability improvements in the past have relied upon increased armor protection.



***Patriot is effective against aircraft over long campaigns and during intense attacks.***

Yet survivability can be enhanced by reduced size and increased agility, rather than by just adding more armor. The F-16 does well in air battles because it is small and difficult to acquire. The Army must embrace this philosophy in the future.

Similarly, the logistics system must provide the essential resupply in a timely manner. However, we must shift our priority from the idea that the "tail" determines the size of the "teeth" to the idea that the "teeth" take along only a minimal amount of "tail." One logistics solution is reliability, which allows a reduced "tail." Greater reliability would help sustain acceptable operational availability.

The ADA doctrinal emphasis must also shift. The operational nature of campaign planning must receive greater attention. Meeting engagements will become the normally anticipated form of battle, both in

Europe and in contingency theaters. Research into future doctrine supports that trend.

An analysis of each contingency mission should produce a minimal force package balanced against each required battlefield function. To minimize the forces required, interservice cooperation must increase. Joint and allied training can increase the effectiveness of those force packages.

The reorientation to contingency forces, along with force structure cuts, will increase the pressure to complete modernization programs. Any weapon system needing modernization must show its increased mission effectiveness with respect to strategic mobility and decreased manning.

How does Air Defense Artillery support an Army changing as a result of force reductions and other national pressures?

In terms of firepower, the present Patriot system is effective against aircraft over both long campaign periods and during intense raids. Patriot's ability to counter a saturation tactical missile attack, however, needs improvement. Improvements in low- to medium-altitude air defense firepower are also needed. The forward area air defense (FAAD) systems provide a great increase in firepower available to protect the maneuver force, as well as the ability to strike targets previously unreachable.

Mobility addresses both the ability to reach favorable firing positions and the ability to maintain coverage of a maneuver force. The Patriot's long range supports force coverage well, but equipment size and technical requirements limit movement and possible firing locations.

Improvements for Hawk will increase mobility, yet the system will still have difficulty supporting highly mobile warfare. Only FAAD systems have the necessary mobility to cover a heavy maneuver force.

With the Army shrinking, force structure becomes a critical characteristic. Yet the need for continuous operations in ADA units requires a certain minimum number of assigned personnel. The greatest savings in personnel will likely come in logistics and maintenance with continued improvements in system reliability.

### **Firepower Issues**

The ability to deliver huge amounts of accurate firepower on the enemy is key to success on the modern battlefield. For Air Defense Artillery, firepower requirements translate into the ability to defeat massed air raids, cruise missiles, jammers and tactical missiles. Some characteristics of systems that relate to firepower include the number of missiles in the unit uploaded at any one time and in the air at any

## Battery Firepower Ratios

	Patriot (8 launchers)	Hawk (8 launchers)	FAAD (8 ADATS) (6 NLOS)	Avenger (36 PMS)
<b>Basic load</b>	64	36	128/144	576
<b>Missiles</b>	32	18	64/72	288
<b>Missiles in air simultaneously</b>	9	2	8/12	72
<b>Manpower</b>	88	125	113	144
<b>(A) Total missiles per man</b>	0.72	0.28	2.40	4
<b>(B) Available missiles per man</b>	0.36	0.14	1.20	2
<b>(C) Missiles in air per man</b>	0.10	0.02	0.17	0.50

given moment. Those firepower characteristics, along with the total number of personnel in the ADA unit, are shown in the firepower chart above.

Measures of effectiveness in the three shaded rows give rough estimates of the firepower to manpower ratio of each air defense system. Figures in Row A provide a measure of sustained effectiveness. Figures in Row B look at each system against a raid that would not allow reload time. Figures in Row C consider the most stressing situation, when aircraft arrive simultaneously.

Several conclusions are possible if the foregoing measures are adopted. For ADA systems to handle the high- to medium-altitude threat, it appears that Patriot enjoys a large advantage over Hawk. For a large raid over a short period of time, Patriot has a missile-per-man availability ratio more than twice that of Hawk. On near simulta-

neous arrival of aircraft, Patriot can keep approximately five times more missiles in the air than Hawk. However, the figures do not consider planned improvements to the Hawk system, which will help to narrow the difference.

Besides greater system capabilities, Patriot delivers more firepower for each personnel slot than Hawk. With system improvements, Hawk could approach Patriot firepower by adding more launchers, but the improvement would not be dramatic since additional launchers would require more personnel. It is clear that Patriot provides much greater firepower than Hawk when considering the personnel investment involved. However, Hawk provides advantages in mobility and deployability.

Another firepower issue is the ability to deal with massed TBM strikes. Patriot is presently the only system capable of defense against

TBMs. However, with only four missiles on each launcher, the near simultaneous arrival of multiple TBMs coupled with the requirement to successfully counter chemical warheads requires a large number of launchers. One possible solution is development of a single function missile with only anti-TBM capabilities. Without a need to counter evasive maneuvers, the missile can be smaller and more missiles can fit on a launch platform. The new missile could also provide area defense against TBMs.

FAAD has an even greater requirement for a high firepower to manpower ratio. Due to the systems' shorter ranges and need to support the maneuver forces during the early stages of the lodgement process, FAAD must provide a large payoff in firepower for every man on the ground. Avenger units have the advantage in this area. All of the measures of effectiveness fa-

vor early deployment of the Avenger battery over the ADATS and NLOS batteries in a contingency theater. However, the complementary capabilities of each FAAD component make eventual deployment essential to our mission.

Since the smaller Army will be required to fight effectively throughout a large theater, all weapon systems must be highly mobile. The mobility requirements have several aspects. All systems must use positions that maximize their effectiveness.

For air defense systems, that means site requirements must not be so restrictive as to deny them use of effective positions. The requirements must also make enemy templating of possible locations difficult. The capability for airmobile movement must also exist to give the force necessary agility and range. The individual fire units of ADA batteries supporting maneuver forces must be mobile enough to maintain their coverage.

The FAAD components have most of the required mobility. ADATS can cover the heavy maneuver force in a high threat environment. NLOS and Avenger are small and airmobile, with very short emplacement and displacement times.

High- to medium-altitude (HIMAD) systems are much less mobile. Patriot's size, vehicle ground pressures and site requirements constrain its possible firing locations.

Some planned improvements will decrease the battery signature by providing greater dispersion of fire unit components. The great range of the system, however, lessens the requirements for keeping up with the supported force's movement.

Hawk is airmobile via CH-47, but requires 15 lifts to move an assault fire platoon (AFP). The site requirements for Hawk are also much less stringent than the Patriot site

requirements. The need to remove missiles from the launchers before movement slows displacement, but improvements are planned in this area. The Hawk unit location signature is decreasing due to upgrades being fielded or planned. The frequent moves and limited numbers of AFPs also hamper Hawk in the support of corps operations.

Air Defense Artillery has the mobility to support the changing Army. Its greatest need is at the corps level where no ADA assets exist that can provide HIMAD coverage while fol-

### ***We must explore all air defense systems for potential manpower savings.***

lowing forces through deep battle maneuvers.

With more emphasis on reinforcement to mature and contingency theaters, ADA systems must deploy with forces they support. Although HIMAD system lift requirements are still extensive, the present systems have improved. But ADA systems have always proved bulky and not amenable to air transport in a small number of lifts. A Patriot or Hawk battery requires numerous lifts. This includes very scarce C-5 assets for essential Patriot battery elements. Fielding C-17 aircraft would help alleviate this problem, but there are still many weapon systems competing for aircraft space. Prepositioning equipment has proven workable in Europe and should be used in other locations. A smaller Patriot missile to handle the TBM threat would increase strategic deployability.

ADATS requires a large number of lifts and specialized aircraft. Yet

ADATS was designed for the support of heavy maneuver forces, which command even greater lift requirements. So ADATS' deployability problems are best solved by keeping the ADATS at the same location as the heavy maneuver force.

Fast sealift is a transport means that lessens the importance of weight and size restrictions. Given enough warning time and port facilities, this option deserves serious attention in contingency planning.

### **Force Structure**

Cutting manpower requirements will be essential. In the earlier discussion on firepower, the amount of firepower per man was one measure of effectiveness. Is it possible to increase that ratio by cutting the number of personnel?

Patriot is not a good candidate for such cuts. While technology might allow some personnel savings, the need for local security remains. Security measures in Patriot units exceed the manpower available. However, the location of Patriot units, normally in the corps rear or echelon above corps, allows for the use of host nation security forces.

Planned upgrades to Hawk should result in manpower savings. Further analysis can determine which improvements bring the largest increase in effectiveness to manpower ratio. For example, redesign of the launcher to carry the missile during movement could provide significant manpower savings while increasing fire unit effectiveness.

The FAAD components all operate with a two- or three-soldier crew. It is difficult to believe that those numbers could decrease, especially when sustaining the systems throughout a campaign.

We must explore all air defense systems for potential manpower savings. As technology improves each system, most manpower savings will probably occur in the support system, rather than the actual opera-

tors. The pressing need for security and other unit operations in combat environments will dictate a minimum size for fire units.

The interoperability issue can yield large rewards, yet requires the greatest amount of coordination and perseverance before producing results. The changing Army environment throughout the world makes increased interoperability an essential component for military success. CFE and deployment constraints will limit the amount of Army air defense artillery available in any theater. Such limitations require full planning and cooperation with the other services for accomplishment of the mission.

Command and control elements should be the focus for interoperability efforts. Each ADA battalion should have set procedures in place for linking to the other services' counterair headquarters. Communications equipment should be compatible and redundant.

Interoperability in both joint and combined operations is a valuable force multiplier. Improvements in this area require close coordination, but are necessary during this period of force reductions.

For Air Defense Artillery to successfully perform its mission in the changing Army, a detailed analysis for each contingency mission is essential. The force commander must analyze the expected threat in each operations plan and determine the air defense requirement. With conventional force reductions, some battalions might lose batteries to maintain the required level of air defense in other theaters. Commanders must identify the missions that reserve units can meet and allocate active duty units to the more time-sensitive missions.

Each CINC's OPLAN would match an air defense force to the required air defense capability. Redistribution of the ADA force structure to the areas of greatest concern

is one solution. Use of force packaging from the corps ADA brigades is another way of tailoring the force to the mission.

Although Europe may take on more of the characteristics of a contingency theater, it will still retain many of the attributes of a mature theater. Specifically, the combination of a still formidable threat, the crucial nature of our European allies and historical perspective would make the European theater a critical one. Forward deployment of some U.S. forces is likely to contin-

### ***One result of CFE negotiations has been recognition of the 'special' status of Air Defense Artillery.***

ue, at least for the near-term. If the troops remain, air defense coverage of their positions and sustaining base must continue. The reduction in U.S. combat aircraft will also affect post-CFE NATO. The Air Force might argue for a greater emphasis on missions that reflect their range and flexibility attributes. For example, one likely reduction scenario would require negligible cuts in theater nuclear, interdiction and offensive counterair mission capabilities, making the close air support and defensive counterair mission prime candidates for reduction.

Since U.S. reinforcement operations will become more important, CFE increases the importance of the infrastructure supporting such operations. In particular, the aerial ports of debarkation (APODs), sea ports of debarkation (SPODs) and POMCUS sites play a critical role in the defense of NATO. CFE lessens the threat of a surprise ground attack, yet APODs, SPODs and

POMCUS sites remain vulnerable to preemptive air attacks. Moreover, the static nature and "softness" of those assets makes them ideal targets for air and missile attack. Air defense protection of these assets is essential.

One result of CFE negotiations has been recognition of the "special" nature of Air Defense Artillery. Both sides consider air defense systems "defensive" and, therefore, not treaty-limited items (TLI). This supports the CFE mandate to eliminate the capability for surprise attacks, since aircraft and missiles have historically been the key to successful surprise attacks. Recent Soviet increases in air defense force structure at the tactical levels emphasize their belief that such systems will not face reductions as well as their confidence in their utility as protection against surprise attack.

*Strategic Implications.* The first contention is that ADA's role in Europe must shift from a purely operational level concern to one with strategic implications. With the U.S. strategic objective of maintaining a network of strong and effective allies in Europe, reduction of forces there causes our strategy to be increasingly dependent on our ability to reinforce rapidly. Yet, as mentioned earlier, Soviet air and missile forces threaten that ability. So a strategic interest depends upon successful air defense of that means of reinforcement.

Two areas of strategic concern are the protection of reinforcement mechanisms and strategic warning. APODs and SPODs are critical nodes that enable reinforcement of the theater. A Government Accounting Office report in December 1988 stated that "air and sea terminals are poorly protected against aircraft, missile and *spetsnaz* attack" and that "POMCUS sites are vulnerable to preemptive attack."

What else can we predict about the U.S. position in a post-CFE

NATO? Reductions will "thin" the forces in our national zone. Since all nations may not have equitable reductions, changes in national responsibilities could also be significant. Consequently, there may be less force to defend the total area.

The Soviets, however, will still retain their inherent advantage of land transportation networks for reinforcement. The combination of lower U.S. force density and Soviet reinforcement advantages will increase the importance of U.S. reinforcement operations. That effect is somewhat balanced by the expected increase in warning time before a Soviet attack.

The present concept for echelon above corps (EAC) air defense does not provide complete coverage for APODs and SPODs. Instead, NATO employs an area air defense concept in Germany. APODs and SPODs are protected by attrition of enemy aircraft as they overfly ground-based air defense or are engaged by NATO air defense interceptor aircraft. If aircraft bypass (via sea approaches) or overwhelm the defenses, the critical APODs and SPODs are at great risk.

From a strategic standpoint, deterrence of the Soviets in Europe depends upon a robust and reliable reinforcement scheme. Analysis conducted in support of the CFE negotiations shows that NATO defense after CFE is as effective as before reductions if reinforcements arrive on schedule. The Concepts Analysis Agency studies show the same results, although the stability of the situation does allow some moderate loss of reinforcements without dire consequences. A key finding is that effective air defense of those reinforcement mechanisms is vital.

What can Air Defense Artillery do to protect the vital APODs and SPODs? One solution requires restructuring of EAC ADA in Europe to provide point defense of those

critical assets. While the density of air defense forward in Europe decreases under this proposal, the scarce ADA fire units deploy where they are most needed. The deterrence provided by such air defense would contribute directly to U.S. and European strategy.

*Strategic Warning.* One anticipated result of a CFE agreement is increased early warning as the density of troops and offensive equipment in Europe decreases. NATO will have early warning of a ground attack due to the Soviet Union's re-

### **32nd AADCOR Patriots supply Europe's only anti-TBM capability.**

quirement to mobilize a force large enough to seize strategic objectives.

Warning time decreases, however, when air assets lead the attack. Air forces can mass very quickly over great distances. The prudent Soviet planner would precede a coordinated air and ground campaign with a surprise aerial attack to deprive NATO of its early warning and reinforcement capability.

A robust and reliable early warning network is essential for the defense of Europe. Planners must consider degradation of the joint and combined network and determine the necessary measures to ensure its continuous operation. Providing assured strategic early warning of the greatest threat to our APODs and SPODs is a critical task.

Another concern is the extensive role played by national technical means in the verification of CFE treaty compliance. The Soviets possess a co-orbital anti-satellite (ASAT) capability unmatched by the United States. Deterrence of

Soviet use of their ASAT is presently non-existent. Protection of our national technical means is dependent upon Soviet goodwill and restraint.

The ADA School is the Army proponent for the kinetic energy (KE) ASAT weapon system. Protection of our national technical means through the deterrence value of a U.S. ASAT capability is a primary reason for that weapon system. The United States must not allow hostile nations to gain control of space. We need ASAT to ensure treaty verification and protect strategic early warning assets.

*Operational Implications.* Operational implications related to Air Defense Artillery include countering TBMs, the future of the 32nd Army Air Defense Command (AADCOR) and Air Defense Artillery's relationship with the Air Force.

Warsaw Pact TBMs are not subject to negotiation in the present CFE talks, although they will probably be the subject of follow-on short-range nuclear force (SNF) negotiations. In any case, the intermediate nuclear force (INF) treaty reductions and expected decreases in NATO combat aircraft will reduce the number of priority TBM targets. High-value assets in the corps rear are now higher priority TBM targets for the Soviets. At the same time that negotiated reductions will be reducing the target set, the Soviets will continue to improve the accuracy of their TBM force. The result will be a more lethal TBM threat with possible targeting of NATO assets at the corps level.

Defense against TBMs fails to keep pace with the threat. Patriot is the only NATO weapon system with anti-TBM capability. Planned improvements to Patriot will increase that capability. Currently, positioning of Patriot systems is inconsistent with the requirement for the defended assets to be within the

small Patriot anti-TBM footprint. Resolution of this problem should consider possible redeployment of Patriot for protection of extremely critical assets against TBM attack. Additionally, since Air Defense Artillery is responsible for the missile defense capability package, a broader area requiring resolution is counterfire against the TBM infrastructure. That capability requires close integration with intelligence and indirect fire support means. Destruction of the TBM before launch is one solution to possible enemy saturation tactics.

As part of the NATO integrated air defense system, 32nd AADC-OM must review its roles in Europe as Soviet air forces withdraw from their forward air bases in Eastern Europe. In particular, the threat of massive air attacks deep into NATO's rear with little warning has decreased as the ranges increase with Soviet withdrawal.

The need to defend critical static assets at EAC has not changed. Instead, the location of those assets at risk will change as the Soviet forces withdraw from Warsaw Pact countries. The defended assets at EAC still require protection in the near-term, but the identity and location of assets needing defense will change in the mid- and long-terms.

Wherever the location of NATO critical assets, the HIMAD units of the 32nd AADC-OM must be available to counter the massing of aircraft against those assets at EAC. While massive Soviet air operations might no longer be possible, the threat will still have the advantages of shorter range (consider refueling), mobility and initiative against a given target.

