AIR DEFENSE ARTILLERY

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AIR DEFENSE ARTILLERY

PATRIOT...20

The Patriot missile system is highlighted in the special section beginning on Page 20. Air Defense Artillery wishes to acknowledge Maj. Edwin W. Mazzanti of the Patriot Project Office, Redstone Arsenal, Ala.; Patriot TRADOC System Manager Office, Fort Bliss, Texas; and Tactics Department, USAADASCH, Fort Bliss, Texas. Their assistance made the "Patriot" feature section possible.

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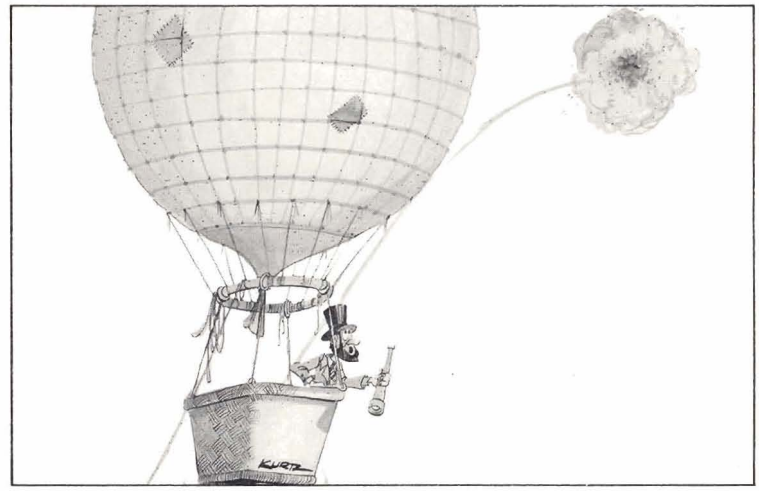

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Intercept Point

Since Patriot is the cornerstone of the theater army's integrated air defense, a pebble cast into the Patriot pond sends ripples throughout Air Defense Artillery. The January deployment of the first oversea Patriot battalion is fraught with significance for all air defense artillerymen. It signals the beginning of a new era in which Air Defense Artillery, its arsenal strengthened by high-tech weaponry, will establish unchallenged credentials as a full-fledged member of the combined arms team.

The arrival of the 4th Battalion, 3rd Air Defense Artillery, in West Germany culminates almost two decades of effort by the air defense artillery community to field a system capable of meeting the modern threat. A special report in this edition of *Air Defense Artillery* tells much of the Patriot story. The 22-page section describes the system and its role on the air-land battlefield, but it doesn't tell how Patriot has become the catalyst for a new approach to fielding weapon systems that will become a model for the deployment of future weapon systems.

Patriot has been measured against the toughest criteria ever established for an Army weapon system, a "milestone" procurement and deployment program that sets new standards for the fielding of Army weapon systems.

Under the old way of doing business, the Army fielded new weapon systems in accordance with the initial operational capability (IOC) concept. The IOC target date was the date that the unit, normally a battalion or battery, equipped with the new weapon system was expected to achieve operational capability. This concept was, in essence, based upon the manufacturer's prediction of when production models of the new system would begin rolling off the assembly line.

The Patriot program and the old IOC methodology, however, met head-to-head during Follow-on Evaluation (FOE) II, which was conducted in June and July 1983. The equipment didn't work as advertised. System experts forecast that the shortcomings could be corrected in five weeks. But the Army leadership and the air defense artillery community were not satisfied that the shortcomings could be corrected in such a short time. Instead,

Major General James P. Maloney

the Patriot program was taken off the IOC concept and placed on a milestone schedule.

The Patriot milestone concept was a three-step process designed to guarantee the system would be fielded only when it was proven beyond doubt that it would work as designed, that the soldiers were trained to operate and maintain it, and that it could be logistically supported. The Patriot milestone plan, approved by senior Department of the Army officials, featured three basic milestones.

Milestone I required U.S. Army Air Defense Artillery School certification that the TOE-authorized complement of soldiers and equipment was ready to begin the 16 weeks of collective training required of all newly activated Patriot battalions. This meant that the Air Defense Artillery School had to be satisfied that the equipment worked properly and could be supported throughout both collective training and the 14-week FOE III. No target date was established for Milestone I; it was to be considered achieved only when the necessary conditions were met.

Milestone II was the battalion's successful completion of 16 weeks of collective training. Specific standards were developed for use as a yardstick to measure training effectiveness. The Air Defense Artillery School designed a "center certification" which combined portions of the Patriot ARTEP with the scoring methodology of NATO tactical evaluations.

Milestone III was the successful completion of Follow-on Evaluation III which, like FOE II, was conducted by the U.S. Army Operational Test and Evaluation Agency. Milestone III was passed when the Patriot soldiers and equipment met or exceeded the criteria established by the U.S. Army Training and Doctrine Command.

The milestone program, while simple in concept, presented unique challenges. Since there was no set date for deployment, planners involved in the numerous decisions associated with fielding a new system scheduled to replace older systems were faced with a continuum of deployment possibilities.

For example, the Army is in the process of inactivating the last of the 32nd Army Air Defense Command's (AADCOM) four Nike Hercules battalions. What would be the impact if the Patriot battalions were late in arrival? The 32nd AADCOM's Hawk battalions were scheduled to be phased down. Should that plan be allowed to proceed on schedule? The soldiers needed to man the new Patriot battalions would have to be recruited about 18 months prior to unit activation. Should the rate of recruitment be changed? How? If Patriot was to be delayed, should the construction of Patriot facilities be slowed? Should the resources required for the Patriot training base at Fort Bliss, Texas, be stockpiled or left on the shelf in anticipation of a program change? The Army felt that the benefits to be gained by proceeding with a tough, no-nonsense milestone schedule were worth the risk and, as it turns out, the Army was right. Patriot has passed all the milestones.

The milestone approach to weapon system fielding, meanwhile, is being applied to another new weapon system—the Sergeant York Gun. (See "Sergeant York Back On Track," Page 9.) Air Defense Artillery is fortunate to be the first combat arms branch to benefit from well-conceived milestone deployment schedules that ensure, at several checkpoints, that soldiers are armed with weapon systems that work as they were designed to work.