Despite the INF treaty and expected withdrawal of Soviet TBM units from eastern Europe, the Soviet Union will still possess the greatest TBM force in the world. While many targets in NATO will now be beyond the Soviet TBM

range, other assets and troop concentrations are still vulnerable. For the near term, 32nd AADC-OM's Patriot units provide the only active anti-TBM capability in Europe.

Other arguments favor the present forward deployment of 32nd AADC-OM. For the near-term, the size of Patriot and Hawk equipment prevents large-scale air deployment. Response by fast sealift might be too slow for air defense. The enemy might launch preemptive air attacks

### ***32nd AADC-OM is a critical component in USAF Europe's counterair operation.***

with little warning. The best way to counter that problem is with forces in place.

32nd AADC-OM also plays an essential role in the Army's counterair concept and AirLand Battle doctrine. Even though the present organization of U.S. HIMAD units does not have them directly accountable to maneuver commanders, the ability to support maneuver is retained.

The freedom to maneuver is critical to AirLand Battle doctrine. The Patriot and Hawk units in 32nd AADC-OM must prevent the enemy from exploiting the medium- and high-altitude regions for air attack against such maneuver.

32nd AADC-OM's continued existence is a critical component in USAF Europe's counterair operation. Any assistance that Army air defense can provide in the counterair effort would free dual purpose aircraft for other roles, such as interdiction. Studies show that the sustainability inherent in ground-based air defense meshes well with

the quick response and massing characteristics of an air force.

32nd AADC-OM should remain in Europe. The Soviet Union possesses a large and modern air and TBM threat, fully capable of threatening portions of Europe. HIMAD coverage protects maneuver forces under AirLand Battle doctrine. The cooperation and coordination with the Air Force and allies for air defense is an important force multiplier that cannot be easily replaced.

The counterair mission area at the operational level is inherently a joint endeavor. Since the CFE treaty will reduce the number of combat aircraft in Europe, accomplishing the counterair mission will become more challenging. An earlier discussion raised the possibility that the apportionment of Air Force Defensive Counterair (DCA) aircraft would decrease as a result of CFE.

One possible solution poses the use of joint engagement zones, where both missile units and combat air patrol (CAP) aircraft engage enemy targets in the same airspace. Airspace control measures might also prove a cost-effective means of recovering some DCA mission capabilities. With the air defense in the theater becoming more sparse, the use of airspace control measures must accommodate air assets' requirement for greater freedom to maneuver.

Emerging improvements in positive identification technology suggest another area that could greatly assist the counterair mission. By being able to positively identify friends and hostiles at extended ranges, ADA fire units can unleash the full capabilities of their missile systems.

Air Defense Artillery must coordinate closely with the Air Force on their expected reactions to CFE reductions. If the Air Force decides that a greater proportion of the DCA mission must now be borne by the Air Defense Artillery, the

branch has a strong argument for retention of fire units in Europe.

*Tactical Implications.* Since CFE will cut the number of tanks, artillery and armored troop carriers, the divisions in Europe will feel the greatest effects. The associated FAAD battalions could face withdrawal from Europe (with or without POMCUS of their equipment) or a realignment of their mission. What factors should determine the future use of those units?

FAAD units in the European theater must support AirLand Battle doctrine and the supporting counterair concept. Maintaining freedom to maneuver for the combined arms team is a key to that doctrine. To ensure that freedom to maneuver, Air Defense Artillery must provide coverage at all altitudes and throughout all force echelons.

FAAD contributes greatly to the counterair mission and can defeat the threat posed by Soviet aircraft. The FAAD contribution is essential not only for protection of defended maneuver units, but also for the sizeable attrition FAAD units can inflict on transiting aircraft targeted against EAC assets.

Other factors, beyond mission accomplishment and training, do have some impact. Personnel cuts imposed by a CFE treaty might have an indirect effect. Similarly, a re-orientation of the force to contingency operations might require restructuring. And limits on the nation's strategic deployability assets may limit FAAD options. With these considerations in mind, what becomes of FAAD units if their parent brigades or divisions are withdrawn from Europe?

The best alternative means stationing FAAD units in Europe. To defend maneuver units against the range and mobility of a modern air force requires in-place ADA fire units. Deployment of such units from CONUS in the face of a preemptive air attack is problematic, considering the size of the fire units and scarcity of lift assets. Training is a strong argument for this alternative, since the fire units would train *where* they would fight.

Control of those "orphaned" FAAD units should reside at the corps ADA brigade level. Under AirLand Battle doctrine, the corps commander is the transition point from the operational level of war to the tactical level. The corps commander must have the means of controlling the airspace, defending key critical assets in the corps zone and bolstering the air defense in critical divisional areas. The additional FAAD units would directly support these objectives.

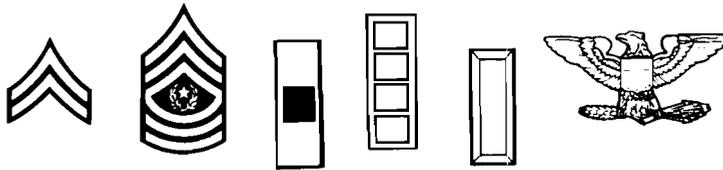
This alternative supports AirLand Battle by placing the available assets at the corps level where they can fulfill the corps commander's priorities. The flexibility gained best accomplishes the counterair mission in Europe.

The implications for Air Defense Artillery in NATO after CFE seem clear. The changes in Europe, massive and unexpected, make future planning a very difficult process. To bring order to the planning process, we must discard the old mindset and replace it with a flexible and realistic approach in line with the changing world. Only with such changes can Air Defense Artillery realistically and effectively influence its future.

**Maj. John Henry Hug's** article was adapted from a white paper titled "Air Defense Artillery and Conventional Force Reductions" that was presented at the 1990 Air Defense Artillery Commanders Conference.



**Avenger enhances Stinger's effectiveness within a strategically deployable and tactically mobile platform for contingency theater operations.**



## CAREER NEWS

### Army Replaces SQTs

The Army has decided to replace the skill qualification test (SQT), which has long served the Army as a yardstick of professional development, with a newly designed self-development test (SDT). The Army decided to replace the SQT because the purposes for which the SQT was created — the training and development of our soldiers and NCOs — are now being more effectively accomplished by an NCO Corps that ranks as the best in our nation's history. Our NCOs know how to train our soldiers, and they understand the vital link between soldier training and unit tasks in their training programs.

In place of the SQT, the Army will establish a series of NCO SDTs so that NCOs can measure and guide the growth of their professional competence — the skills and proficiencies our sergeants will need as they continue to develop as leaders.

The SDT will be a formally administered written test of military occupational skills (MOSSs), training expertise and leadership knowledge. Most of the questions will come from soldier's manuals. The leadership competencies outlined in the NCO leader development action plan will be the basis for the leadership portion of each SDT.

Preparing for the SDT will be a soldier's personal responsibility. To do well on the new test, soldiers will have to study training reference material that will be made available throughout the Army.

After full implementation, the SDT will become one of the key factors in determining NCO promotions, assignments, school selection and retention. The new professional development test will also be linked to the NCO Education System and may become a prerequisite for attendance to the Basic NCO Course and Advanced NCO Course, as well as a diagnostic test to assist school commandants and command sergeants major in assessing the leadership skills of incoming students.

The U.S. Army Training and Doctrine Command will develop the SDTs and administer them under the guidelines of the existing training standards structure. Each MOS will have three tests: one for sergeants, staff sergeants and sergeants first class. Active Army NCOs will take the SDT annually while their counterparts in the Reserve Component will take it every two years.

The following milestones should serve as guidelines for planning as SDT transition and implementation plans are developed.

SQTs for privates, privates first class and specialists or corporals will be eliminated at the end of the current test cycle. That's Nov. 30, 1990, for the Active Army and Aug. 31, 1991, for the Reserve Component.

We will continue to administer SQTs for sergeants through sergeants first class in each MOS and grade until the corresponding SDTs are implemented. As a planning goal, SDTs should be fully implemented throughout the Active Army by Oct. 1, 1991, and throughout the Reserve Component by Oct. 1, 1992.

Individual proficiency at every level remains fundamental to the development of leaders throughout our ranks. Since the new SDTs will place a premium on individual initiative and personal effort, it is still up to the individual soldier to take charge of his career, and it is up to senior NCOs to motivate junior NCOs to put in the hours necessary to prepare for the new professional development test.

The Army's renewed emphasis on the NCO as the trainer of our soldiers and the inauguration of the SDT will help ensure that our quality soldiers develop into NCOs of unparalleled professionalism and that they sustain the high level of performance that has made today's Army the finest peacetime force the nation has ever fielded.

— CSM Robert W. Harman

## CAREER NEWS

### ADA NCOs Produce Promotion Guides

The climb up the promotion staircase is a tough one, but two recently published promotion guides can help enlisted personnel make it to the top.

Believe it or not, the average soldier doesn't know how to get promoted. So says MSgt. Wilson L. Walker (U.S. Army retired) of Killeen, Texas. That's the reason the former ADA NCO wrote *How You Can Get Promoted (During Troop Cuts)*.

"I wrote it to help soldiers," Walker said. "Most soldiers don't know about promotions even though they have AR 600-200."

His self-help book, designed for enlisted soldiers, is a step-by-step guide to promotion that gives pointers on everything from how to polish boots to how soldiers should conduct themselves when they go before promotion boards.

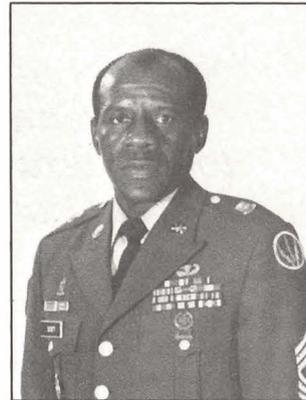
Walker got the inspiration for his book from working with junior NCOs as a platoon sergeant and first sergeant. "Too many good NCOs weren't getting promoted because they didn't know how to 'package' themselves for the promotion board," he recalls.

"I know the advice I put in the book works," said Walker, "because I gave the same advice to soldiers when I was a platoon sergeant and first sergeant. One of my soldiers, who was about to go before the board, came to me for help. She maxed the board. Another soldier I helped walked away from the board only three points away from maxing it. I helped one nervous soldier prepare for the board. It took months to train him. He didn't max the board, but he was promoted three months later."

*How You Can Get Promoted* is a best seller at the Fort Hood Post Exchange where the Army and Air Force Exchange System is giving it a marketing tryout before deciding whether or not to place it in PXs around the world. The book, meanwhile, benefits from excellent word-of-mouth endorsements. B.W. Coleman, who administers the NCO Education System at the U.S. Army Air Defense Artillery School, Fort Bliss, Texas, said "it's like a promotion digest; everything under one cover." Air Defense Artillery's command sergeant major, CSM Robert W. Harman, heartily recommends the book: "It's what every career soldier should know: how to enhance one's career and make it to the top."



Walker



Scott

In El Paso, the book is available at the CBD Book Store in Capistrano Shopping Mall on Lee Trevino. Soldiers can also order the book from G.A.W. Marketing, 2306 Shoemaker Drive, Killeen, Texas 76543. The price is \$9.95.

As a companion to Walker's book, ADA soldiers will want a copy of the *Air Defense Artillery Enlisted Professional Development Guide*. Produced by the Office, Chief of Air Defense Artillery (OCADA), U.S. Army Air Defense Artillery School, the guide is largely the work of SGM John H. Scott.

The guide, specifically tailored to ADA enlisted soldiers, is a concise but thorough guide to promotion. Though written in a less inspirational style than Walker's book, it, too, covers all the bases. The ADA promotion handbook also contains helpful ADA career progression charts and excellent ADA MOS authorized/operational strength graphics that give ADA soldiers a clear view of their competition.

"The guide contains everything the ADA soldier needs to know to get promoted," Scott said. "It's something the branch has needed for a long time. Work had started on the guide before I arrived at OCADA," said Scott, "but the soldiers working on the project had been reassigned. I had the opportunity and the help I needed to see the project through to the end."

Copies of the *Air Defense Artillery Enlisted Professional Development Guide* are being mailed to ADA brigades and battalions for free distribution to ADA soldiers.

# Seaborne Chaparral

*Soldiers of the 1-2nd ADA sealift their Chaparrals from Georgia to the Texas Gulf Coast in a dress rehearsal for contingency combat operations*

by Hubert L. Koker

**T**he ADA battalion commander couldn't conceive of any contingency mission that would railroad his corps Chaparral unit into battle. And the competition for scarce space aboard the huge C-5A Galaxies, he figured, ruled out an airlift. If they went to war, he knew they'd most likely go by sea. So when his request to sealift rather than rail transport his battalion to Exercise Roving Sands '90 was approved, he realized his soldiers had been granted a precious opportunity to practice a wartime-type deployment in peacetime.

As Operation Desert Shield progresses, many units are reporting delays due to unforeseen problems on the debarkation docks. Should the 1-2nd ADA receive orders to follow other 11th ADA Brigade units to Saudi Arabia, its soldiers will be among the few who have practiced an actual sealift operation.

Most Forces Command units list movement by sea as one of their mission-essential tasks; however, few get a chance to practice it. Even then movement-by-sea plans usually end at the port of embarkation. However, the 1st Battalion, 2nd Air Defense Artillery (Chaparral), Fort

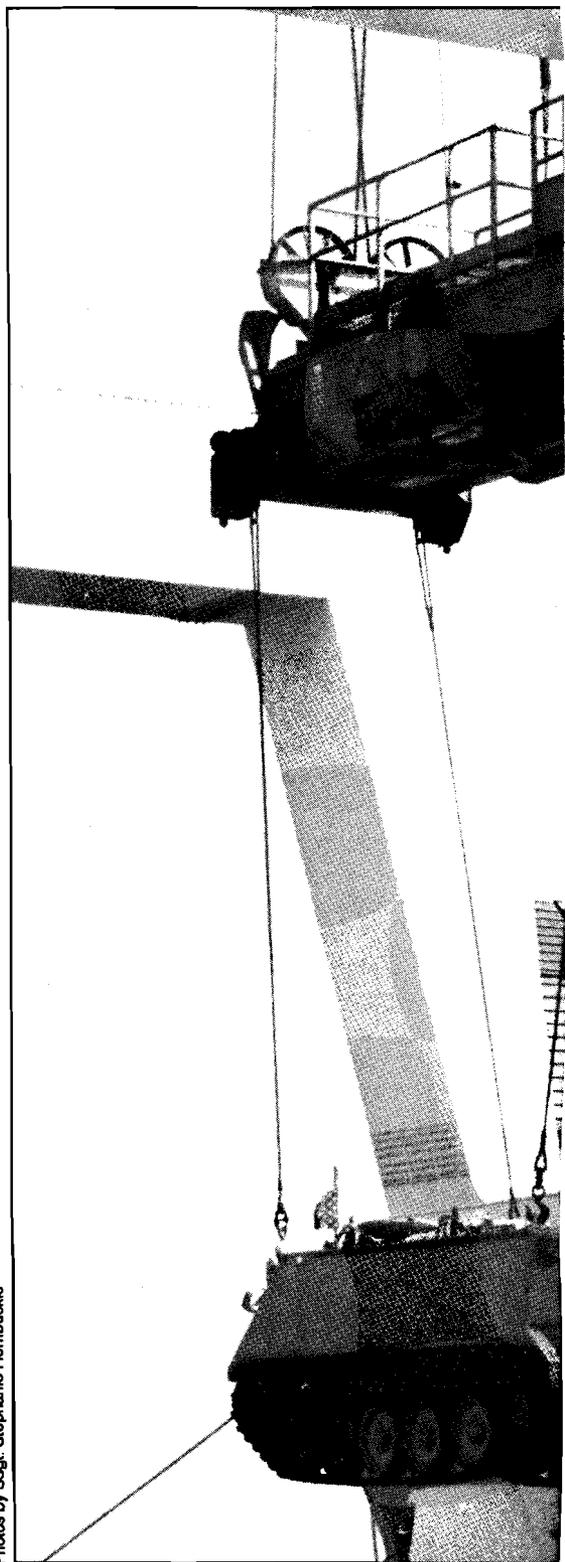
Stewart, Ga., had a unique chance this spring to actually transport their tracked vehicles by sea.

"We were pleased to have this opportunity," said Lt. Col. Robert M. Maggio, battalion commander. "The ship loading and transporting is good training for the battalion. It allows us to practice every aspect of our wartime mission."

The shipload exercise, coordinated by the Military Traffic Management Command, Charleston, S.C., was the first for any battalion of the 11th ADA Brigade.