*

On Track

The Red Army publishes a professional journal titled *Anti-Aircraft Defense Herald* that is the counterpart of the U.S. Army's *Air Defense Artillery*. The Soviet journal reveals threat air defense artillerymen spend a lot of time worrying about the same problems which concern U.S. air defenders. Not the least of these is the importance of making training as realistic as possible.

The following paragraph from an article in a past edition caught my eye: "Tactical exercises permit the maximum degree of approximating a training process to real battle conditions and thereby put into practice one of the underlying principles of combat training—learn that which is necessary in war."

The author, Soviet Air Defense Forces Chief of Staff Col. Gen. S. Romanov, went on to point out that the value of tactical exercises can be degraded by what he called "indulgences and simplifications."

"The increasing demands of modern warfare pose, as never before," General Romanov wrote, "the question of the irreconcilability of indulgences and simplifications when conducting tactical exercises. Indulgences and simplifications tend to create incorrect notions of a modern air defense operation, fail to develop the necessary fighting qualities in the troops and give a distorted ideal of the real training they have received."

The point General Romanov was trying to make is that it doesn't pay to cut corners in training. An old U.S. Army adage puts it another way: The more you sweat in peace, the less you bleed in war.

Air Defense Artillery has often been accused of cutting corners in training because the air threat is difficult and expensive to portray in training scenarios. Air defense artillerymen, it's true, have wrestled with the problem ever since the air threat and the weapons to counter it evolved.

During the horse cavalry days of Fort Bliss, Texas, keeping the mounts off loco weed and finding prairies a trooper could charge across without worrying about his mount breaking a leg in a prairie dog hole may have been a problem. But constructing realistic training scenarios was no problem.

CSM Frederick T. Stafford Jr.

There were Apache war parties to track down in nearby mountain redoubts and Pancho Villa to chase across the Rio Grande.

Instilling realism into the training process, however, became a much more difficult task when National Guard regiments arrived at Fort Bliss in 1940 to train "to shoot planes out of the sky" at the newly established Anti-aircraft Training Center. The New Mexico National Guardsmen of the 200th Coast Artillery (AA) trained with broomsticks and wooden models. Their first live-fire exercise was against Japanese Zeros that strafed Clark Field near Manila at the outbreak of World War II.

Today, the air threat has grown much more sophisticated, but the same technology that goes into new air defense weapon systems, such as Patriot and the Sergeant York Gun, has made approximating the air battle a real possibility. The Patriot troop proficiency trainer, which features embedded computer software that provides "netted" scenarios for engagement control station operators, is but one example. There are many more. A vital element once missing from the simulated battlefield has been added—a multiple integrated laser engagement system (MILES) for aircraft and air defense systems. This year, Air Defense Artillery will spend $28.7 million on aerial targets, including the new generation hostile expendable aerial targets that have dual flight capability and can imitate threat flight patterns.

We have come a long way from broomsticks and wooden models, but our improved training technologies must be accompanied by a renewed dedication to realism in training. It is up to the NCOs responsible for training to see that our new training devices and training technologies are incorporated into unit training that accurately reflects the difficulty and complexity of the air-land battlefield.

A Chaparral battery commander returning from a recent rotation through the National Training Center, noted in his after-action report that "Success at the National Training Center operations rests with squad leader proficiency and initiative." Despite a successful rotation, the unit commander found much to criticize about Air Defense Artillery's performance at the National Training Center. He noted, for example, a lack of enthusiasm on the part of some NCOs for the new forward support role assigned Chaparral by AirLand Battle Doctrine. He blamed the lack of enthusiasm as much on a distaste for the hard work involved as he did on doubts about the wisdom of assigning Chaparral to a forward support role.

Too often we train under optimum rather than adverse conditions. Too often our air defense artillery training seems oriented toward our easiest mission, the protection of static assets, rather than our toughest mission, the mobile defense of maneuver units, a task that requires a great deal more sweat and hard work.

There is only so much the NCO can do to make tactical exercises more realistic. The units we support in tactical exercises, for example, continue to downplay the air threat. But those things the NCO can do make a big difference. We must make every crew drill, every live-fire exercise and every tactical exercise a real school of combat for air defense crews by insisting that soldiers perform their functions in peacetime exactly as they would in a combat zone.

Only in this way can our soldiers learn "that which is necessary in war."

*

Survivor Traits Strengthen Defender

by Sp5 Gary Lindsley

Combine the skills of a hunter-gunsmith with the courage and competitive spirit of a soldier-sportsman and the end result is a survivor. Air defense artilleryman SFC Terry Traylor has drawn on all of these attributes to overcome a life-threatening illness and recapture an abundant life.

When he can't be found in his shop or downrange operating radio-controlled targets for 4th Battalion, 61st Air Defense Artillery, Fort Carson, Colo., he may be found building a new rifle or molding his own ammunition in his workshop at home. If he can't be found there, try Alaska during bear season.

When most youngsters were just finishing kindergarten and learning to play basketball, Traylor was going hunting with his father. "I started hunting with my father around Alpine, Texas, and in the fall I would hunt with my grandfather in Arkansas. We would mainly hunt squirrels, deer and rabbits," said Traylor.

According to the marksman, it was a question of economics in his early days of hunting. "Hunting was how my grandfather filled the refrigerator with meat. But it wasn't just economics that got me involved with hunting. It was also the sport. I love all the elements of being outdoors. I come from a long line of hunters."

Traylor doesn't have to bag his prey to have a successful hunt. Being able to enjoy nature is enough for him. Plus he enjoys the hobbies related to hunting. This outdoorsman started crafting guns after he received his first one at the age of 12. "People began to give me broken-down weapons. I would repair them and resell them."

In his workshop at home, Traylor has several rifles that he made from scratch, including the stocks and barrels. Depending on the type of barrel design, it usually takes Traylor from six to 14 hours to complete a rifle. However, he doesn't stop there. With the required molding equipment and lead, he also reloads the bullets he uses for hunting.

With his tailored weapons and ammunition, he hunts anything from squirrel and antelope to grizzly bear in states ranging from Colorado and Wyoming to Alaska. Traylor can't tolerate hunters who shoot game and leave it to rot. "It takes a lot of work to backpack an elk or deer out of the mountains, but it's intolerable to waste any wild game."

SFC Terry Traylor examines a rifle he made. (Photo by Sp5 Gary Lindsley)

Traylor doesn't use his rifles only for hunting. The last two years he has competed in marksmanship events during Fort Carson's "Ironhorse Week," an annual unit sporting-events competition, and was approached by the All-Army shooting team.