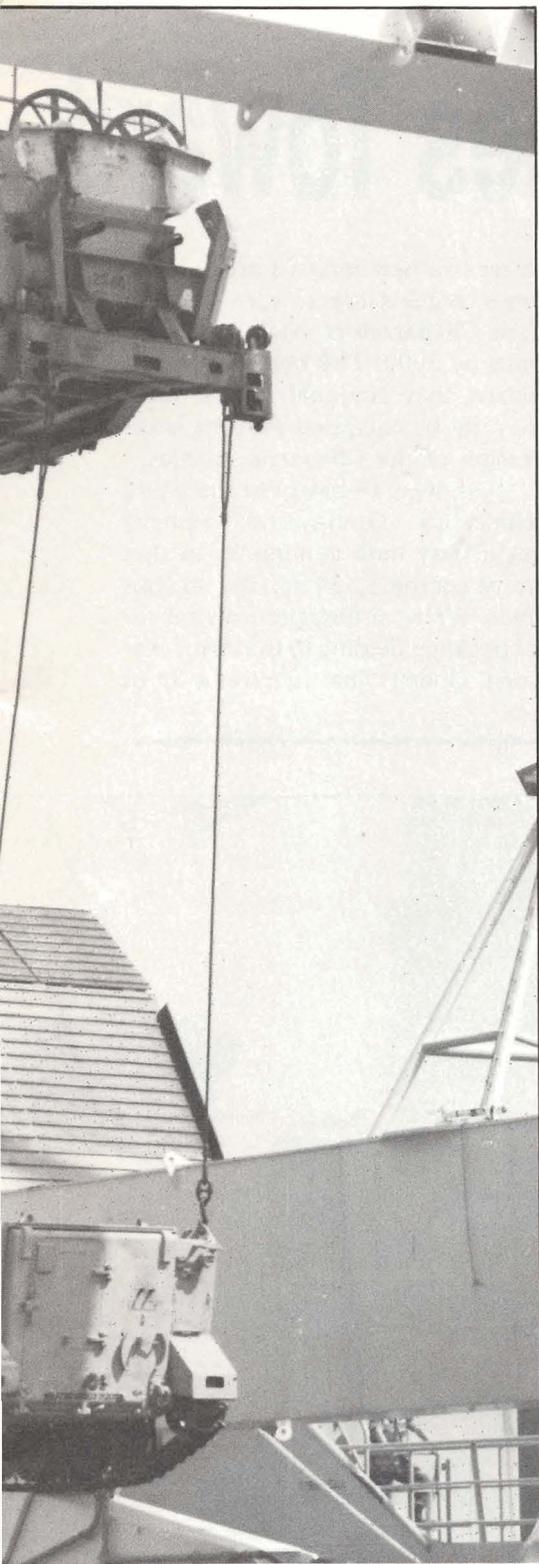
Two Army vessels, the *Gen. Frank S. Besson Jr.* (LSV-1) of the 335th Transportation Detachment and the *Lt. Gen. William B. Bunker* (LSV-4) of the 1099th Transportation Detachment, both Army watercraft, transported the battalion's 85 vehicles from Savannah, Ga., to Corpus Christi, Texas. From there, they moved by M-915 and M-872 tractor-trailers of the 62nd Transportation Company (medium truck) of Fort Bliss, Texas, to the Doña Ana Range Camp, N.M., to participate in the 11th ADA Brigade's Roving Sands '90 exercise.

"We knew what ships we were going to get about a month out, and I was able to send the loading and



Photos by SSGT Stephanie Hornbuckle

unloading officers to the ports for coordination. It was almost like a tactical exercise without troops,"



**1-2nd ADA Chaparrals loading onto LSVs at the Port of Savannah for shipment to Corpus Christi, Texas.**

said Maggio. "While Capt. Elijah L. Campbell went to the Transportation Group at Fort Eustis, Va., and

worked on the loading plans, 2nd Lt. Augustus W. Lee Sr. traveled to the Port of Savannah, and 2nd Lt. William J. Caprio traveled to the port at Corpus Christi for coordination," he added.

Soldiers of the ADA battalion then road convoyed under Lee from Fort Stewart to Garden City,

Ga. Once there, the soldiers unloaded the vehicles from the railcars and drove them to the docks at the Port of Savannah. The soldiers then lined up their Chaparrals, armored personnel carriers, track recovery vehicles and other battalion vehicles and prepared them for loading onto the vessels. LSVs are made for drive-in loading, so no cranes are provided on the

# Chaparral Marches Toward

**C**haparral missiles are unfunded in President George Bush's FY91 budget, but this doesn't mean the end of the veteran short-range air defense system. Currently deployed in Southwest Asia for Operation Desert Shield, Chaparral will continue to be shifted from the Active Army units to Army National Guard units.

About 1,534 of the new Chaparral rosette scan seeker missiles, contracted for in previous fiscal years, will be delivered as scheduled.

However, since plans were to provide 6,912 missiles to the National Guard by the year 2000, the lack of funding creates a potential 5,378-missile shortfall.

"Our main thrust is to try to get us back into the budget by the '92 to '93 time frame to make up the shortfall," said Ted Grandy, project manager for Chaparral and the forward area alerting radar (FAAR). Chaparral is in the midst of a transitional period in which Active Army units scheduled for inactivation or

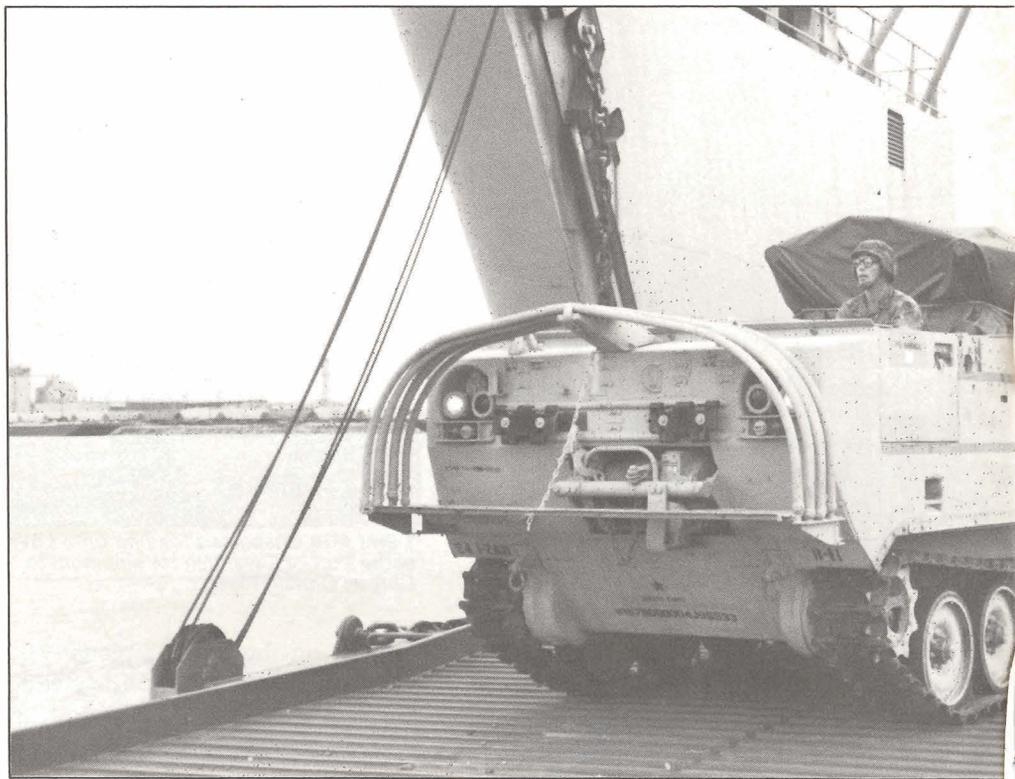
to receive new forward area air defense systems are to turn over all their Chaparrals to National Guard units by 2000. The budget decision means that National Guard units may not be equipped with the latest version of the Chaparral missiles.

"Although we have lost the FY91 missile buy," Grandy said, "we have got a busy time coming up in that we've got the 1,534 missiles on contract. We're also responsible for total package fielding to the Army National Guard. That requires a lot of

ships. However, dock cranes were used for loading at the Port of Savannah as there was no room for the ships to beach. A giant dock crane lifted the military vehicles one at a time to the decks. Once the vehicles were safely on deck, the air defense soldiers drove the vehicles to their exact load positions. Soldiers and dock workers then secured the vehicles with the Peck and Hale tiedown system.

WO 1 Brent Stubbs of the *Besson* liked the idea of hauling ADA equipment. "This is the first time we have had the opportunity to move ADA equipment. The vessel was designed to support combat arms brigades to unimproved ports, such as Honduras. This is a different experience for the crew."

Before the day was over, all vehicles were secured safely on the ships, ready to set sail the next morning on the five-day trip to Corpus Christi. The soldiers boarded buses headed back to Fort Stewart to complete personnel preparations for Exercise Roving Sands '90. Ca-



prio and his soldiers met the LSVs at Corpus Christi and looked on as the LSVs pushed their way onto the

sandy beach and lowered the ramps, permitting soldiers to drive their vehicles directly off the ships.

# an Uncertain Future

management." The 1,534 missiles already under contract will be initially deployed to Active Army units in Europe and will later be transferred to Guard units.

Chaparral was first fielded as an interim system in the early 1960s. When the Mauler air defense system program was canceled in 1965, officials decided to deploy Chaparral worldwide. An improvement program, climaxed by the rosette scan seeker, began in the early '70s and has lasted two decades.

Ford Aerospace has produced 596 Chaparral fire units for the U.S. Army and an additional 182 fire units for six foreign countries. Each fire unit costs about \$41.6 million while each missile costs about \$67,000. A Chaparral fire unit with its basic load of 12 missiles would cost about \$2.4 million. Hughes Aircraft Co. is the second-source contractor.

The Chaparral/FAAR Project Office, Redstone Arsenal, Ala., employs about 49 federal service civil-

ian workers. The project office's two military slots are currently vacant.

"We've just lost our buy, but we still have lots of work to do in deploying our system to the National Guard and trying to restore the missile buys in subsequent years," Grandy said.

**Skip Vaughn** writes for the *Redstone Rocket*, Redstone Arsenal, Ala.



Observers were very impressed with the highly professional manner in which the Army ground guides

worked with drivers to unload the vehicles.

"In Savannah," explained Caprio, "we knew the exact space allowed and only enough vehicles were sent to fill this space. However, we did not know the weight distribution, and some jockeying took place in the loading order." Vehicles were loaded by a crane and set down on the deck where soldier ground guides worked well with soldier vehicle drivers, to the compliments of dock workers and ship personnel. These Army watercraft are not used for troop transport, but after some discussion, the unit was allowed to send a maintenance man along with the vehicles on each of the ships. This was a wise decision in that this man was able to start the vehicles and do minor maintenance aboard ship.

Once in Corpus Christi, drivers and ground guides off-loaded the ships. Special landing beaches or areas were made accessible so the ships could lower their ramps.

"The five days at sea caused

some delay in preparing the vehicles for the trip by truck to Fort Bliss," said Maggio. "LSVs store their cargo on the deck. In other words, there are no holds. It was amazing what salt water can do in five days. We can't be absolutely sure that the saltwater caused some equipment failures, but we adjusted our prescribed load list for the tracked vehicles."

Not one of the battalion's 85 vehicles were damaged during the five-day sea trip, a credit to the soldiers, sailors and dock personnel who participated.

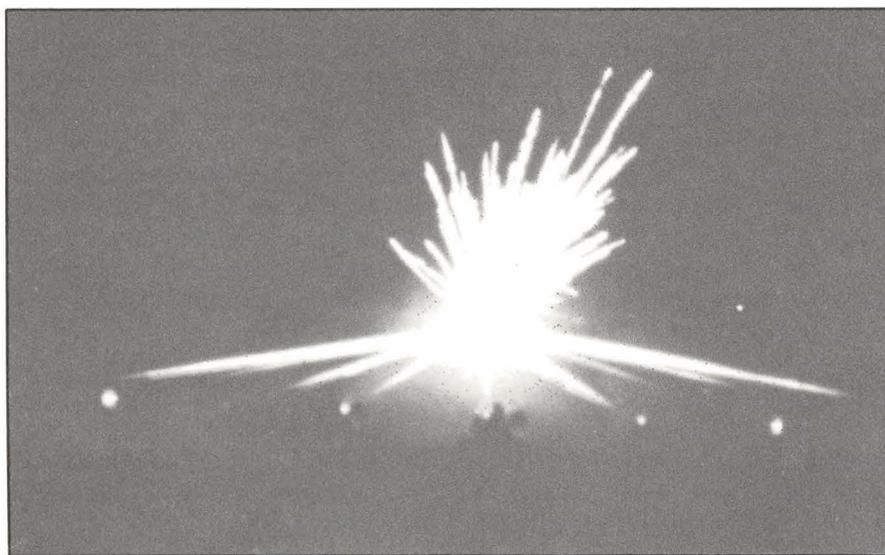
The Exercise Roving Sands deployment proved to be an enlightening experience for soldiers of the Fort Stewart battalion — an experience sure to pay huge dividends if the ADA battalion is called upon to participate in a contingency operation across the ocean.

**Hubert L. Koker** is assistant editor of *Air Defense Artillery*.

**SSgt. Stephanle Hornbuckle** is an 11th Air Defense Artillery Brigade photojournalist.

# When Ducks Don't Fly at Night

by Capt. Don Pierce



**D**eathly quiet fills the desert summer's night. The Vulcan squad leader hesitates to crack his knuckles for fear the noise will travel for miles. Breathing is slow and deliberate. The moon is full, and shadows appear to move where no movement exists.

Earlier he heard his driver snoring loudly by the towed Vulcan. The squad leader climbed from his well-

prepared fighting position and nudged the sleeping driver, causing him to roll over. The quiet returned; that is, until the field phone rang. The ring was barely audible; the squad leader thought he was dreaming. It was, after all, 0045 and he was tired. But something in the back of his mind told him it was not a dream. The squad leader answered, and the infantry platoon

leader on the other end whispered, "Enemy infantry to our front. One platoon-sized in the wash, and it looks like two platoons or more moving up the west bank toward 2nd Squad's position. Hold fire 'til I give the signal."

"Roger," the squad leader replied, and hung up. He knew exactly what the lieutenant was talking about. It was in *their* plan.

Charlie Company's mission? Defend Debnam Pass, a meandering, sandy wash that varied in width from 20 to 50 meters. The platoon was on the northern end of the wash at the mouth of the pass. They were oriented south, with 2nd Squad and 3rd Squad on the hillside to the west, and 4th Squad on the high ground to the east. Each could see into the wash and had excellent fields of fire. 1st Squad was defending the wash slightly behind and adjacent to the other squads. This defense formed a slight arc, opening toward the south. A tank ditch and wire and mine obstacles, tied into the terrain on both sides of the wash, reinforced the defense.

The towed Vulcan platoon had the mission of providing air defense for C Company, recognized by the Vulcan platoon leader as the most critical asset on the battlefield. He divided his Vulcans in pairs, two with 1st Platoon and the other two with the rest of C Company. The two Vulcan squads with 1st Platoon were to protect the infantry platoon by keeping the pass clear of enemy aircraft to allow a possible counter-attack by friendlies. The Vulcan platoon leader saw this as their "day" mission. He directed the squad leaders to see if they could tie in with the company's night defense mission as well. He then left it up to the squad leader.

The 1st Squad, 1st Platoon's company dug positions just behind a tank ditch, using the soil as an embankment. Two towed Vulcans sat nearby, about 50 meters behind 1st

Squad's position, one on each slope east and west. They, too, were oriented south into the wash, and sat in engineer-prepared positions. Earlier coordination with the infantry platoon leader provided wire communications between the two. Wire communications also existed between the two Vulcans. Alerted to the enemy infantry, the Vulcan squad leader notified his gunner and the other Vulcan squad leader.

There was no movement. There was no sound. The only thing that might alert the enemy was the obstacle itself. In the full moon, the Vulcan squad leader used his binoculars to observe the approaching enemy on the hill and in the wash. While he watched, a BRDM came around the bend in the wash, moving slowly and quietly. The infantry platoon moving in the wash, having spotted the obstacle, edged over to one side and stopped in the shadows.

The BRDM eased closer to the wire and mine obstacle. The larger infantry force, now high on the western slope, was in full view of the first Vulcan. The second Vulcan, on the west side, could see the BRDM but not the infantry. This information was relayed to the infantry platoon leader located with the 1st Squad by the obstacles. 1st Squad, dug in by the tank ditch, saw it all.

The platoon leader alerted his company commander. The mortars stood by. The platoon leader called the Vulcan squad leader and told him to take a bead on the BRDM and wait. The Vulcan squad leader acknowledged and sighted in. The other Vulcan did the same. The platoon leader gave directions to his infantry squads and all barrels pointed south.

The BRDM stopped just short of the obstacle, about 40 meters from 1st Squad. The sky suddenly lit up, illuminated by a parachute flare fired by the infantry platoon leader.

There was no wind, and the flare hung in the air for what seemed like ages directly over the enemy, but with every weapon in the vicinity pouring lead into the enemy infantry and BRDM, no one had time to notice. The Vulcans fired at the BRDM at the same time it was engaged by a Dragon. The Dragon was too close, but the Vulcans spit enough fire into the wheeled reconnaissance vehicle to destroy it. Machine guns and M-16s killed all but one squad-sized element of enemy infantry. The enemy tried to pull back down the wash, but the mortar rounds landing 150 meters south of the tank ditch changed their minds. The enemy squad returned ferocious fire in desperation, but they, too, soon died. In less than 10 minutes all was quiet again.

Later that night, another BMP rounded the bend, spotted the destroyed BRDM and tried to pull back, only to be destroyed by the Vulcan and Dragon. When the enemy regiment attacked early the next morning, the Vulcans were in the same positions. When the enemy's close air support aircraft flew down the wash at Debnam Pass, they were greeted by a fusillade of 20mm rounds. Not one friendly vehicle near Debnam Pass was lost to enemy aircraft that day. The two Vulcans, in concert with the other two Vulcan squads to the east and a myriad of Stinger teams on high ground, destroyed six aircraft. An enemy tank, after extensive repositioning, killed one Vulcan.

This is the National Training Center at Fort Irwin, Calif. The day battle was not the important issue here. Rather, the ability to make effective use of the Vulcan system at night, while retaining the capability of providing air defense coverage, is noteworthy. The day plan and night plan were integrated.

What should we do with air defense at night? The threat emphasizes night operations. We, as air

defenders, must discipline ourselves to be ready for 24-hour operations. When forward area air defense weapons systems support a maneuver force, the old NDP (night defensive perimeter) should be against the law. A Vulcan platoon possesses a tremendous amount of firepower, but is not designed to protect itself against a sizeable ground attack. Augment tanks with infantry, and vice versa. The Vulcans, as well, rely on maneuver elements to provide ground security. The idea is not to button up, go to sleep and let them do it all.

The secret is integration. A great many effective uses exist for Vulcans at night. They can provide task force command post security against a night ground attack. They can integrate into an infantry or armored ground defense. They can ideally (METT-T permitting) integrate their ground defense role and their air defense plan. Thus, come morning, no one has to rush to pre-planned and prepared positions while artillery is falling and enemy chemicals are being employed.