During Ironhorse Week in 1983, Traylor won seven medals, including five gold, one silver and one bronze. However, he didn't think he would be able to compete in 1984's competition due to illness. During a routine medical examination, doctors discovered that he had melanoma cancer.

"Before going through the surgery, doctors at Fitzsimmons Army Medical Center weren't too optimistic. The operation took six-and-one-half hours. But they were surprised at my remarkable recovery. They said the way I had lived most of my life, outdoors, is probably the reason I'm doing so well," he said.

When Ironhorse Week rolled around, Traylor set out to prove to himself that he could still shoot. With the muscles in his shoulders not up to full strength, he won two gold, two silver and one bronze medal. "Knowing I could still shoot was a big confidence builder. My whole life has changed. I have become a lot closer to my family. I realized how important they are to me."

Traylor now plans on going hunting in Alaska to fulfill his life-long dream of bagging a grizzly bear. This, like his other adventures, will require the strength and courage of a hunter, sportsman and soldier.

1/4 ADA's Pen Mightier Than Computerized Supply

by Sp4 Greg Kivett

The 1st Battalion, 4th Air Defense Artillery Battalion, Fort Lewis, Wash., is a Hawk battalion with about $100-million worth of equipment, yet has no computerized supply system. And though assets are cataloged by the traditional, but outdated, property book method, the battalion recently won a quarterly supply award for an unprecedented third time.

This is the second year of competition for the 9th Infantry Division Commanding General's Quarterly Supply Award, and the 1/4 ADA is the only battalion to win the trophy more than once.

Some might consider 1/4 ADA's success surprising since it is one of just three battalions at Fort Lewis that use a property book instead of a computer system. Adding to the victory, accord-

ing to CWO 3 Adolphus Redding, 1/4 ADA's property book officer, is that "we probably have twice the dollar value of the normal battalion. We have missiles, missile launchers, missile loaders and sophisticated radar equipment."

Redding has been the property book officer for all three triumphs, but a different battery has represented the battalion each time. He inspected each of the five batteries in the battalion. Redding looked at absentee baggage files and individual clothing records, inspected hand receipts and checked self-service supply procedures and other functions that make supply an important but tedious responsibility.

As part of the competition, Redding was then inspected by MSgt. Edward Deoskey, G-4 chief supply sergeant. "Deoskey inspected document registers, suspension files, report of survey files, self-service accounting files and hand receipts filed in the S-4 office," the chief warrant officer explained. Both Redding and the representative unit, Charlie Battery, received a score of 98.75 points out of a possible 100.

Presenting the trophies, Brig. Gen. William H. Reno, assistant division commander, recalled gaining his keen appreciation for the importance of supply while a battalion commander in the 1st Infantry Division. Reno said, "Maj. Gen. Red Fuller, 'Big Red One' commander, would spend an hour with battalion commanders going over the books—if so much as a screwdriver was missing there was hell to pay."

But there was no worry about missing screwdrivers as the 1/4 ADA proved that sometimes the property book pen is mightier that the computer.

1/51 ADA Battles Threat In Celtic Cross II

by Sp4 John Vastyan

Two Navy F-18 fighter aircraft swooped down into the desert valley. Looking like sleek birds of prey on a hunt, they raced between mountains, soared to cloud level and dipped again, the sonic thunder of their engines trailing behind them as they searched for "enemy."

"At the speed they're going, I doubt they can spot any of our positions," said SSgt. George Colon, B Battery, 1st Battalion, 51st Air Defense Artillery, as he watched the jets approach from inside his carefully camouflaged foxhole.

Sp4 Robert Everhart, Chaparral senior gunner, raises the weapon's firing rails in the direction of approaching enemy aircraft during a recent field exercise. (Photo by Sp4 John Vastyan)

Nearby, Sp4 Victor Williams, senior Vulcan gunner, worked feverishly to prepare for his first "engagement" during the war game activity. Approximately 6,000 Air Force, Navy and Army participants gathered at Fort Hunter Liggett, Calif., for the annual field exercise, Celtic Cross II, last fall.

From his command post, Colon plotted the movement of the two aircraft with a target alert data display set and a detailed map of the area. When Colon spotted them, he radioed Williams and told him to engage the aircraft if possible.

The jets worked further down the valley. "Out of range," came Williams' reluctant reply.

An hour later, from the top of a hill two miles away, the reported approach of two similar "Orange Force" jets brought a confident reaction from SSgt. Kenneth Stoffel, D Battery, 1/51 ADA. Crouched inside a small camouflaged position, Stoffel relayed the warning to his Chaparral senior gunner, Sp4 Robert Everhart, to "alert to the direction of the approaching aircraft."

When Everhart replied that he had visual contact, he began tracking the aircraft, controlling the direction of the missile-launching rails from within a sealed canopy. He activated the identification, friend or foe, interrogator, giving the aircraft pilot the chance to identify himself. "In this scenario, we could tell they were enemy aircraft by the nature of the IFF response," explained Stoffel.

The Vulcan and Chaparral positions were strategically set up to protect key areas within "Blue Force" territory. The Vulcans were to protect the 7th Infantry Division's tactical operations center. The Chaparrals were positioned to protect a 7th Combat Aviation Battalion helicopter airstrip and headquarters.

"The ADA mission has been a vital one so far during the exercise," stated 1st Lt. Kevin Kenific, D Battery, 1/51 ADA executive officer. Kenific and Sp4 Paul Glavuritch, Chaparral senior gunner, worked together at the D Battery tactical operations center. As part of the team manning that station, they received information on approaching aircraft from a nearby radar and supplied it to all of the battery's firing positions. "In the battle zone," assured Glavuritch, "we're not entirely dependent on the ADA weapons. If they were hit, we'd survive and fight as infantry soldiers."

Facing Combat Hazards Teaches Novice Troop

by Linda F. Fozo

"Someone yelled 'Gas!' I masked and was all nervous. People were shooting at us from the woods. I said, 'Dang! Oh no, check this out!' " That's when Pvt. 2 Doris Grayson, gaining her first "combat" experience, obeyed the order to shoot before making it to safety behind the lines.

Grayson, an 11th Air Defense Signal Battalion, 32nd Army Air Defense Command medic, two months out of advanced individual training, was getting used to working behind a desk at battalion headquarters. However, A Company soldiers, determined to make a combat medic out of her, took her with them on their ARTEP.