Although the Vulcan's night vision is limited, making use of the supported maneuver force's capabilities, as the squad leader did in the scenario, is an aggressive way to accomplish the mission.

Night or day, Air Defense Artillery will continue to play a key role on the combined arms team. Embrace the warrior spirit and seize every opportunity to kill the enemy, whether they fly, ride or walk. Remember, when the ducks don't fly at night (and it won't be long before they readily do), there are a good many varmints on the ground.

**Capt. Don Pierce** is a former National Training Center observer-controller who is currently assigned to the Combined Arms and Tactics Department, U.S. Army Air Defense Artillery School, Fort Bliss, Texas.

# Operation Desert Shield



*Air Defense Artillery responds to crisis  
in the desert oil kingdoms*

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**Soldiers of the 11th ADA Brigade, shown departing Biggs Army Airfield, Fort Bliss, Texas, were among the first deployed for Operation Desert Shield.**

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## *A Line Drawn in the Sand*

**Editor's Note.** *The following article was composed as diplomats struggled to devise a peaceful solution to the crisis created by Iraq's invasion of Kuwait, and as the United States continued to prepare for hostilities in case diplomacy fails.*

**by Blair Case**

"From time to time, when you least expect it, when everyone thinks the world is quiet," Gen. Colin Powell, chairman of the Joint Chiefs of Staff, told reporters, "someone tugs on Superman's cape."

Air defenders equipped with Patriot, Chaparral, Avenger, Vulcan and Stinger were among thousands of U.S. soldiers deployed to Southwest Asia in response to Iraq's sudden August 2 invasion of tiny, oil-

rich Kuwait and the subsequent massing of Iraqi troops on the Saudi border. Some boarded air transports headed for Southwest Asia, while others mounted their weapon systems and equipment on rail cars for transportation to ports.

First to deploy were elements of the 82nd Airborne Division, the 101st Air Assault Division and the 11th Air Defense Artillery Brigade. The 11th ADA Brigade air defenders were airlifted by C-5 Galaxies and C-141 StarLifters from their desert training base at Fort Bliss, Texas. Embarking with them were Avenger fire units and crews from the 6th ADA Brigade, a Fort Bliss training unit.

These soldiers, who confronted more than 100,000 Iraqi troops fresh from their lightning conquest of tiny Kuwait, drew a "line in the sand" near the Kuwaiti-Saudi bor-

der that President Bush warned Iraqi leader Saddam Hussein he must not cross.

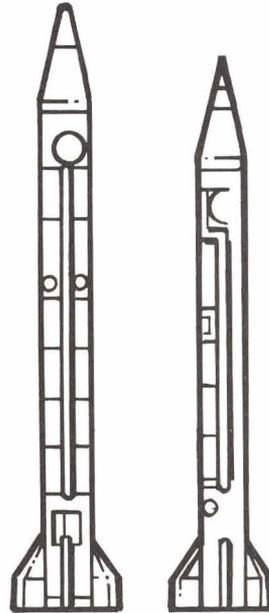
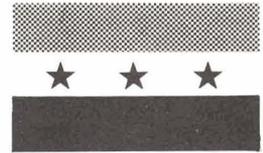
They were followed by units of the 24th Infantry Division (Mech), 3rd Armored Cavalry Regiment, 1st Cavalry Division and 2nd Armored Division, along with their ADA elements. Soon afterward, the 1st Cavalry Division, 2nd Armored Division and 197th Infantry Brigade, along with their ADA elements, began moving toward their debarkation ports. President Bush called up Army reservists during the final weeks of August.

American warplanes and attack helicopters, meanwhile, flocked toward the oil kingdoms, and 45 thousand U.S. Marines prepared for sea as naval armadas, including four aircraft carriers, sailed for the Persian Gulf. The massive American buildup, made possible by careful

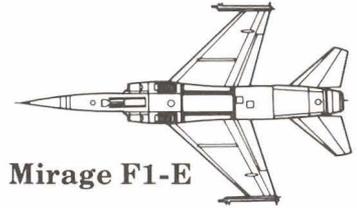




## Iraq



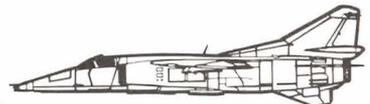
Hussein Scud-B



Mirage F1-E



MiG-29 Fulcrum



MiG-23 Flogger

## United States

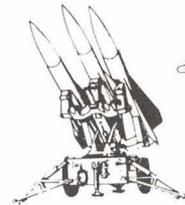
(ADA deployment as of Aug 31, 1990)



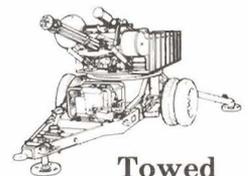
Avenger



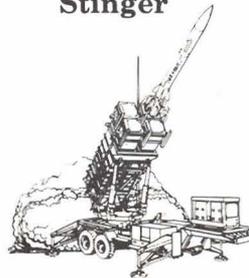
Stinger



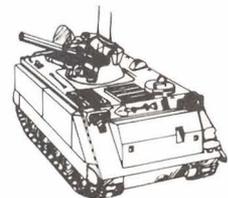
Hawk



Towed Vulcan



Patriot



Self-Propelled Vulcan

contingency planning, was the biggest, boldest and most hazardous deployment of American forces since the Vietnam War. However, in sharp contrast to the American buildup in Vietnam, which took place in a series of small increments over a number of years, the August deployment of U.S. forces to Southwest Asia was sudden and dramatic.

By the end of the second week of Operation Desert Shield, as many as 30,000 soldiers were in place in Saudi Arabia, and approximately 45,000 Marines were at sea on ships headed for the Persian Gulf area. While the Bush administration was purposely vague about numbers, it was thought as many as 150,000 American troops might eventually be committed to Operation Desert Shield.

By the third week, with troop levels inside Saudi Arabia estimated at 35,000 and thousands more on the way, the news media openly speculated that U.S. forces might switch from a defensive to an offensive posture. They quoted a senior military official who said operational planning has shifted abruptly from getting troops to Saudi Arabia to how to use them to defeat the Iraqi army and drive Hussein from power. Iraq was said to have transferred elite Republican Guard units from Kuwait to defensive positions inside Iraq, a clear indication that Hussein feared a U.S. invasion.

Iraq began moving tactical ballistic missiles (TBMs) into Kuwait during the third week of Operation Desert Shield. The missiles were thought to be the Soviet-built Scud B and an Iraqi-modified version of

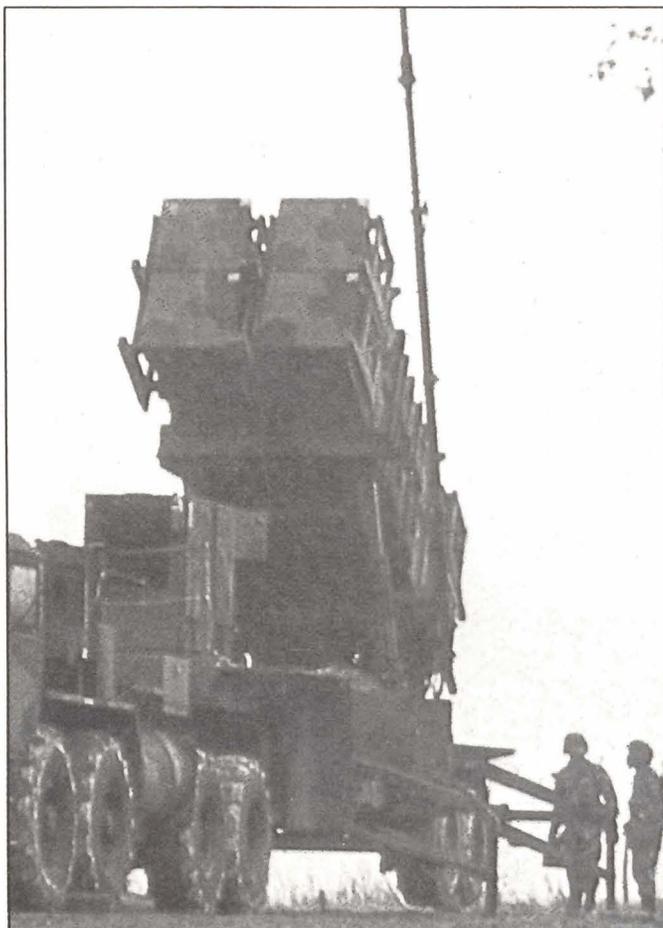
the same missile called the Hussein. Both versions of the long-range missile are capable of hitting targets deep inside Saudi Arabia.

The Soviet Scud B delivers a 2,172-pound warhead while the slightly larger Hussein delivers a 3,281-pound warhead. Some munitions experts say the Iraqi TBMs are capable of delivering chemical warheads, but other experts, including Israeli intelligence sources, speculate that the Iraqis have not yet perfected the technique of fitting chemical warheads to the long-range missiles.

The U.S. Patriot fire units positioned in Saudi Arabia provide the sole defense against TBMs. The sophisticated Patriot surface-to-air missile can intercept TBMs with pinpoint accuracy, provided the missiles are detected early enough in their flight.

Unlike Operation Urgent Fury, the U.S. invasion of Grenada, and Operation Just Cause, the expulsion of Panamanian strongman Manuel Noriega from power, Desert Shield promised to be no walkover. During the first days of the operation, only meager U.S. forces were assembled to help Saudi Arabian forces confront the huge Iraqi war machine. During these crucial moments, analysts predicted only near-total success in a desperate air battle could have stopped Hussein's armored columns short of the oil fields.

By the end of Desert Shield's second week, television stations were showing viewers scenes of Patriot launchers arrayed to defend Saudi airfields. Col. John McBroom, commander of the 1st Tactical Fighter Wing from Langley Air Force Base in Virginia, told the Associated Press that his pilots and ground crews had felt vulnerable on the ground when they first arrived in Saudi Arabia. They felt much more secure, he said, as ground units, including Patriot batteries, arrived and took up positions.



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**Operation Desert Shield marked the first contingency deployment of the Patriot air defense system.**

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**11th ADA Brigade soldiers try to sleep while waiting their turn to board airlifts for Operation Desert Shield.**

The Patriot batteries were first deployed to protect airfields far south of the Kuwaiti border. "Shooting airplanes out of the sky can't be considered anything but defensive action," said Capt. Joseph P. DeAntona, commander of B Battery, 2-7th ADA, the first Patriot battery deployed under tactical conditions outside the United States. "Any Iraqi fighters would surely be aggressors if they came this far into Saudi Arabia."

Civilian analysts rated Iraqi troops a poor match for U.S. soldiers, despite experience gained during their long war with Iran. Senior U.S. commanders were, at first, less sanguine. American soldiers faced Hussein's million-man army, desert heat, the threat of chemical and ballistic missile attack, and the possibility that Hussein might succeed in uniting the Arab World in a "holy war" against the "colonial powers."

From the beginning, Operation Desert Shield commanders stressed the importance of the air battle expected to kick off any hostilities. With Air Force and Army Aviation arriving in Saudi Arabia far ahead of mechanized infantry and armor units, the need for air defense units

to protect endangered airfields and ports was alarmingly apparent. Patriot units were allotted precious space aboard the first airlifts to fulfill that essential mission.

As the American buildup continued, U.S. commanders turned their thoughts to offensive rather than defensive operations. The emphasis on the air battle, however, remained paramount. The key to smashing the Iraqi war machine, military leaders said, was the same as the key to defending Saudi Arabia. First win the air battle, then let the Apaches and A-10 Thunderbolts eliminate the Iraqi's 10-to-one advantage in tanks.

The emphasis on the air battle shone an unaccustomed spotlight on Air Defense Artillery. When television cameras focused on air defense fire units set up to defend Saudi air bases, oil fields and ports, news commentators, for the first time, explained the essentiality of their mission rather than their contribution to the federal deficit.

Air power is particularly decisive in desert warfare. The all-pervasive sand in the Saudi Arabian Desert is about the consistency of talcum powder. The blowing sand gets into everything, clogging air filters and

causing engines to overheat. It settles into the receivers of M-16s and turns to grit between the threads of canteen caps. Digging a foxhole takes forever, because the sides keep caving in on themselves, and soldiers unaccustomed to the desert end up in foxholes that look more like miniature bomb craters than fighting positions. Slogging across the dunes is tiring enough; running makes a hundred-yard sprint seem like a marathon. It doesn't particularly matter because in the desert, where there is no cover or concealment and little defilade, the infantry doesn't get far unless it's led by armor.

Wheeled vehicles fare poorly off the highways. They quickly bog down in the sand dunes. Vehicles that stay on the road get chewed up by strafing aircraft. Tracks do better in the sand, but there is no place for tanks to hide in the desert, and a lot of very bright people have put a lot of thought into designing weapon systems and munitions — many of them airborne — that kill tanks. They work especially well against tanks caught in the open.

So, to get anywhere, especially when the other side has more tanks than you have, you've got to have

air supremacy. This allows your tanks to rumble across the sand without being decimated by enemy aircraft and, at the same time, allows your aviators — the Apache and A-10 drivers — to cut the opposing armor force down to size.

The opening weeks of the Operation Desert Shield provided supporting evidence for ADA leaders who, with troop reductions and budget cuts in the immediate forecast, have contended that Air Defense Artillery has a vital role to play in contingency warfare. It's probably incorrect to say there were many lessons learned during the opening weeks of Desert Shield. The operation dramatized aspects of contingency operations that had long worried U.S. planners. For example, the United States should consider establishing pre-positioned war reserve sites, like those in Europe, for contingency missions. The

## Chemical Warfare Threat

Operation Desert Shield commanders say U.S. soldiers are trained and equipped to cope with the Middle East chemical warfare threat.

Iraq brought its chemical weapons production facilities on line in the early 1980s. Five facilities are believed to be operational. The Smarra facility, with test grids that cover more than 25 miles, produces mustard gas as well as Sarin and Tabun nerve agents.

Iraq used mustard gas, nerve gas and cyanide gas to stop human wave attacks during the Iraq-Iran War of 1980 to 1990, and then turned chemical weapons against its own citizens, the rebellious Kurds, in 1987.

Third World TBM threat is a figment of no one's imagination. Air Defense Artillery must keep working to strengthen its growing ATBM capabilities, and must concentrate on "first-lift" capabilities. Since the United States can project Air Force and Army Aviation squadrons into a contingency theater faster than mechanized infantry or armored units, the opening battles of contingency operations will likely be air battles — battles the United States could lose unless ADA units are present to protect airfields. Air Defense Artillery must be part of the initial forward deployment, and ADA units must roll down the ramps ready to fight.

## Firsts for ADA

Operation Desert Shield marks the first contingency deployment of Patriot and Avenger units. While women have long served in Patriot and Hawk units that faced the nation's Cold War adversaries in Europe and Korea, Operation Desert Shield also marks the first time that female soldiers of the "First to Fire" branch have deployed to a contingency area where hostilities seemed imminent. CSM William Doctor of the 11th Air Defense Artillery Brigade said eight Fort Bliss women, none of them in command slots, deployed with Patriot units to Southwest Asia.

Army spokesmen named parent organizations participating in Desert Shield, but refused to identify individual ADA battalions or batteries actually deployed to Southwest Asia. They also declined to divulge which air defense weapon systems they took with them. "We took all of our equipment," said a 101st Airborne Division (Air Assault) spokesman.

The 3-4th ADA, of the 82nd Airborne Division, stationed at Fort Bragg, N.C.; the 2-44th ADA, of the 101st Airborne Division (Air Assault), Fort Campbell, Ky.; and

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*SSgt. Stephanie Hornbuckle, Headquarters and Headquarters Battery, 11th ADA Brigade, boards a Military Airlift Command aircraft bound for Saudi Arabia. She was one of many female soldiers who deployed with the Fort Bliss brigade.*

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## To the Soldiers of Operation Desert Shield

"You are embarking on a vital mission. Your success will be critical to the security and prosperity of the United States and, indeed, the entire community of nations.

"Your presence on the Arabian Peninsula will be instrumental in deterring further aggression and in achieving the objectives established by our President. You demonstrate that the United States will not be intimidated by threats or pressure. Fighting alongside American Marines, airmen and sailors, you will guarantee our inevitable victory, should deterrence fail. You have been trained to the highest standards, and you

are ready to fight and win.

"As you deploy, rest assured that we will take care of your loved ones at home. We will provide all the support that your families need during your absence. The Army has always taken care of its own.

"I am confident that should we be challenged, you, the American soldier, will once again fight with valor and determination. Everyone in the Army and in our nation is proud of you as you deploy to defend the United States and our way of life."

— Gen. Carl E. Vuono  
Army Chief of Staff

the 1-5th ADA, of the 24th Infantry Division, Fort Stewart, Ga.; are Vulcan/Stinger battalions.

The 11th ADA Brigade, with headquarters at Fort Bliss, Texas, is a U.S. Army Forces Command unit with elements at Fort Bragg and Fort Stewart as well as Fort Bliss. At Fort Bliss, the brigade's Headquarters and Headquarters Battery and its 2-7th ADA, 3-43rd ADA and 5-62nd ADA, all Patriot battalions, took part in the Desert Shield deployment.

The 2-7th ADA deployed its Headquarters and Headquarters, Bravo, Delta, Charlie and Foxtrot batteries.

The 3-43rd ADA deployed its Headquarters and Headquarters and Alpha batteries and the 516th Maintenance Company.

The 5-62nd ADA deployed its Headquarters and Headquarters, Alpha and Charlie batteries.

The 70th Ordnance Battalion's 507th Maintenance, also of Fort Bliss, went along in support of the Patriot battalions.

The 3rd Armored Cavalry Regiment, Fort Bliss, has an Avenger platoon. The platoon's fire units —

the first of the Army's new family of forward area air defense (FAAD) systems to be fielded, had been loaded on rail cars for days when the regiment received orders to deploy during the second week of Operation Desert Shield.