All four line companies and some headquarters soldiers participated in the exercise. "The companies were given 14 missions to be evaluated on," said SFC Herbert Martinez, battalion operations NCO. "They included NBC, food service and communications. During an ARTEP, which is a pseudo-combat situation, time is of the essence."

Perimeter defense was also an important aspect of the exercise, as the private discovered during her first field mission. "I almost panicked. I was told

to fire back at them and I did. We made it to the perimeter," Grayson said.

Although the bullets were blanks and the nuclear, biological and chemical attacks were simulated, the training, according to Grayson, was real.

"I slept through an NBC attack and realized I could have been dead in actual combat," she said. The medic was more alert during the next attack but she didn't have her protective gloves on. "A real chemical agent would have penetrated my skin," she said, looking at her hands.

The evaluators "demanded" that the young private become more combat-ready and sent her on a mission. A soldier was ordered to drive Grayson to some "casualties." Along the way, Grayson's newly found survival instincts took hold. "I felt like something was going to happen, and I told the driver to mask and get ready. I just knew we were going to get ambushed," she said. Grayson and the driver survived the ensuing ambush but were taken as prisoners of war.

After her release, Grayson said, the NCOs had her running and dodging behind trees and low-crawling to give aid to "wounded" soldiers. She also learned different techniques to move wounded soldiers to safety.

The 18-year-old soldier, learning from her mistakes, said candidly, "I didn't realize how much I'd forgotten about NBC. The ARTEP helped a lot by having me go through the practice of protecting myself and treating casualties for various combat injuries."

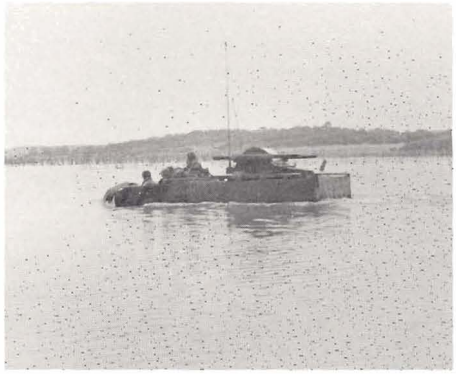
2/5 ADA Spiced by Variety Maneuver

by PFC Brian Lepley

Combining air, land and water maneuvers by day and night, Capt. Aaron Giles, commander, D Battery, 2nd Battalion, 5th Air Defense Artillery, concocted a savory exercise to reward his unit for an "up to par" maintenance posture.

The exercise cut an exciting slash through the boredom of repetitive motor pool work. Giles proposed the exercise to his battalion commander. He "got the go" from Lt. Col. Gary Bridgewater when Delta's level of maintenance was on target.

Soon after, they deployed for an overnight air, land and river exercise. "We wanted to get into some diversified



Soldiers of the 2/5 ADA were given an opportunity to see just what the Chaparral could do in the water during an adventurous overnight exercise. (Photo by PFC Brian Lepley)

training, so we developed an offensive exercise in which we would be airlifted to pre-positioned Chaparrals, cross a river, then gain and hold an objective. We then waited until night and returned the same way," Giles said.

The mission was unique for the air defense artillerymen. Instead of being confined to usually land-bound vehicles, their training was expanded with the help of the 502nd Combat Aviation Battalion, Fort Hood, Texas, which flew the soldiers to the field.

After touching down in an open area, the artillerymen picked out their vehicles in the tree line. The maintenance checks were completed and the machine guns were attached before the tracks moved out to the swim site. At the site, the Chaparrals immediately sought cover, then later emerged one by one to be dipped in the drink for a water-seals check. Each track, under the protection of an M-578 light recovery vehicle, was sent into the river.

This was the first time in four years that any unit from the battalion had attempted a river crossing, according to Delta's first sergeant, Fletcher Womack.

Giles concluded, "The men were motivated by the different training and that makes for a better unit."

2/57 ADA Edges NATO Allies in Hawk Games

by Dennis Moreland

NATO is 14 countries in partnership devoted to preserving democracy, and at times they join together for military readiness training. At other times, they get together for a less serious, but not unimportant, type of training—training intended to build camaraderie which strengthens those bonds of partnership.

The latter was the purpose of the 32nd Army Air Defense Command's annual Hawk competition between a U.S. and a West German air defense unit. The match was divided into four parts: operational readiness exercise, marksmanship, athletics and orienteering and common skills.

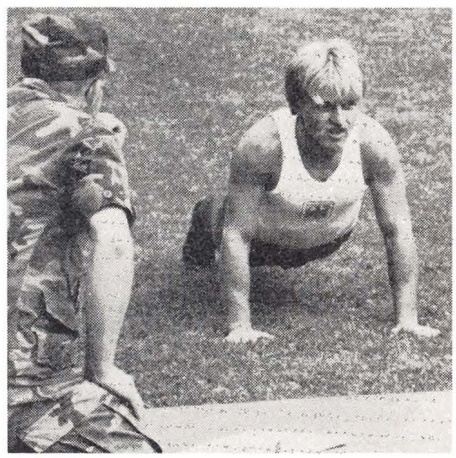
Soldiers of the 2nd German Air Division bested their American counterparts in the operational readiness exercise and athletics, while the air defenders of C Battery, 2nd Battalion, 57th Air Defense Artillery, came out on top in the marksmanship and orienteering and common skills categories.

When all the points for each category were added up, the Americans had a higher total and were awarded the Hawk competition trophy.

Winning was not the primary purpose of the match. "It's mainly an opportunity to get together with NATO allies," said Capt. Matthew Brown, C Battery commander.

The German and American soldiers each had their strong points according to Lt. Col. John J. O'Connell, 2/57 ADA commander. The Germans, for example, usually have less personnel turnover in their Hawk batteries. It's not uncommon to find very experienced senior sergeants in jobs where Americans use relatively new personnel. This impacts on the operational readiness exercise.

American and German officers and NCOs were evaluators and scorers for the competition. The competition ended with an American-style barbecue.



West German SSgt. Christian Bahschnitt muscles through a set of push-ups to help outdo the Americans in the athletics competition. The category included a two-mile run, sit-ups, push-ups, long jump and discus throwing. (Photo by Dennis Moreland)

2/61 ADA 'Shoot-Off' Motivates Crew

by Sp5 Geary McSpadden

Twice a year, the 2nd Infantry Division's 2nd Battalion, 61st Air Defense Artillery (C/V), South Korea, packs up and moves southwest to the Yellow Sea.

They travel about 150 miles to their sea range for the final contest, in a month-long competition, that determines which squad will represent each battery at aerial gunnery. The reason for competing is due in part to the cost of ammunition. Chaparral missiles cost approximately $70 thousand each. The battalion receives 12 Chaparral missiles a year for training, firing six each venture to the range.

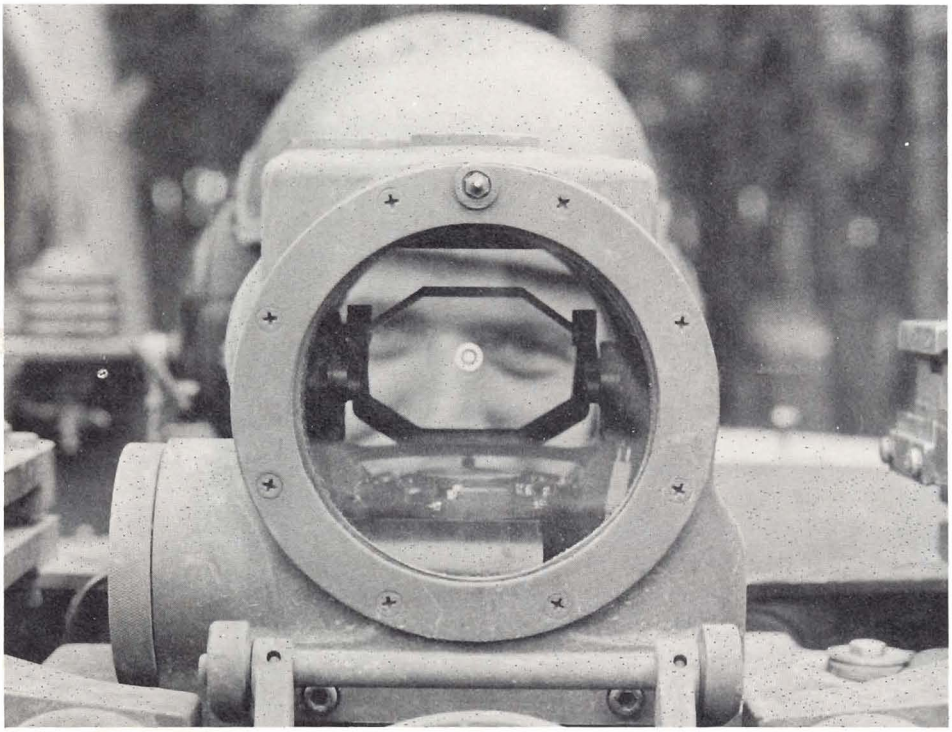
Competing seems to have paid off for the battalion as Vulcan crews shot down 80 targets, and Chaparrals brought down six for six missiles fired. The 1st Squad of 1st Platoon, B Battery, scored highest in competition, totaling 1,045 points from a possible 1,100.

Competing for bullets has advantages according to SSgt. Jerome Shepard, squad leader of the winning Vulcan squad and a 10-year veteran of Air Defense Artillery. "It motivates the crews," he said, "and makes them more conscious of what they're doing."

A senior Chaparral gunner and nine-year Air Defense Artillery veteran, Sgt. Shannon L. Barrett, also agrees competition has its usefulness. "It's worth it just to fire a missile," he said.

Lavega Green is a civilian technical representative for the government-contracted company that flies the radio-controlled target planes for the Vulcans. "I've been flying these for ADA units Armywide for five years, and this is the biggest kill I've seen to date," he said. "The targets were shot down as fast as we put them up."

Sgt. James R. Stetzer, a maintenance section chief with C Battery, 2/61 ADA, boresights the launch rails on a Chaparral before firing. (Photo by Sp5 Geary McSpadden)



Sp4 Donn M. Lambert, a senior gunner with B Battery, 2/61 ADA, checks the tracking mechanism on his Vulcan. (Photo by Sp5 Geary McSpadden)

69th ADA Brigade Umbrellas Bavaria

by M. Katherine Burke

Soldiers of the 69th ADA often gave their Army meal packets to Leutershausen youngsters as a goodwill gesture or, in this case, for a bike ride. (Photo by M. Katherine Burke)

The 69th Air Defense Artillery Brigade, 32nd Army Air Defense Command, spread an air defense umbrella over much of Bavaria during Autumn Forge '84.

Its guardian canopy reached from Wuerzburg south to Regensburg, providing overhead cover in two exercises, Flinker Igel and Certain Fury. The 3rd Battalion, 60th Air Defense Artillery, scrimmaged to the south, while the 3rd Battalion, 7th Air Defense Artillery, squared off against another 69th unit, the 6th Battalion, 52nd Air Defense Artillery.

The 3/60 ADA fell under German command in the NATO exercise, Flinker Igel, a week-long operation that raged to the west of Certain Fury's Blue versus Orange conflict. Certain Fury pitted 6/52 ADA, in league with the 3rd Infantry Division, against the Blue team's 3/7 ADA, supporting the 5th Infantry Division from Fort Polk, La.

"Every time we get a chance to work with German forces, I think it forms a stronger link, because we prove we can live and fight together," said Col. Wallace Arnold, 69th ADA Brigade commander.

"When German units get command and control over American units (as with the 3/60 ADA in Flinker Igel), then I think it makes that alliance just that much stronger," he said.

Having Hawk missile battalions directly linked with ground maneuver forces, as they were during Certain Fury, "develops a closer working relationship to the division," added Arnold.

"We have to learn to work with the ground forces, to be a part of the air-land battle, and that gives us an unusual chance to operate with the infantry and other ground elements," he said.

While missile crews slogged through ankle-deep sludge, the 69th ADA headquarters staff set up shop as a neutral participant in the tiny village of Leutershausen.

"We do that because we feel it's pretty significant—we have to know how to operate in a wide variety and number of environments. In the village concept, you can hide yourself in a town and displace your communications and operate for a longer period of time than you can sitting out in a field," Arnold explained.

In Leutershausen, troops took part in an air gun shoot-out against members of a local marksmanship club, were invited to visit the local YMCA and worshipped in song with German youths.

3/68 ADA Flashes 'Through-Cockpit' Accuracy

by Paul Younghaus

Something can be done well or it can be done exquisitely. The soldiers of 3rd Battalion, 68th Air Defense Artillery, went for perfection during their Hawk missile live-fire exercise at Camp Lejeune, N.C.