### Desert Shield Addresses

1st CAV DIV  
APO NY 09306

3rd ACR  
APO NY 09209

11th ADA BDE  
APO NY 09616

24th INF DIV (M)  
APO NY 09315

82nd ABN DIV  
APO NY 09656

197th INF BDE  
APO NY 09315

101st ABN DIV (AA)  
APO NY 09309

Present transit time between CON-US post offices and Saudi Arabia is 10 days. A temporary restriction limits first class mail to 12 ounces or less, including audio cassettes.

At Fort Benning, Ga., the 197th Infantry Brigade (Mech) has a Stinger platoon.

As units geared up for Desert Shield, there was the usual flurry of activity that accompanies major deployments. Some soldiers moved up wedding dates. Hundreds of stay-behind spouses prepared to cope, at least temporarily, with life as single parents and the knowledge that the Desert Shield deployment might turn out to be a lengthy one.

As Fort Bliss elements of the 11th ADA Brigade lifted off from their desert training base at dawn on a Sunday morning, soldiers struggled with the mix of exhilaration and anxiety that always visits troops headed into a combat zone, but commanders reported the soldiers were confident, enthusiastic and eager to accomplish their mission.

Eighteen Fort Bliss federal civilian employees, with special technical and troubleshooting skills, left for Saudi Arabia at the end of August. Typical of the civilians was Norm Nagle, a U.S. Army Missile Command logistics assistant who works with Patriot missile systems.

At a key Saudi air base, Lt. Col. Lee Neel, commander of the 2-7th ADA, told newsmen that "I personally told my family to be prepared for a long haul. I'll see you when I see you."

Whenever possible, Operation Desert Shield troops are being housed in air-conditioned barracks, but Neel told reporters during the opening weeks of the operation that his Patriot soldiers had yet to sleep indoors, but that he hoped to have 10 air conditioners soon. "We need to give them a good night's sleep in this climate when we can," he said.

One of Neel's Fort Bliss soldiers told reporters that the 2-7th ADA soldiers were having little difficulty adjusting to Saudi Arabia's scorching heat. "We live in a hot place, the Chihuahuan Desert," the soldier explained.

The U.S. and Saudi soldiers are not facing Iraq alone. More than 20 countries, including Egypt and Syria, have pledged military or financial support to Desert Shield.

Islamic religious leaders asked Arabs in the Arabic countries arrayed against Iraq to support Operation Desert Shield even though it meant suffering the presence of "infidels and Christians."

### The Home Front

Back in the United States, there was an outpouring of support for the soldiers, particularly strong from communities adjacent to those Army installations supplying the bulk of troops for Operation Desert Shield.

Maj. Gen. Donald Lionetti, chief of Air Defense Artillery, told reporters at Fort Bliss that: "Army families are tough. Even though soldiers may be deploying, let me tell you, these companies and troops and batteries and battalions and squadrons are all forming their own

support groups, involving families of soldiers, sharing information and helping each other out." Army installations, including Fort Bliss, set up family assistance centers to provide a variety of services to the families of departed soldiers.

Soldiers airlifted to Southwest Asia departed in secrecy with only fellow soldiers to see them off, but cheering civilians lined the shoulders of highways leading to debarcation ports. As soldiers of the 101st Airborne Division (Air Assault) moved their vehicles down the interstates from Fort Campbell to their debarcation ports, they passed beneath overpasses hung with patriotic banners and American flags.

Retail outlets gave away bottles of sun tan lotion, foot powder and lip balm, or sold them to installation procurement officers by the thousands at wholesale prices.

School districts adjacent to military installations employed psychologists to train teachers to recognize

and deal with symptoms of stress in schoolchildren who have a parent, or parents, deployed for Desert Shield.

Still, Desert Shield commanders worried that popular support might evaporate if the United States gets bogged down in a desert stalemate or a long war of gradual escalation. Should diplomacy fail to create a peaceful solution to the crisis, they counseled against half-measures and advocated instead a "no holds barred" campaign.

The Iraqi invasion of Kuwait, coming as it did at the celebrated end of the "Cold War," was a rude awakening for many Americans. With the cost of Operation Desert Shield running in the billions of dollars, it became apparent that the longed for "peace dividend," or at least a sizeable chunk of it, might be delayed indefinitely.

For others, Desert Shield seemed to reconfirm America's position of world leadership and symbolize its continued willingness to accept the responsibilities that come with being a world power.

"The notion that the United States shouldn't serve as a policeman for the world has become a favorite saying around here," Gen. Powell told newsmen gathered at the Pentagon. "But when someone needs a cop, guess who they call."

At Fort Bliss, Lionetti told family members he hopes air defenders assigned to Desert Shield can accomplish their mission and return without facing actual combat. But with Iraq refusing to yield to either UN pressure or the growing presence of U.S. and international forces, chances of that happening seemed anything but assured.

As August drew to a close, U.S. units, which had been concentrated in defense of airfields and ports, moved farther north to take up holding positions behind the thin line of Saudi forces standing guard on the Kuwaiti border.

### \*ADA Deployment

#### 1st Cavalry Division

4th Battalion, 5th ADA  
(Vulcan/Stinger)

#### 2nd Armored Division

2nd Battalion, 5th ADA  
(Stinger teams)

#### 3rd ACR

Avenger platoon

#### 11th ADA Brigade

2nd Battalion, 1st ADA  
(Hawk)

2nd Battalion, 7th ADA  
(Patriot)

3rd Battalion, 43rd ADA  
(Patriot)

5th Battalion, 62nd ADA  
(Patriot)

#### 6th ADA Brigade

(Avenger fire units)

#### 24th Inf Div (Mech)

1st Battalion, 5th ADA  
(Vulcan/Stinger)

#### 82nd Airborne Division

3rd Battalion, 4th ADA  
(Vulcan/Stinger)

#### 101st Airborne Div (AA)

2nd Battalion, 44th ADA  
(Vulcan/Stinger)

#### 197th Infantry Brigade

(Stinger platoon)

\* ADA units deployed, or in the process of deploying, as of Sept. 15, 1990.



## ADA FORUM

### FAAR in the Future

During the Command Sergeants Major seminar at the Commander's Conference this summer, questions arose about the future of the forward area alerting radar (FAAR). Will the FAAR be replaced? What will happen to the operators and maintainers? These questions concern many of the branch's top NCOs.

Misinformation and speculation cause much of this concern. Here's what I have on the FAAR.

The Department of the Army has directed that the FAAR be removed from the Army inventory and placed in storage effective Sept. 30, 1990. Of course this will affect soldiers having MOS 16J, Forward Area Alerting Radar Operator, and MOS 24M, Vulcan System Mechanic, with the FAAR maintainer indicator ASI X7.

The 16J MOS will not be deleted, nor will it go away. All our soldiers holding MOS 16J will retain the MOS and remain in their units as early warning system operators until normal rotation. There is still the requirement in all units for early warning. The 16J soldiers will receive high mobility, multipurpose wheeled vehicles with the AN/VRC-46 radios and security devices from the FAAR, and perform early warning duties much like the infantry scout until such time as the Army procures an interim early warning system or a ground-based sensor.

As of now, the ground-based sensor probably will not be fielded until the mid- to late-1990s. We should have an interim sensor, probably the tactical defense alerting radar, fielded to light infantry units or light divisions as early as the first quarter FY93 and to the heavy divisions by the third quarter FY94. That will fill the gap until we can field a ground-based sensor.

We will still access personnel toward the 16J authorizations we currently have and project to have for the next five years. The revised 16J program of instruction, to be implemented Oct. 1, 1990, will teach the manual short-range air defense control system with added courses in communications and vehicle and aircraft identification.

The personnel problem with the Vulcan system mechanic is not so easily solved. The ASI X7 will be deleted Oct. 1, 1990, and 24MX7 positions will no longer exist after FAAR has gone out of the inventory. However, 24M soldiers will remain in units as Vulcan system mechanics until we get an interim sensor to replace the FAAR. At that time they will become the maintainers of the interim system. When the forward area air defense (FAAD) ground-based sensor is fielded, those positions will go to the Ordnance Branch, the proponent for maintenance of the ground-based sensor and the FAAD system. MOS 24M personnel will remain in their



present units until normal rotation and then go to a Vulcan position.

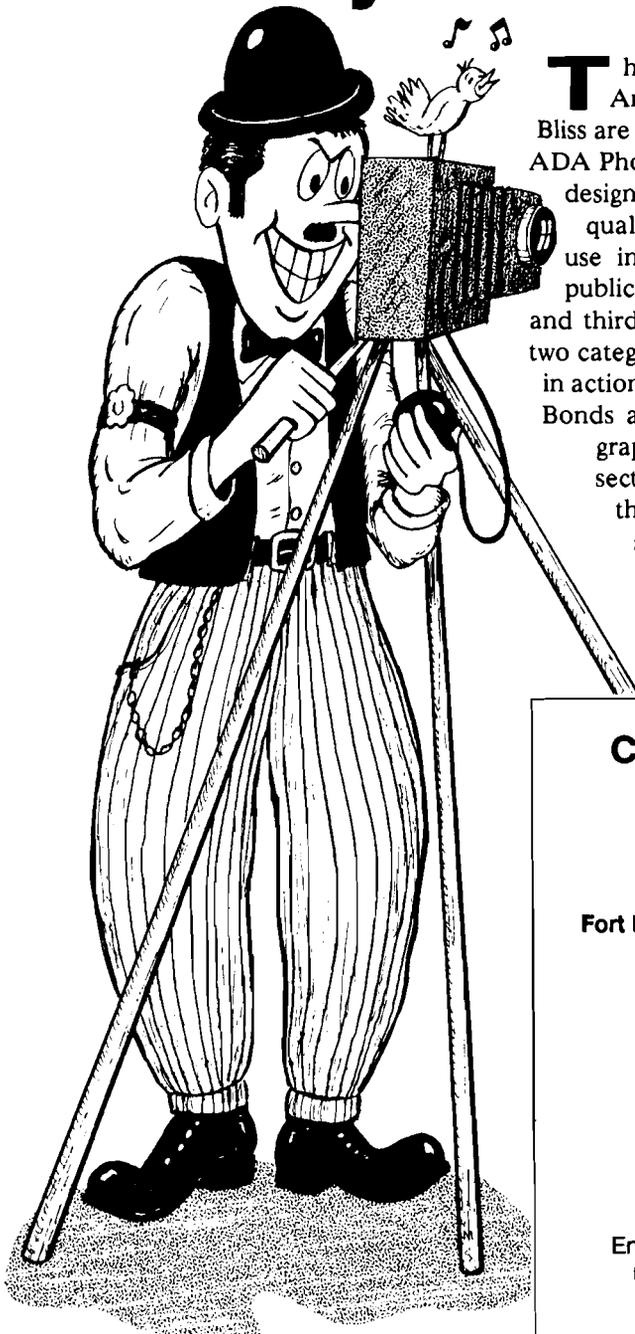
Those positions will not be refilled by a 24M. Soldiers with MOS 24M will serve as Vulcan mechanics until the FAAD systems replace the Vulcan system.

NCOs should explain the situation to soldiers with affected MOSs within their chain of command and assure them that they haven't been forgotten.

— CSM Robert W. Harman  
U.S. Army Air Defense Artillery School

## ADA Photo Contest Opens

# Ready . . . Aim . . . Shoot!



**T**he U.S. Army Air Defense Artillery School and Fort Bliss are sponsoring the first annual ADA Photo Contest. The contest is designed to create an archive of quality color ADA photos for use in a wide variety of ADA publications. The first, second and third place winners in each of two categories (Fort Bliss and ADA in action) will receive U.S. Savings Bonds and will have their photographs published in a special section of *ADA Magazine* and the *Fort Bliss Monitor*. A sweepstakes winner — the best photograph from all those submitted — will also be selected.

### Contest Prizes

**Sweepstakes**  
\$500 Savings Bond

#### Fort Bliss and ADA In Action

**1st Place**  
\$350 Bond

**2nd Place**  
\$250 Bond

**3rd Place**  
\$150 Bond

Entries must be received  
no later than 12 p.m.  
March 30, 1991

The Fort Bliss category gives you an opportunity to submit photographs that portray operations and training at Fort Bliss. Appropriate photos for this category may include, but are not limited to, scenic shots of Fort Bliss and its training ranges and photographs of Fort Bliss soldiers in Advanced Individual Training, Officer Advanced Course, Officer Basic Course, Advanced Noncommissioned Officers Course, Platoon Leader Course or Allied Students classrooms and field training exercises. The category is also open to photographs of families at work and at play, recreational activities and military life in all of its exciting facets.

The ADA in Action category is open to photographs of ADA units and soldiers from around the world. The photos should be action shots of ADA soldiers performing their duties. Appropriate subjects include, but are not limited to, field training exercises, National Training Center rotations, live-fire exercises, parades and ceremonies.

All submitted photos (regardless of whether they are prize winners) become the property of the United States. Your slides will be reproduced and the originals returned, provided you enclose a stamped, self-addressed envelope. Prints will not be returned unless a negative is furnished as part of the entry. Your name will be included in a photo credit line each time your photo or photographs are published. Only



glossy prints (4x6, 5x7, 8x10 or 11x14) or slides will be accepted. Please include negatives, if possible, along with prints. Identify, when possible, the names of units, locations and individual soldiers and include a brief description of the action taking place in the photograph on a separate sheet of paper (do not write on the back of photographs).

Anyone, except members of the *ADA Magazine* or *The Monitor* staffs, may enter the contest. The entry deadline is March 30, 1991. Photos received after this deadline will not be eligible for prizes. To enter the contest, simply clip or copy the entry form at right and mail it to: Photo Contest; *ADA Magazine*; ATTN: ATSA-ADA, Building 55; Fort Bliss, TX 79916-7004 or to: Photo Contest; *The Monitor*; Fort Bliss, TX 79916.

## Annual ADA Photo Contest

Please enter the enclosed photographs and/or slides in the Annual ADA Photo Contest.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

I certify that the attached photograph(s) is an original made by myself. I grant the Army or its civilian publishers exclusive rights to reprint the attached photograph(s) as they see fit without compensation to myself. I understand that upon submission the photograph(s) becomes the property of the United States.

Signature \_\_\_\_\_

Mail to:

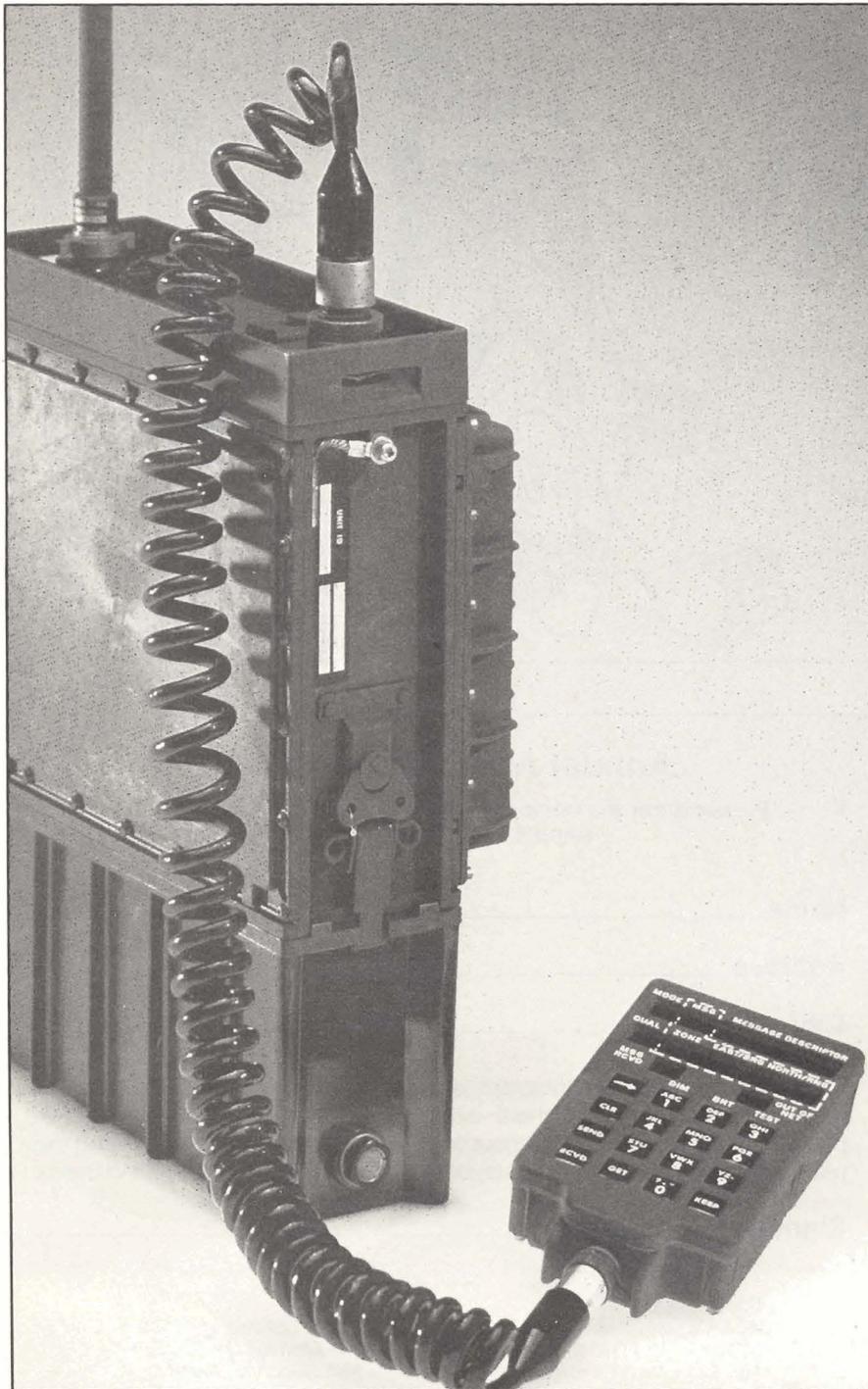
Photo Contest  
*ADA Magazine*  
 ATTN: ATSA-ADA, Bldg 55  
 Fort Bliss, TX 79916-7004

or

Photo Contest  
*The Monitor*  
 Fort Bliss, TX 79916

# EPLRS

*New system  
completes  
FAAD C<sup>3</sup>I link*



Heavy division ADA battalions will employ about 120 EPUUs.