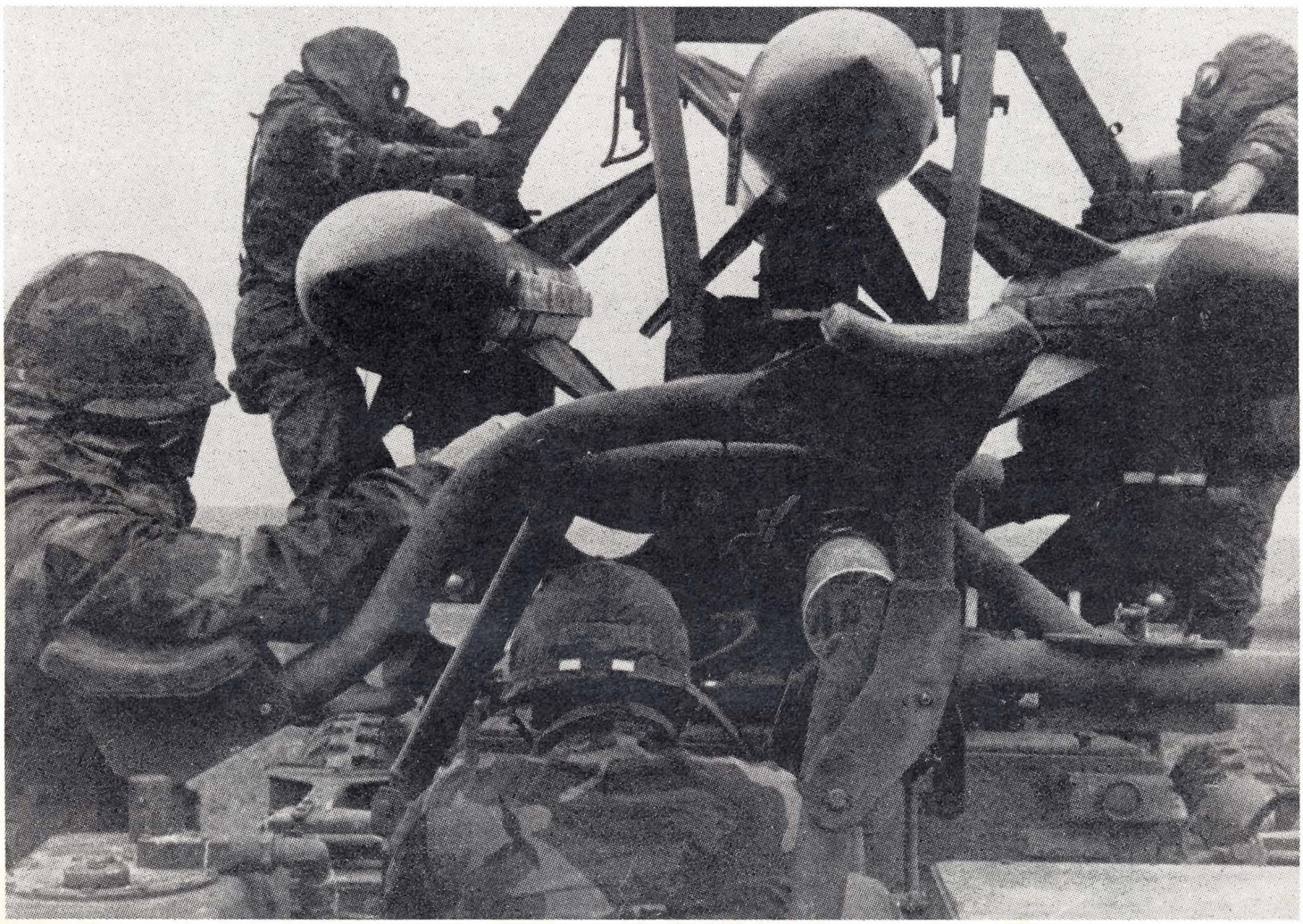
In fact, the telemetry coordinators figured one of the missiles would have gone "through the cockpit" of an actual aircraft, according to Capt. Donald C. Ecklin, battalion executive officer.

A switch from using electronic simulators, the 3/68 ADA soldiers fired five Hawk missiles. The soldiers were evaluated on firing and combat and operational readiness.

Prior to the live fire, they were also evaluated on their perimeter defense, nuclear, biological and chemical warfare readiness, convoy movement, conventional maintenance, air defense operations and prisoner of war handling, Ecklin explained.