**A**lexander the Great had a tremendous advantage over modern battlefield commanders. From a vantage point, he could survey the entire battlefield and know not only the exact location of his own formations, but those of his enemy as well. By contrast, modern commanders on today's expanded battlefields must make command decisions while lost in the "fog of war," seldom knowing, with absolute certainty, the exact location of their own units, much less those of the enemy.

The imminent fielding of the Enhanced Position Location Reporting System (EPLRS) promises to pierce the fog of battle and return battlefield commanders to the vantage point their ancient counterparts enjoyed. The U.S. Army has signed an initial \$107 million production contract with Hughes to activate the EPLRS production lines. The contract award came after EPLRS met or exceeded all requirements of the Army's production system verification tests in April.

Designed to support tactical operations on the battlefield with a reliable, digital communications system, EPLRS will link the individual elements within each battlefield functional area (maneuver control, intelligence/electronic warfare, fire support, air defense and combat service support). EPLRS will serve as the foundation for data distribution in the Army division, brigade and lower echelons and will service a large portion of corps data distribution requirements. The exchange of battlefield information, in near real time, between the battlefield functional areas, allows a degree of

interoperability currently impossible with other systems.

Soldiers in Avengers, M-1A1 tanks, Bradley fighting vehicles or tactical operations centers can receive air threat warnings from the forward area air defense (FAAD) units, initiate a field artillery fire mission and display maneuver and intelligence data pertinent to their mission. The EPLRS has other capabilities not found in other data transferring radios such as network management, communications architecture, high-tech communications techniques and anti-jam capabilities. EPLRS also provides automatic position location and identification and a variety of navigational services. These additional capabilities, referred to as EPLRS services, can be used by individual users, command and control centers, or a combination of different functional areas for battlefield synchronization.

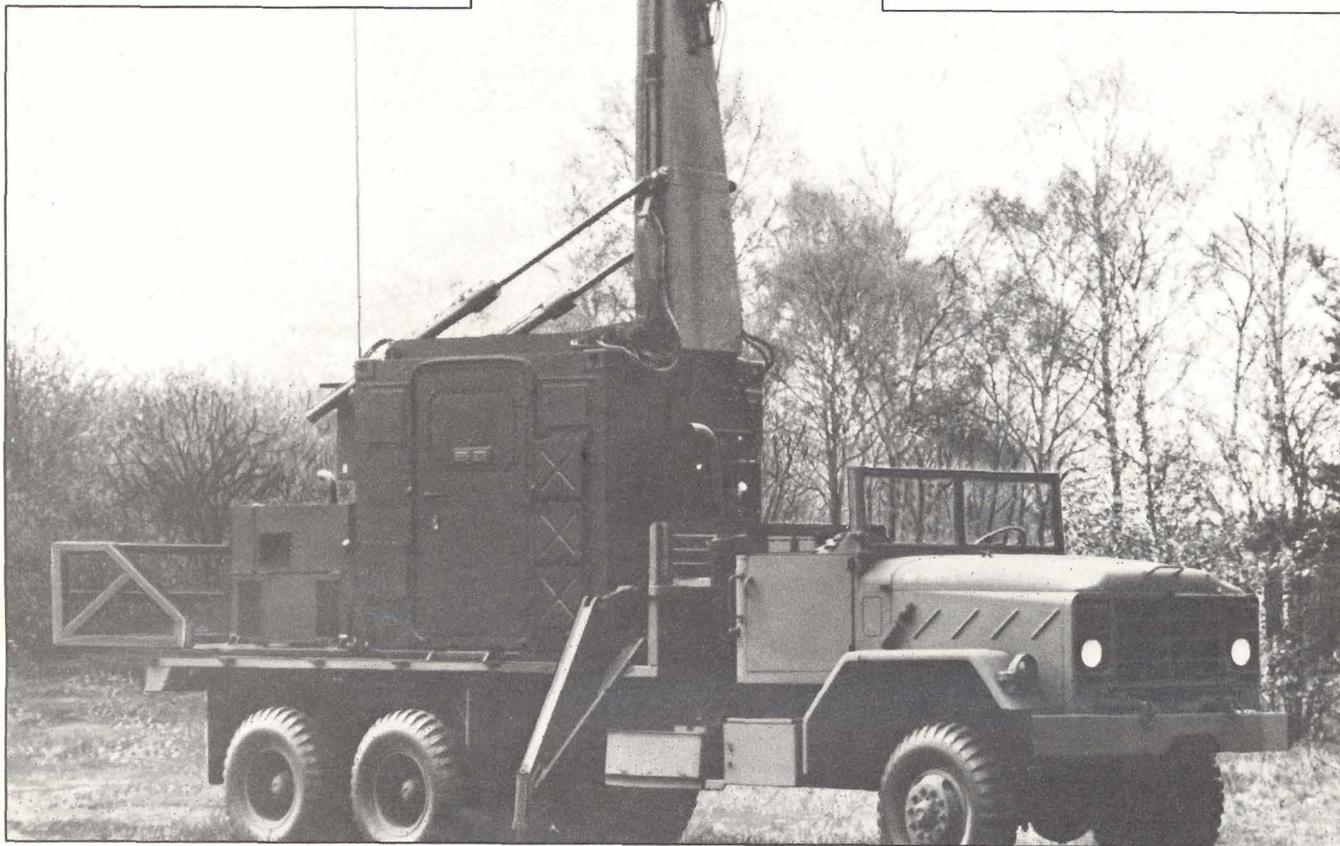
There are two basic EPLRS elements: the net control station (NCS) and the EPLRS user unit (EPUU). Contract options, if exercised, will initially produce eight NCSs and 1,843 EPUUs.

The Army plans to deploy up to four single NCS communities in support of a division area of opera-

tions. The NCS, a fully militarized shelter that houses the EPLRS network management facility, will be deployed with each brigade, division and attached signal battalion. The NCSs are currently configured in S-280 shelters installed, operated and maintained by the signal organization. Plans are to downsize from the S-280 to an S-250 shelter. Each NCS controls and monitors the operation of a network consisting of up to 250 EPUUs.

The NCS serves as the focal point for automated technical control and network management of the EPLRS community. The NCS also provides automatic processing of position location, navigation and identification requests and exchanges data with other NCSs to ensure continuity of operations.

At a maneuver brigade tactical operations center, the NCS computer hardware and software can be configured to receive a wide range



of information. The NCS electronically displays friendly deployments on a map background complete with air defense and field artillery support overlays.

The 24-pound EPUU radio set is a lightweight, manportable unit that gives the user the ability to access EPLRS services and data transfer when hooked to a data terminal. The radio set can be carried on soldiers' backs, may be mounted in vehicles and shelters (such as trucks and tanks) or may be installed in fixed- or rotary-wing aircraft.

The ADA battalion in heavy divisions will employ about 120 EPUUs. The EPUUs will provide data communications for air tracks from sensors to firing units as well as command and control from air battle management operations centers (ABMOCs) to batteries to platoons and to firing units.

Let's imagine a soldier carrying his radio into battle. What can an EPUU do for him? Is it worth carrying on his back, taking up space in his HMMWV, Bradley fighting vehicle, shelter or tactical operations center? Can it ensure the six battlefield basics: survivability, reliability, flexibility, speed, security and synchronization?

When the soldier turns on the radio, he is automatically entered into the network. Now, the soldier can transmit or receive data communications via a tactical computer such as a handheld terminal unit connected to the EPUU. He also has access to numerous EPLRS services through the user readout device.

Through a capability referred to as notices, the EPUU-equipped soldier can receive common information such as current challenge and password, current edition of the signal operating instructions, operation movement times or weather data.

The EPUU on the soldier's back, in his vehicle and in his aircraft maintain the same time as all other

EPUUs in the division. This ensures precise timing so that aviation assets and field artillery fire support can be closely synchronized with ground maneuver forces. He no longer has to reset his watch before an operation to ensure that everybody has the same time.

The soldier can request navigation assistance to any point on the map or EPLRS-equipped unit, day or night, in many types of weather and receive automatic updates. The soldier can also send free-text messages up to 10 characters in length. A MEDEVAC helicopter can receive automatic updates of his location, even as he moves to rendezvous in a safer area.

Equipped with the same type of radios, scout and attack helicopters in transit for a combined arms operation can receive air corridor guidance and alerts to ensure safe passage to the battle area. Aviation elements with EPLRS radios have the same capability as ground users, allowing a high degree of synchronization with ground forces.

The EPUU provides position locations to friendly units but not to the enemy. The EPUU is not a "constant emitter." Transmissions are in bursts of less than one-1000th of a second, and are separated by one or more seconds. The radio signal is spread across a wide spectrum.

This means that the signal looks like background noise, especially when many radios are operating in the same area. This is true even when soldiers operate the EPUU at high power. Combined with other anti-jamming techniques such as frequency hopping, pseudo noise coding, and interleaving, the enemy would have a very difficult time exploiting friendly transmissions or pinpointing their locations.

If, by chance, one of the EPUUs is captured, the losing unit would inform the NCS. Should a captured EPUU go unreported, the NCS op-

erator, who also tracks unit movement, would be alerted by unauthorized requests for information from the captured EPUU. The combination of tracking and monitoring the unauthorized request would prompt further investigation. The NCS operator can effectively lock out a captured EPUU that is requesting unauthorized information. If the enemy attempts to disassemble the radio, tamper protection automatically renders it useless to them.

Major advances in technology are already being considered for inclusion in EPLRS. One such advance is very high speed integrated circuits that will provide cost and power savings while reducing size and weight.

"EPLRS is the only communications means available to meet the objective FAAD command, control, communications and intelligence (C<sup>3</sup>I) system requirements for passing time-critical air defense information to gunners and command posts fighting the air battle in the forward area," said CWO 3 Ronald E. Jackson, U.S. Army Training and Doctrine Command deputy assistant management officer for FAAD C<sup>3</sup>I. "EPLRS is critical to the objective FAAD C<sup>3</sup>I system," he continued.

"It delivers the real-time air picture to FAAD fire units and to the non-ADA component of the FAAD system, the combined arms initiative. And it provides the means to disseminate time-critical weapons control orders, battlefield geometries and airspace control measures. It also channels acknowledgements back up the chain of command," Jackson added.

The EPLRS contract award is viewed by ADA force designers as a significant step toward the creation of an operable FAAD C<sup>3</sup>I network. Once the Army has selected a FAAD ground-based sensor from among currently competing candidates, the major elements of FAAD C<sup>3</sup>I will be in place.

# 'Yes Sir, I'm Integrated!'

*Sure, everyone says they're integrated, but don't bet on it, warns National Training Center expert*

*by Capt. Mark W. Borreson*

**E**ach time a new rotational unit arrives at the National Training Center, at Fort Irwin, Calif., the observer-controllers go down to the Dust Bowl, a staging area for units preparing for employment, to get acquainted with the leaders and soldiers of the rotational unit. The Vulcan platoon leader, a lieutenant, talks about his parent battalion and how long his platoon has been working with the unit. Then the fateful question: "Is your platoon integrated with this unit?"

The answer is always, "Yes Sir, I'm integrated. They treat me right. I'm always included in everything that goes on here." The answer is too often a different one *after* the rotation.

What the lieutenant normally finds out is he isn't as integrated as he thinks. People get tired and stressed. The combat multipliers, including the air defense platoon, are less important in the minds of the task force commander and the S-3 as the pressure builds. They for-

get to call you when an operations order is being issued or a rehearsal conducted. Engineer priorities for survivability change in the defense to tank-killing systems. As a result, air defense fire units don't get dug in. These are just some things that happen when you're considered an outsider by your supported unit. What can you do about it? Here are some ideas that will help make you a member of the family, so to speak, an indispensable member of the team.

What is integration? *Webster's Dictionary* defines integration as "incorporation as equals into society or an organization of individuals of different groups." A combined arms team is a group of equals with different tasks and capabilities incorporated into an organization for combat. Every unit is important and everybody must act with unified effort to accomplish a given mission.

You may ask, "How do I start to integrate with my supported task force?" The following are some tips from other air defense platoon leaders who have successfully been "The Man."

*Learn maneuver tactics.* One of the most important things you can do is get tactically competent. Learn how elements of a task force conduct operations. How do they conduct offensive, defensive and



**Task force commanders often forget air defense when the pressure starts to build.**

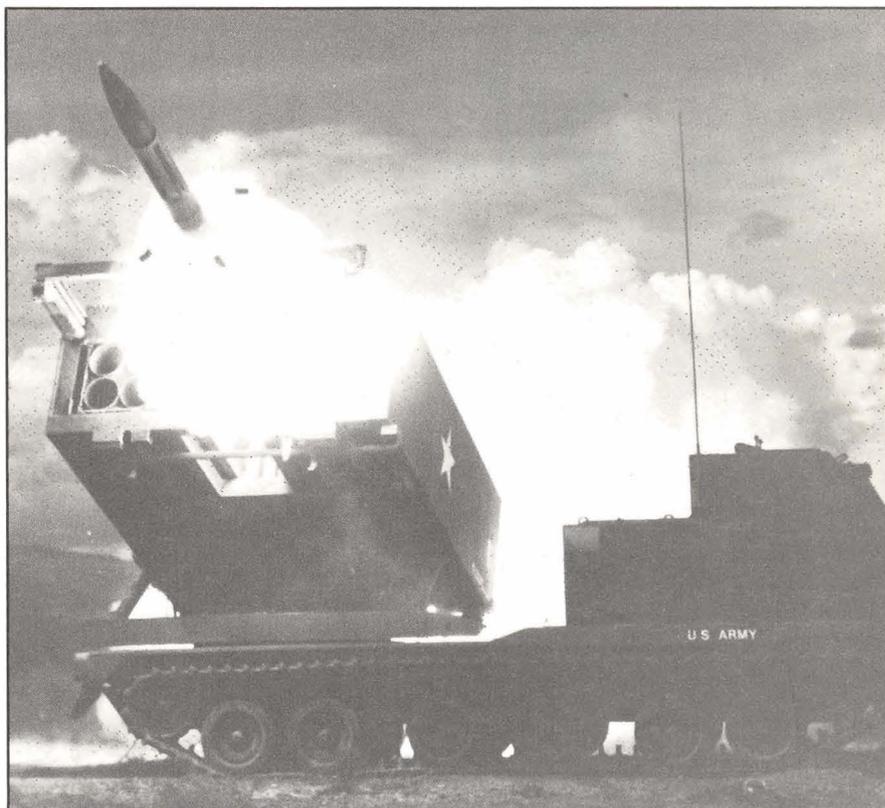
contingency operations? How do they write an operations order? How do they maintain command and control? You can't join in conversation or support a unit until you understand how they do business. Good references to read are FMs 71-1, 71-2 and 7-7J.

*Learn to talk "tank" or "grunt."*

Every profession has its own professional jargon. Just like ADA has its own language, maneuver officers have their ways to describe what they do. You can't explain what your function should be if you can't make yourself understood when you speak. When people don't express themselves in the manner we are accustomed to, we tend to discount what they have to say as unimportant. People tend to shut out what they don't understand or what they feel it isn't important for them to learn. Worse, they may decide you're incompetent and ignore you altogether. The best way to learn the way of the "natives" is to live with them. Some good references for key buzz words are FMs 71-1, 71-2, 7-7J and 101-5-1.

*Know the capabilities of the weapon systems you support.* What is the maximum effective range of the weapons organic to your task force? What type of ammunition do they use? How are the weapons employed most effectively? How long can they operate before they must refuel or rearm? How fast can they travel? How can they contribute to the air defense effort? These are all important questions that affect the way you deploy your ADA assets to defend them against air attack. This knowledge will help you when you and the task force commander develop a detailed air defense priority list. Good references are FM 7-7J, 71-1, 71-2, 101-10-1 and 101-10-2.

*Establish a habitual relationship.* Most CONUS ADA units are located on the same installation with the units they are tasked to defend.



**ADA platoon leaders must know the capabilities of the systems they support.**

Depending on the situation, it isn't always possible to have a habitual relationship. The ideas apply no matter how much time you have to get acquainted with your supported unit. Get into your supported unit's hip pocket. It will help you learn their language. Most units do things a little differently than other units of the same type. It could be SOP-driven or personality-driven by the unit commander. As a new member of the staff, you need to understand how they get things done. Learn the staff planning process. Learn how to build a staff estimate. Don't be different, and don't use jargon they don't understand. Now that you know their language, use it to describe what you do and how you should do it.

The amount of time you spend with your supported unit is important. You have more credibility if they know who you are and work with you regularly. Ways to do this

include attending their officer development classes and spending several days a week working in their offices. You can work on things they need or projects from your parent unit while you are there. The key is to be seen. If they have a question, you're there to answer it. If they have a meeting, you're there to attend. A good reference for staff operations is FM 101-5.

*Stand up for yourself.* Backbone can be your greatest personal asset. An ADA lieutenant is often the low man on the staff totem pole. You are junior in rank and experience. If you're a wimp, others on the staff may take advantage of you. Remember, most task force commanders have captains between them and their lieutenants. Task force commanders aren't used to seeing lieutenants, let alone hearing them speak. You need to understand that most task force commanders have their own ideas on

what should be done with their ADA platoon. However, you may know the correct way to employ your weapon systems. If you're right, stand by your guns; however, if he insists on doing it his way, he is the commander.

*Be a team player.* Team players always get what they need. That goes for staff officers also. Yes, you're a platoon leader. You're also a battalion special staff officer. Those who succeed do both jobs well.

Do your fair share plus a little more in the task force tactical operations center. Help a buddy with his tasks in a crunch. He will remember it and take care of you too. If you don't know when a meeting is, ask. Be proactive in everything. Don't wait for others to take care of you. You will lose, and your soldiers will lose.

*Let your logistics requirements be known up front.* The task force S-4 must know, and you should remind him of, your requirements for all classes of supply. This will depend on your ADA battalion SOP for support of ADA units. Do you support yourself through your battery? Do you require the task force to help you with sustainment? Make sure your needs are clear and concise. Go over your requirements often and restate them when necessary.

*Terrain management.* Where are ADA elements placed in the task force plan? This will depend on current wisdom in both the ADA and maneuver communities. How does your air defense battalion commander want ADA units employed in his area of operations? He probably has coordinated his techniques with the division commander. If you

do it his way, you can't go wrong. Remember the ADA employment guidelines and base your plan on METT-T and a good air IPB.

Once you know where you fit into the task force concept of an operation, go see the man who owns the ground you intend to occupy. Usually he will be a company or team commander. If you have fire units collocated with his company, attend his operations order. Get integrated into his fire plan. Confirm the engineer survivability priorities.

*Team up with your ADA platoon sergeant.* Your platoon sergeant is a key player in your success. You two people are a team. He must know what's going on at all times and be ready to execute all mission preparation tasks in your absence. He needs to be prepared to lead the platoon in combat if something happens to you. He needs to have a good working relationship with the logistics people in the task force. These people include the support platoon leader, the battalion motor officer, the medical platoon leader and the S-4.

These ideas are not the "golden rules" we search for as soldiers to ensure success. However, they will enhance your chances of being a winner.

The key to integration is constant coordination and personal contact with your supported unit. What's important to them should be important to you. If you are integrated, you can't fail because you didn't do your job as part of the task force staff.



**Backbone counts because an ADA lieutenant is often low man on the totem pole.**

**Capt. Mark W. Borreson** is a live-fire air trainer at the National Training Center, Fort Irwin, Calif.

**Contingency Area** — *It's hard to believe that only yesterday you were sitting around waiting for loading instructions on the airstrip back in CONUS. Today, the air is electric with anticipation. The hasty defensive positions the anti-tank sections dug into the sand offer little relief from the sun. Your light force was deployed quickly, and you are being counted upon to stop a rapidly advancing mechanized force.*

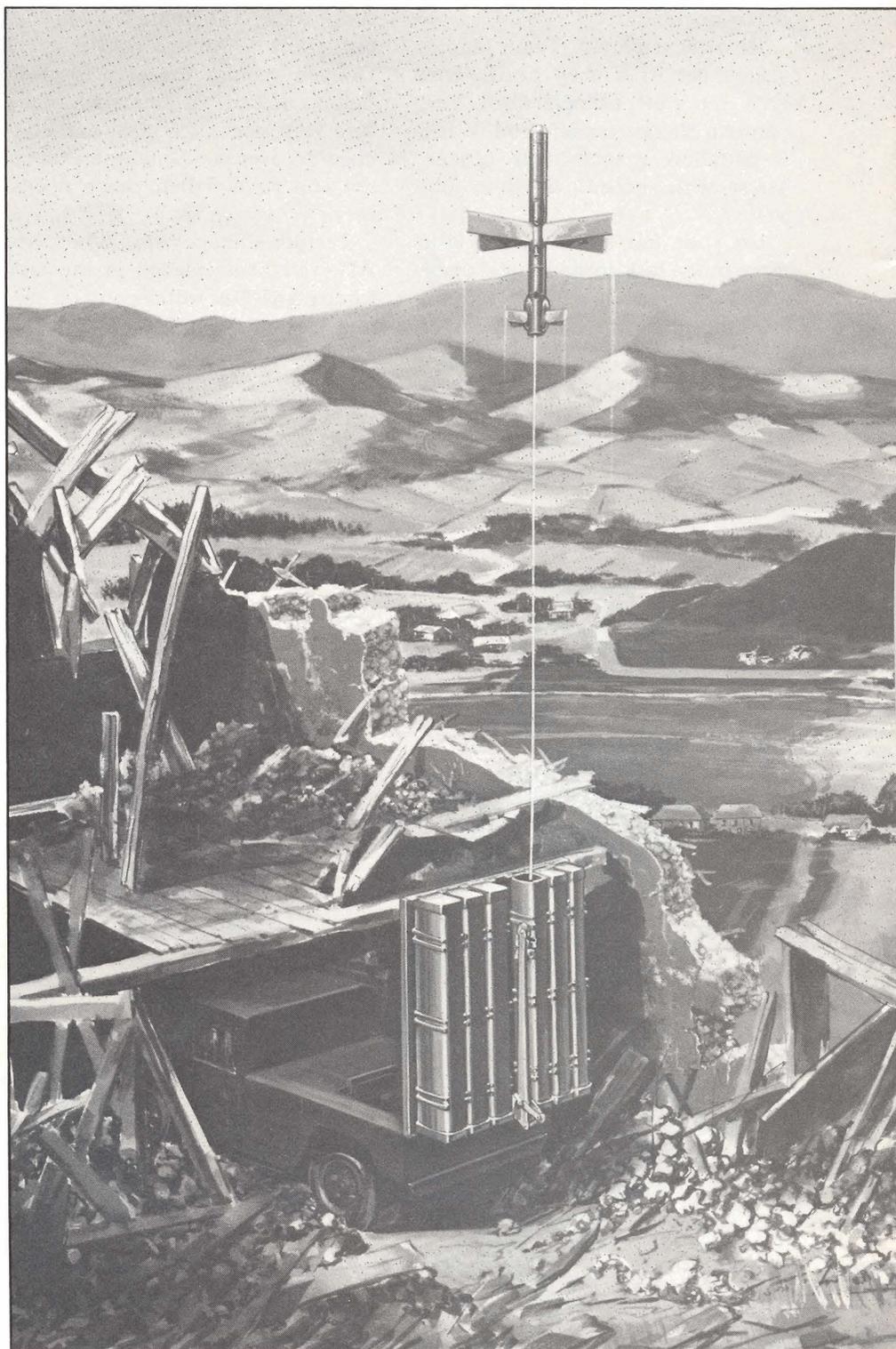
*When your scouts identify the mechanized force more than 10 kilometers out, your ambush force braces for the engagement. Only limited artillery support is available, but you've got an ace in the hole — two supporting sections of NLOS. Already the NLOS gunners have launched their missiles. With deadly accuracy, the fiber-optic guided missiles strike the enemy's leading main battle tanks, cutting the enemy's armor punch down to size. Your artillery fire impacts on target, further depleting the enemy's strength.*

*The enemy commander calls for fire support, and his column surges ahead. Enemy attack helicopters appear as the column moves to within nine kilometers of your ambush site. Playing hide-and-seek, they search for the culprits who have eliminated their tank comrades. The sight of their own highly lethal gunships heartens the enemy column as it presses on.*

*Suddenly, two gunships erupt in flames. The crews of the two surviving gunships search for the source of the mysterious destruction, but there is no enemy to be seen. The gunships hunker lower, using the rolling terrain to hide and move forward. Another NLOS missile strikes a gunship, setting it ablaze, and the fourth gunship, unable to find the air defense force, breaks off.*

*You've stopped an enemy task force in its tracks. You owe your success to a weapon without a name.*

# Wanted: A Name for



# Non-Line-of-Sight

by Maj. Werner Fedako

**T**he scenario on the opposite page introduces a new and upcoming member of the combined arms team, and we are now soliciting the help of soldiers and DoD civilians in naming this new system. Currently referred to as NLOS, for non-line-of-sight, the system uses the Army's innovative fiber-optic guided missile (FOG-M) technology to destroy tanks on the far side of ridge lines or helicopters hovering behind terrain mask.

NLOS is a component of Air Defense Artillery's family of forward area air defense (FAAD) weapon systems, which includes the line-of-sight forward (heavy) (Martin Marietta's ADATS), the line-of-sight rear (Boeing's Avenger) and the FAAD command, control and communications component. Although Air Defense Artillery has the lead in NLOS development, testing and evaluation, the Army is exploring a variety of combined-arms applications and NLOS may also be fielded to Field Artillery, Armor and Infantry units.

Gen. Maxwell Thurman had NLOS in mind when he challenged Army leaders to adapt a more visionary approach to new weaponry. "We are not good at seizing the initiative on revolutionary ideas for armament. The FOG-M story is one in which we waited too long to visualize the opportunity."

Pioneered by U.S. Army Missile Command (MICOM) engineers, FOG-M technology relies on a tiny strand of plastic-covered glass similar to the material the telephone industry uses in new telephone cables. The new fiber-optic cable carries thousands of times more data than conventional cables, and is immune to many of the countermeasures that plague today's weaponry. The FOG-M program began in 1983 as



an anti-tank technology demonstration at MICOM's Research Development and Engineering Center (RDEC), Redstone Arsenal, Ala. RDEC engineers set out to prove they could develop, in-house, a missile system using a fiber-optic link to give a gunner, safely hidden from sight, missile flight control and a real-time view of the battlefield.

Its elegantly simple technology, relatively low price tag and impressive performances quickly made FOG-M something of a media darling. *U.S. News and World Report* billed FOG-M as the "Little Missile that Can," and even the CBS news magazine, *60 Minutes*, lavished praise on the NLOS system in a segment otherwise devoted to chastising the weapons procurement bureaucracy.

Most of the excitement was generated by videotapes that showed FOG-M scoring direct hits on moving tanks and helicopters. Following a short session on a FOG-M simula-

tor, a corporal who had never before seen the system took the controls during a live-fire test and demolished a stationary helicopter on his first try.

Since each of the Army's combat arms has an obvious stake in the destruction of hostile tanks and helicopters, the MICOM engineers expected the combat arms to embrace FOG-M technology with open arms. This, however, was not to be the case. Instead, the technology that gave birth to NLOS languished on MICOM drawing boards for years while MICOM engineers struggled to bring it to the attention of force designers. The problem was that most of the combat arms were already locked into their respective modernization programs. Air Defense Artillery was an exception.

Mounted on a high-mobility, multipurpose wheeled vehicle (HMMWV), the NLOS tactical system consists of six missiles, an on-board target acquisition device, a

ground control gunner's station and fiber-optic cables that link each missile to the gunner's station. After launch, the NLOS missile levels out for flight. Video images, virtually immune to jamming, are transmitted to the gunner's station via the thin fiber-optic cable paid out behind the missile like line from a fishing rod's spinning reel. This allows the NLOS gunner, in comparative safety, to view the battlefield. He sees what the missile sees on the TV screen in front of him in his HMMWV. The gunner assesses the scenario, selects a target and enters commands that send the missile on its way to intercept.

During the entire flight, the gunner is able to see the area below and in front of the missile. This imagery, produced by a TV or imaging infrared camera in the missile's nose, is transmitted down the optical fiber and appears on the gunner's monitor. If he wants, he can move the camera's field of view left, right, up or down. When the gunner detects what he thinks might be a target, he uses the camera to zoom in for positive identification. Upon identifying a target as hostile, the gunner places a track gate on the target. The missile then automatically tracks the target to intercept. The gunner can fine tune the aim point to hit the target at its most vulnerable point. The gunner can also take over manual control and guide the missile to intercept.

Since the missile flies well above the terrain, it is able to "see" targets hidden from direct-fire weapons behind hills or other obstructions. NLOS can launch missiles at predetermined intervals and the gunner can have several missiles — each at a different point in its flight — in the air simultaneously. The image from the missile's seeker is automatically recorded in the fire unit and can subsequently be played back for damage assessment, battlefield intelligence and training purposes.



Despite successful FOG-M technology demonstrations, system management officers warn that NLOS requires additional work before it is fully ready to fight, win and survive on the AirLand battlefield. Tactics, doctrine and techniques of employment are being developed.

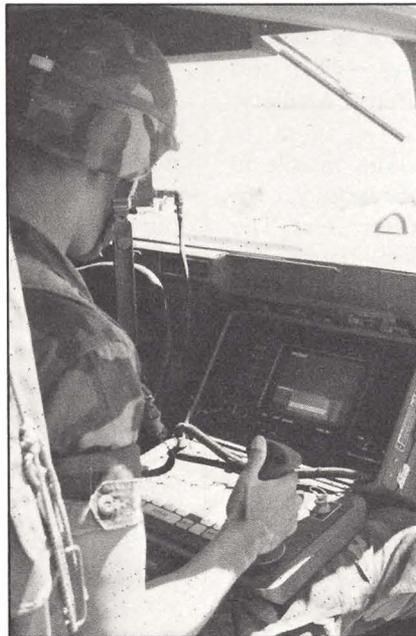
To date, the NLOS ongoing extended user employment (EUE) tests include successful testing of NLOS' multiple launch, multiple target and dogleg engagement capabilities. The ongoing full-scale development activity will ensure that NLOS can work reliably in all battlefield environments and weather conditions and that the training devices and other equipment to mass produce and support it in the field are in place. The NLOS acquisition plan begins force development tests in FY91 and will result in a well-tested system for presentation to Army officials by FY94. The Army plans to equip the first unit with NLOS in 1996.

Currently, NLOS is a system blessed with pizzazz but burdened with a nomenclature as numbing as Novocaine. When the Army neglects to provide a new weapon system with an official nickname, soldiers invariably apply a nickname of their own choosing. For example, when the Army failed to come up with an official alias for the M-42 Self-Propelled Antiaircraft Gun, GIs promptly dubbed it the "Duster." Some say the nickname was suggested by the dust kicked up at the point of impact by Duster's exploding 40mm projectiles. Whatever its origins, the nickname gradually crept into field manuals and military history.

Naming a weapon appears to be more art than science. Dead generals (Sherman, Sheridan, Abrams), birds of prey (Hawk, Eagle, Osprey, Chaparral) and Greek gods (Nike, Hercules, Ajax) are safe, but overworked categories. The feminization of the Army could give the edge

to entries with a feminine twist (Athena, Amazon, Molly Pitcher, Gun Moll). Names should present a positive rather than a negative (Condor vs. Vulture) image and a martial rather than a passive (Wolverine vs. Possum) image.

The Army invites soldiers and DoD civilians to submit suggested nicknames directly to the NLOS Program Management Office. The soldier or civilian who presents the



winning suggestion will be rewarded with a \$100 savings bond, a plaque bearing a photograph of the NLOS system and a letter of recognition.

Contestants are limited to one entry. Entries must be no longer than two short words and should characterize the mission and operational qualities of the vehicle. Entry blanks may contain no more than one suggestion.

Mail your entry to: NLOS Project Management Office, ATTN: Name Contest Coordinator, Redstone Arsenal, AL 35898. The contest deadline is Jan. 1, 1991. In case of identical winning entries, the entry with the earliest postmark will be designated the winner.

The entries will be evaluated by a distinguished panel: Maj. Gen. Donald M. Lionetti, chief of Air Defense Artillery; Brig. Gen. Robert Drolet, air defense program executive officer; Oleh B. Koropey, NLOS project manager and NCO soldier representatives from Fort Bliss, Fort Benning and Fort Sill.

**Maj. Werner Fedako** is the U.S. Army Training and Doctrine Command system management officer for NLOS.

## NAME THAT NLOS CONTEST

Please enter my suggestion in the "Name That NLOS" contest.

Suggestion \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Mail to:**

NLOS Project Management Office  
Name Contest Coordinator  
Redstone Arsenal, AL 35898



## VAPOR TRAILS

### **Patriot Milestone**

Patriot has reached the halfway point in deployment with the addition of three batteries — D, E and F — to the 3rd Battalion, 43rd Air Defense Artillery, Fort Bliss, Texas.

The three batteries each fired a Patriot missile to mark graduation ceremonies and successfully conclude 14 weeks of collective training at Fort Bliss. The 3-43rd ADA thus becomes the first full six-battery Patriot battalion to be trained and deployed.

When deployment is complete in 1994, Patriot will have seven full battalions in the Federal Republic of Germany and three full battalions in the United States.

Patriot was first deployed at Fort Bliss in July 1983 with the 1-43rd ADA and subsequently with the U.S. Army in Europe in March 1985. Today Patriot constitutes the backbone of NATO's air defenses in Europe. The system has been purchased by the Netherlands, West Germany, Japan and Italy.

### **Truth in Testing**

Inside the turret of the Avenger the soldier was definitely having problems.

The heat was almost unbearable; sweat dripped off his face. He wrapped rags around the turret's hand-grips to keep his hands from burning.

His growing restlessness and physical discomfort obviously distracted him from his primary mission: detecting targets and engaging enemy aircraft.

This videotaped scenario was the product of an over-the-shoulder mounted camera inside the Avenger at Fort Hunter Liggett, Calif. In this situation the camera measured human factors engineering, which deals with the interaction of soldier-operators and the technology with which they are working.

As part of the forward area air defense (FAAD) system, Avenger was undergoing an initial operational test and evaluation by the Test and Experimentation

Command (TEXCOM) Experimentation Center (TEC), Fort Ord, Calif.

As with all tests conducted by TEXCOM, human factors engineering provides critical data.

More specifically, human factors research is predominantly a psychology-engineering partnership aimed at increasing systems' efficiency between the human and the machine.

A research psychologist in the TEC Directorate of Testing and Experimentation, Robin Hobbs, conducted human factors testing for the Avenger. Hobbs explained that human factors testing is part of the manpower and personnel integration (MANPRINT) program.

MANPRINT consists of several components — human factors engineering, safety, health hazards, personnel training and manpower. In a recently published article in the *Army Research, Development and Acquisition Bulletin*, Dr. James Geddie, field representative of the U.S. Army Human Engineering Laboratory, TEXCOM Headquarters, Fort Hood, Texas, wrote about the MANPRINT program.