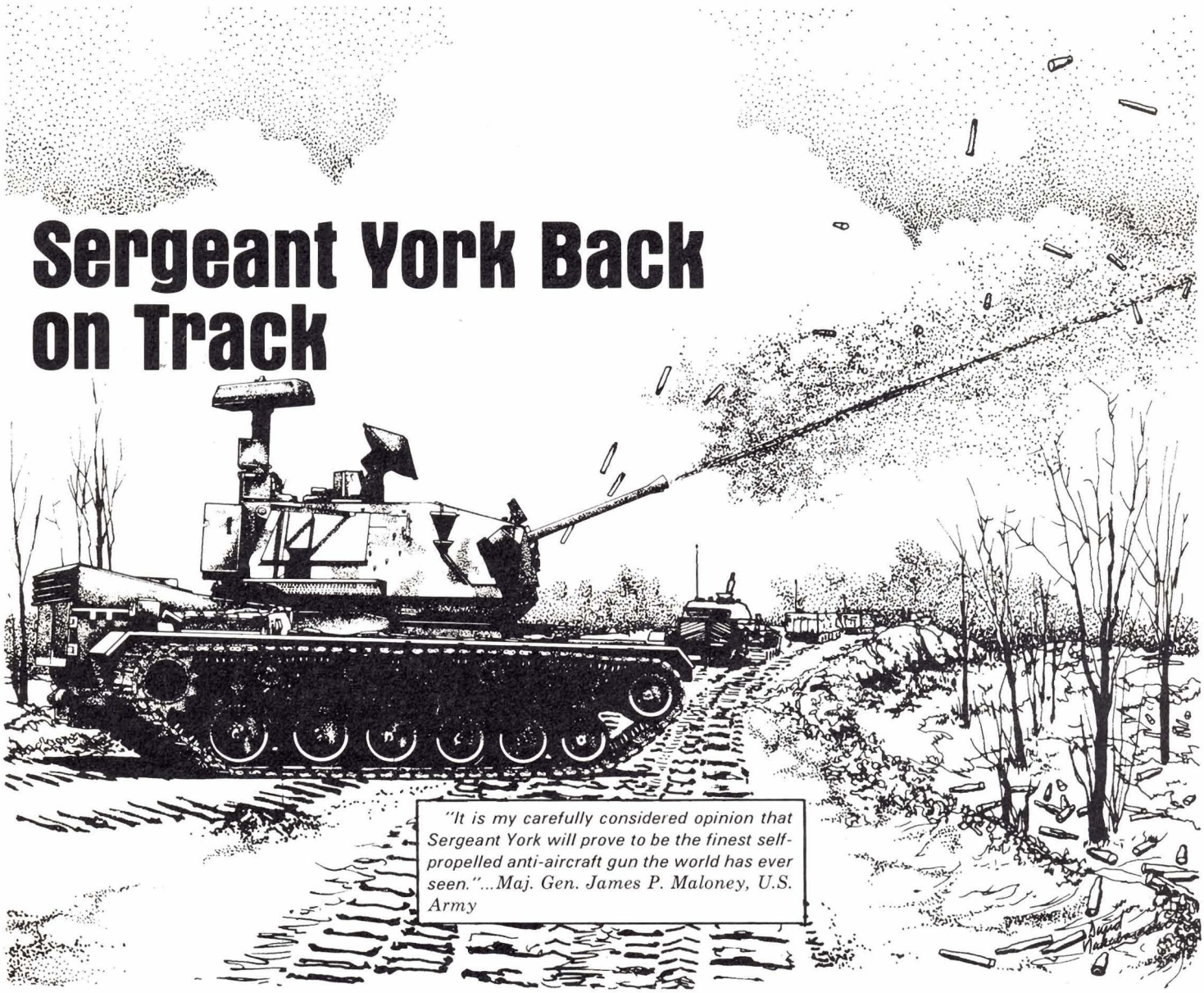
All of the missiles were scored as direct hits. "This was an excellent shoot," SFC Ferdinand F. Janicek said. "The facilities and support we received were excellent, which helped make this shoot a success."

The 3/68 ADA was supported by Marine Corps, Navy and Coast Guard forces. All aircraft and ships within the range of the missiles were moved to prevent mishaps. ✱



A 3/7 ADA missile crew takes corrective measures to remove a hang fire from its launcher. (Photo by M. Katherine Burke)

Sergeant York Back on Track



"It is my carefully considered opinion that Sergeant York will prove to be the finest self-propelled anti-aircraft gun the world has ever seen."...Maj. Gen. James P. Maloney, U.S. Army

When Mark Twain read his own obituary in the morning newspaper, he sat down and penned a letter to the editor which began: "The reports of my death are greatly exaggerated." The same may be said of last year's newspaper headlines that predicted the demise of the Sergeant York Gun.

The Sergeant York eulogies appeared on the heels of Secretary of Defense Caspar W. Weinberger's September 1984 decision to sharply reduce FY85 funding for the new weapon system, pending the outcome of operational tests scheduled this spring. The funding cut has had a serious impact on the Sergeant York program, but U.S. Army Air Defense Artillery School officials have expressed confidence in the system and predict that the Sergeant York will perform well in its crucial spring evaluations.

The decision to reduce FY85 funding for the Sergeant York Gun will delay fielding of the system, but the door remains open for restoration of funding in FY86. The Sergeant York TRADOC System Management Office points out that, while the funding slash means the Army may be unable to start fielding of the system this year, the Sergeant York's streamlined development, production and acquisition program is still years ahead of traditional Army procurement timetables.

Money for 146 Sergeant Yorks was appropriated through FY84 and 31 had been delivered by the manufacturer, Ford Aerospace Corp, by the first week of February 1985. Original production plans called for 10 Sergeant Yorks a month to roll off Ford Aerospace assembly lines, but production will now be spaced out while the weapon system undergoes the evaluation process.

The Sergeant York has received terrible media reviews, including a public roasting on *20/20*, ABC's prime-time news magazine, but Army development and acquisition officials say they are pleased with the system's performance and that Sergeant York's production snags and delays are the sort of problems one might expect with any new weapon system.

Much of the responsibility for proving the media critics right or wrong will fall to E Battery, 4th Battalion, 1st Air Defense Artillery, the Army's first Sergeant York battery. "We must present objectively to the Secretary of Defense and the world the capabilities of the weapon," Fort Bliss Commander Maj. Gen. James P. Maloney told Echo Battery at its activation ceremony, Oct. 31, 1984. "If it is good, we must show that. If it is not—and I don't believe that will happen—then we must show that. Your responsibility is awesome."

This spring, the battery will crew two platoons of Sergeant Yorks in Follow-on Evaluation I. The Army hopes that FOE I will silence critics of the often-maligned weapon system and restore full funding for the Sergeant York program. A poor showing, on the other hand, might tighten executive or congressional purse strings and deny the Army the funds it needs to complete fielding of the weapon system.

The pioneer soldiers of Echo Battery are undaunted by the challenge that awaits them. "The weight is on our shoulders, but, if anyone can do it, we can," said Capt. Alan D. Landry, battery commander. "I'm convinced the Sergeant York concept is sound and I have complete confidence in the abilities of our soldiers to prove its effectiveness. If it can be done, we're the ones to do it."

Echo Battery is equipped with eight Sergeant York Guns, enough for two full platoons and will receive three additional guns for backup during FOE I. The unit is midway through an accelerated training program that Landry describes as a "scrubbed training program" because "all but the absolute test essentials have been eliminated."

While the maneuver phase of the evaluation will take place at Fort Hunter Liggett, Calif., the firing phase will take place at North White Sands Missile Range, N.M. Echo Battery is a TDA unit drawn from The School Brigade and attached to the 11th Air Defense Artillery Brigade, a Forces Command TOE unit. Once FOE I is completed, Echo Battery soldiers will likely be reassigned to Sergeant York training batteries within the Air Defense Artillery School where they will instruct soldiers destined to crew Sergeant York Guns through FOE II and, perhaps, onto the air-land battlefield.