In his article, Geddie wrote that of all the elements in the MANPRINT program, human factors engineering is the only domain that offers a direct way to influence hardware design — a point well-illustrated by the TEC Avenger tests. As with most systems, a great deal of technical, safety and laboratory testing took place before the Avenger was put into the hands of the soldier.

"We always find additional problems with the hardware when we are in a field environment. This is because there is a big difference between testing done in a very controlled environment and testing done out in the field," Hobbs said. "One of the problems we found in testing the Avenger was that soldiers didn't receive adequate training on how to adjust the FLIR (forward looking infrared). The FLIR is a target acquisition system.

"The soldiers in the turret couldn't see the infrared

## VAPOR TRAILS

target image well. The problem was in the adjustment of the contrast between the target and the background. In this case, it was a human training error and not a system problem," Hobbs explained.

Sometimes the error discovered is in training and can easily be corrected by adjusting the training program. Other times, Hobbs said, the problem may be in hardware design, such as the lack of air-conditioning inside the Avenger turret.

"Because the turret is encapsulated, the soldier operating the equipment experiences a greenhouse effect and the temperature inside the turret becomes a health hazard," Hobbs said.

Feedback from soldiers involved in tests is vital to finding the truth. During the Avenger test, the camera videotaped the soldier as he conducted a prescribed action. TEC testers and data collectors reviewed the tape, then brought in the soldier to describe his or her first-hand impressions of what happened as they viewed the tape again. This type of memory cueing is a critical element of the human factors engineering, Hobbs explained.

According to Geddie, this "soldier-in-the-loop" approach to test and evaluation acknowledges the influence of the human operator and his or her performance on total system effectiveness and reliability.

— **TEXCOM Public Affairs**

### Stinger Shoot

Vying for the chance to fire a live Stinger missile, three teams from each major subordinate command of III Corps competed in the Annual Stinger Competition held at Fort Hood, Texas. Twenty-one teams were evaluated with a written test, visual aircraft recognition, target tracking and moving target simulator engagements.

Following the first three days of competition the field narrowed down to the seven best teams, each consisting of a team chief and gunner. The competition ended with awards being presented in four categories: Top Team Chief, Top Gunner, Top Team and Top Unit.

The top team chief was Sgt. Nathan Broussard of the 5th Infantry Division (Mechanized), Fort Polk, La.; first-place gunner award went to Spec. Mark

Burton, 1st Infantry Division, Fort Riley, Kan.; and the first-place team award went to the 5th Infantry Division (Mechanized). Three teams from 3rd Armored Cavalry Regiment, Fort Bliss, Texas, achieved the highest unit average with 95.4 points and were presented the "Top Unit" award.

### Little Returns

Brig. Gen. John H. Little returned to Fort Bliss this fall to be Deputy Commanding General and Assistant Commandant, United States Army Air Defense Center and Fort Bliss. Little's past assignments include Deputy Chief of Staff for Combat Developments,



**Little**



**Garner**

U.S. Army Training and Doctrine Command, Fort Monroe, Va., and Director of Combat Developments and Commander, 56th Air Defense Artillery Brigade, Fort Bliss. Little succeeds Brig. Gen. Jay M. Garner, who departed for his assignment as Deputy Commanding General of U.S. V Corps, U.S. Army Europe and 7th Army.

### Army to Develop ASAT

In its Milestone I Decision, the Defense Acquisition Board authorized the U.S. Army Strategic Defense Command's (USASDC's) Anti-Satellite Joint Program Office and the Army to continue as lead service for the development of a land-based kinetic energy ASAT weapon system over a Navy-led sea-based option.

The kinetic energy ASAT joint program office, established Feb. 27, 1989, at USASDC, takes advantage of the command's established support structure

# VAPOR TRAILS

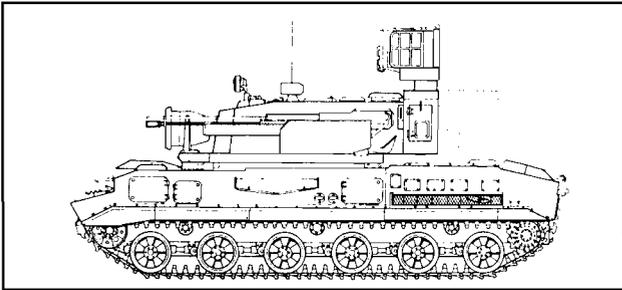
and expertise in developing technology for ground-based kinetic energy interceptors.

The current ASAT program will benefit from experience gained from the Army Zeus and Air Force Thor ASAT systems (operational from 1963 to 1975), the F-15 air-launched ASAT (successfully flight tested) and the ongoing developments of the Strategic Defense Initiative.

— *The Redstone Rocket*

## 2-S6 Antiaircraft Tank

The Soviet 2-S6 antiaircraft tank, known as *Tunguska* to Soviet troops, has two twin-barrel 30mm guns



(range 3km, rate of fire 500 rounds per minute, design similar to that of the BMP-2) and eight SA-19 missiles (range 7 to 10km). The surveillance and tracking radar has the NATO code name Hot Shot. The chassis is derived from the MT-S armored tractor.

— *International Defense Review*

## Iceland Air Defense

Hughes Aircraft Ground Systems Group has received a \$77 million competitive contract from the USAF Electronics System Division to build a new NATO air defense system for Iceland. Hughes is a subsidiary of GM Hughes Electronics.

This advanced, state-of-the-art system will provide command, control and communication systems to improve the overall air defense capabilities of Iceland and the surrounding North Atlantic region monitored and protected by NATO forces.

The Iceland Air Defense System will consist of a control and reporting center located at the Keflavik

Naval Air Station, an alternate control and reporting center collocated with the Iceland software support facility and a voice and digital system providing on- and off-island communications.

Adjacent air defense systems in Norway, the United Kingdom, Canada and the United States will be networked into the system, thus linking the existing North American system and NATO Air Defense Ground Environment serving Western Europe.

Hughes will use a new generation of technology to build Iceland's new system. The overall open system architecture allows for growth and addition of any standard hardware meeting internationally recognized standards.

The data processing equipment will be based on the Digital Equipment Corporation line of commercial computers. It will be the world's first major air defense system implemented with the Ada software language.

Hughes will supply operator workstations based on its AMD-44 product line. The AMD-44 workstation is a flexible system using a full-color, high resolution (four million pixels on a 20- by 20-inch screen) display. Hughes is also using a version of the AMD-44 for its Canadian air traffic control system.

— *Hughes Aircraft Company*

## Air-to-Air Stinger

*A troop of AH-64 aircraft crosses the forward line of own troops on their way to conduct a deep battle operation. Suddenly, a MiG-27 appears from above. Little does the MiG pilot know, an OH-58C is prepositioned at the passage point and prepared to defend the position with his Stinger missile system.*

This scenario will soon be possible for the aviation community at Fort Hood, Texas.

Currently, Dyna Corp's Project OLR at Killeen Airport has begun to retrofit a number of OH-58C aircraft with the air-to-air Stinger (ATAS) missile system. The ATAS system is a defensive air-to-air weapons system developed for OH-58C helicopters.

The weapons system supports two Stinger missile rounds and effectively controls their launch via commands from the helicopter fire control system, operated from the pilot's station. The sighting system is

## VAPOR TRAILS

compatible with all modes of flight, including the night vision goggles (AN/AVS-6).

Initially the aircraft will come from Project OLR with just the wiring and the hardpoints (mounting points) for the ATAS weapon system installed. In November a new equipment training team will arrive at Fort Hood to complete the system installation and personnel train up. Once installed, the system will be capable of firing all configurations of the Stinger missile. Additionally, the ATAS system will use the same kick motor missile as the ground launch units, allowing for greater diversity on the battlefield.

— Thomas E. Brown

### No Tail Rotor Helicopters

McDonnell Douglas' MD 520N five-place commercial helicopter, which features the NOTAR™ no tail rotor system, has joined its sister ship, the MD



530N, in flight tests. The two aircraft, being produced by McDonnell Douglas Helicopter Company in Mesa, Ariz., are expected to be certified by the Federal Aviation Administration later this year. They represent the first conventional production helicopters to fly without the use of a tail rotor. Both helicopters are equipped with the new NOTAR™ system, which uses pressurized air to provide anti-torque and directional control.

— McDonnell Douglas

### 1-52nd ADA Goes to Pacific Thunder

*"ABOUT TO ENGAGE SINGLE-SHOT. COUNT-DOWN TO FIRE — FIVE, FOUR, THREE, TWO ONE. FIRING.*

There was a moment of silence followed by a thundering supersonic boom as the missile sprang from the launcher to intercept the "hostile" target. The white smoke signature allowed the crews to trace the missile, flying at a velocity in excess of Mach 2, as it sped toward its target 20 kilometers away. Finally, a voice pronounced "hostile threat terminated."

This scene was repeated two more times that same day as Lt. Gen. C. A. H. Waller, commanding general, and CSM Richard Kidd of I Corps; and Col. John Costello, commander, and CSM Larry Gunnels of the 35th ADA Brigade looked on. The event: 1st Battalion, 52nd Air Defense Artillery's annual Hawk missile live-fire exercise called Pacific Thunder. The location: Dugway Proving Ground, Utah. The mission: validate the crews' and equipment's ability to protect the maneuver forces of I Corps by detecting and killing hostile aircraft. All units were declared combat capable. A and C Batteries achieved honor battery status by scoring in excess of 95 percent in scored phases.

Months of planning and training paid off in a clear demonstration of the battalion's ability to make an extensive deployment, accomplish the air defense mission and execute redeployment to Fort Lewis with a minimum of equipment malfunction. Augmented by an element of 30th Ordnance Company, four convoys totaling 70 vehicles, 30 towed loads and 171 soldiers departed on an odyssey that culminated in a 12-day, 2,000-mile round trip exercise.

Pacific Thunder was a four-phase operation consisting of preparation, deployment, firing and redeployment. The preparation phase was characterized by crew competitions, repetitive wringouts of the Hawk system and conventional equipment convoys.

Headquarters and Headquarters Battery, 1-52nd ADA Stinger platoon, also had an opportunity to aggressively demonstrate their warfighting skills. Four Stinger teams executed a tactical deployment to Yakima Firing Center, Wash., to participate in a Redeye live-fire exercise. All three Stinger teams achieved tactical kills. Team chief Sgt. Tony Little and gunner Spec. Adam Batteese set the example for other crews by scoring the first direct hit on the LFX.

Once again the soldiers of 1-52nd ADA proved the battalion motto — ALWAYS PREPARED!

# RAIDES

*Rapid air defense evaluation system gives air defense commanders  
new battlefield analysis tool*

*by Capt. Kenneth W. Hodgens Jr.*

**T**oday's dreary climate of force restructuring and funding shortages makes it imperative that a developer prove the worthiness of his product early on to survive Congressional scrutiny. The development of the Rapid Air Defense Evaluation System (RAIDES) supports this claim. RAIDES, even now being employed in Operation Desert Shield, has evolved from concept to mature tactical air defense planning tool in a very short time and at a fraction of the cost of most existing tactical decision aids.

RAIDES owes much of its success to three organizations. The Joint Tactical Fusion Project Office (JTFPO), McLean, Va., and the program manager for Air Defense Command and Control Systems (PM ADCCS), Huntsville, Ala., provided expert guidance. The Army Development and Evaluation Agency (ADEA) furnished dedicated support to RAIDES development through iterative experimentation at the Army Tactical Command and Control System Experimentation Site, Fort Lewis, Wash.

RAIDES was developed by Systems Control Technology, Inc. (SCT), Palo Alto, Calif., under an existing SCT/U.S. Air Force Europe contract through the JTFPO. By using the existing software algorithms that are embedded in the SCT-developed U.S. Air Force Level Automated Planning System, the

developer reverse-engineered the capability to perform automated tactical air defense planning to meet U.S. Army ADA user needs.

The software is hosted on the AN/TYQ-37 Portable All Source Analysis System Workstation (PAWS), developed by Martin Marietta under contract through JTFPO. The system is currently deployed as an intelligence gathering and analysis tool that hosts Linked Ops1-Intel Centers Europe software at 32nd Army Air Defense Command headquarters and its subordinate unit locations.

RAIDES' primary function is to help the air defense planner deploy assets to defend selected priority target areas and portray the resulting air defense posture graphically to the air defense commander. The program displays friendly air defense, including surveyed sites and enemy airfields, over a digital map background.

Using stored, updated data bases containing radar defense and threat parameters and characteristics, RAIDES software algorithms compute and display, in real time, the cumulative relative effectiveness of Army air defenses, taking into account terrain elevation masking effects, while automatically computing and displaying likely enemy air attack routes. The air defense commander quickly sees where his air defense weaknesses are and then optimizes his resources by using the RAIDES system software's "what

if" capabilities. Once SCT had delivered the three additional builds of software, proponent responsibility for RAIDES development transferred to PM ADCCS in FY89.

Air defense planners from the 35th ADA Brigade and 1st Battalion, 44th Air Defense Artillery, tested RAIDES in October 1989. In January 1990, the air defense brigade deployed the PAWS/RAIDES combination to Japan for Exercise Yama Sakura '90. ADEA used the experimentation results to provide the proponent with invaluable data that has led to a refinement of the RAIDES software and has firmly established the need for a RAIDES capability in the air defense automated command post.

Future experimentation with RAIDES will focus on further user interface under operational conditions to refine capabilities and integrate RAIDES into the automated command post environment.

RAIDES gives air defense planners an unlimited capability to plan for contingency deployments anywhere in the world. Its developmental history testifies that, even though the defense dollars are shrinking, quality products that speed up the planning and decision process can and are being produced through the ingenuity and foresight of creative individuals.

**Capt. Kenneth W. Hodgens Jr.** serves with the U.S. Army Development and Evaluation Agency, Fort Lewis, Wash.

*Designing C3 Systems for the Future*

# TELOS HAS THE TOTAL LIFE CYCLE PERSPECTIVE

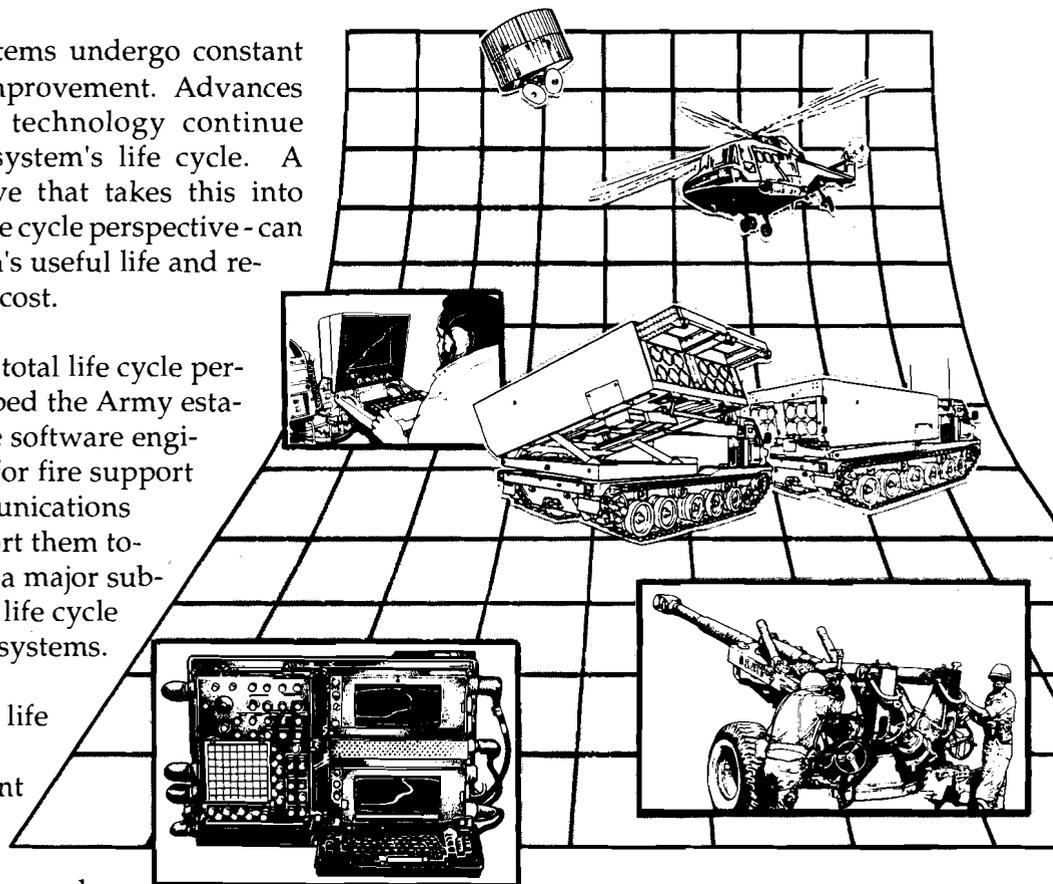
Army C3 systems undergo constant evaluation and improvement. Advances in doctrine and technology continue throughout the system's life cycle. A design perspective that takes this into account - a total life cycle perspective - can extend the system's useful life and reduce its life cycle cost.

Telos has this total life cycle perspective. We helped the Army establish the life cycle software engineering facilities for fire support (1978) and communications (1983), and support them today. And we are a major subcontractor for the life cycle support of I/EW systems.

We apply this life cycle perspective to the development of software for new C3 systems, including the Advanced Field Artillery Tactical Data System and the All Source Analysis System. We have completely redesigned the Multiple Launch Rocket System and Lance Missile Fire Direction Systems, combining them into one maintainable and efficient package.

As C3 systems technology has evolved and grown, so has Telos. We have become experts in the Ada language and design methodology, and have implemented specialized techniques to manage simultaneous development of interoperating systems. MANPRINT helps us simplify the man-machine interface and integrate training and documentation into our design process.

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