The Army, meanwhile, has had little success in countering articles condemning the Sergeant York. One Sergeant York Management Office staffer compares the criticism aimed at the Sergeant York Gun to the disparagement once directed at Sgt. Alvin C. York, the weapon system's namesake. A conscientious objector who wrote "I don't want to fight" on his World War I draft registration form, York was made the object of constant ridicule during his basic training. Reconciling his religious beliefs with the demands of the battlefield, he went on to win the Medal of Honor and become an authentic American hero. Sergeant York Gun advocates hope the public perception of the new weapon system will undergo the same sort of transformation.

Stung by constant criticism of the new weapon system, the Air Defense Artillery Center released the following summary of media allegations and responses. *—by Blair Case*

ALLEGATION	RESPONSE
The Sergeant York's range is insufficient to meet stand-off threats.	The latest tests verify that the Sergeant York's range is well beyond the average battlefield visibility anticipated in Europe and beyond the range of the Soviet Spiral missile.
The Sergeant York can't hit maneuvering aircraft.	Design specifications have exceeded all classes of fixed- and rotary-wing targets, including those maneuvering up to two "Gs."
Optical aiming with ''Kentucky windage'' is more effective than radar tracking or computer aiming.	It is virtually impossible to hit modern high-performance aircraft with optical aiming.
The system ignores targets and locks on latrine fans.	The Sergeant York radars meet required specifications for detection sensitivity and suppression of false targets. The often repeated charge originates from tests conducted in California. During tests of the acquisition radar in a high-clutter environment, the system did sense a fan on the roof of a nearby building, but it never "zeroed in" on the fan or traversed the guns at the fan.
The Sergeant York's radar cannot withstand rough terrain.	No rough-terrain-induced failures have been noted in more than five years of prototype testing.

The Sergeant York Gun stands as a silent sentry as the first Sergeant York Gun unit, E Battery, 4/1 ADA, is activated Oct. 31, 1984, under the command of Capt. Alan D. Landry. (Photo by MSgt. William Darrah)

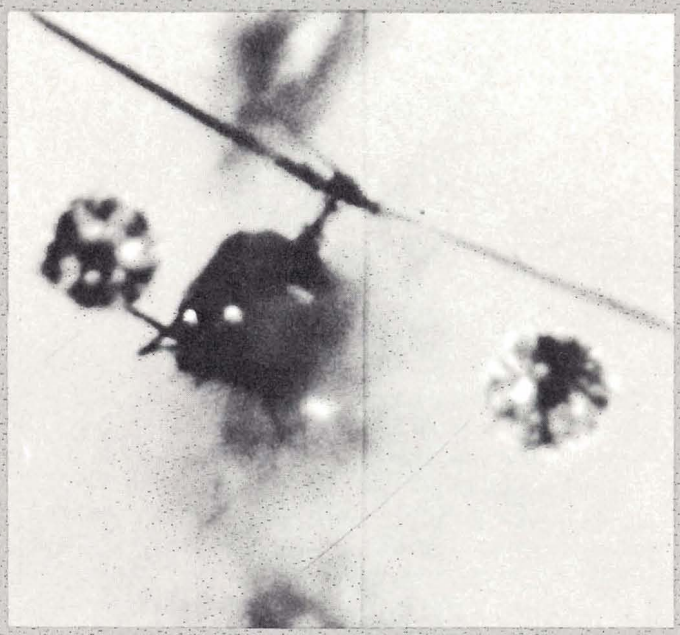
ALLEGATION	RESPONSE
The system's radar emissions will give away unit positions.	The Sergeant York is one of many emitters on the battlefield. Emission control can be exercised when necessary with excellent optical backup.
Performance requirements and mission profiles were changed so that the Sergeant York could succeed.	The Sergeant York has one of the Army's most stable requirement documents. There has not been one change since 1976.

ALLEGATION	RESPONSE
The Army is critical of contractor performance.	The Army sent a letter notifying the contractor of the Army's intention to ensure that all contract provisions would be met and that only a quality product would be accepted. This was good business practice. Reports which quote "totally unacceptable contract performance" have taken the phrase out of context. The Army's letter to Ford Aerospace & Communications Corp. concerned the contractor's "totally unacceptable contract performance" in meeting the production and delivery schedule, not with system peformance.
The Army in its rush to field a major weapon system, chose to ignore standard acquisition regulations and basic common sense in procuring the Sergeant York.	The Army believes it properly followed the planned guidance for this program (Defense Acquisition Regulations and Source Selection), and costs incurred for this program are fair and reasonable. Sufficient regulatory guidance existed and was adhered to during the accelerated acquisition of the Sergeant York. An elaborate source selection process was followed in accordance with governing regulations. The Army did take enough time to properly evaluate the responsiveness of the Sergeant York contractors to the proposal.
The Sergeant York program is six months behind schedule.	The first production unit was delivered to the Army five months later than originally forecast. The program is still several years ahead of most major weapons acquistion programs. The Sergeant York moved from paper requirements to production in only six years.
The Sergeant York gun has reliability problems.	Extensive testing of the Sergeant York prototype system exposed some reliability-failure modes. The needed corrections were identified and incorporated into production hardware. More than five years of testing indicates that original design goals will be achieved.

ALLEGATION	RESPONSE
Tests were abandoned when the prototype system was found unacceptable.	The Army did not "abandon" any tests. Testing in 1982 was changed in scope because of prototype fatigue and the lack of spare parts. The tests were run and completed, with many useful results.
The Sergeant York's engine breaks down frequently and is not powerful enough.	The engine has been successfully used more than 12 years in U.S. tanks, and its reliability and performance has been proven in years of Sergeant York testing.
''Systematic failures'' during post-production tests delayed acceptance of the first fire unit.	Problems primarily involved system integration and were solvable with software changes. Such problems are not unusual for a major weapon system, nor were they showstopping.
Most U.S. helicopters downed during the Vietnam War were lost to heavy rifle and machine gun fire, not elaborate weapons like the Sergeant York.	Lightly armored U.S. helicopters were shot down at close range. Heavily armored Soviet helicopters are expected to stand off and fire anti-tank missiles. A long-range, highly lethal, quick-reacting system is required to defeat this threat on the European battlefield.
The Ford Corp. prototype lost the developmental-operational shootoff.	The Ford prototype performed better in most areas and successfully engaged both fixed-wing and rotary-wing targets. The Source Selection Board used extremely thorough criteria and operated in a manner above reproach.

ALLEGATION	RESPONSE
Computer data was changed so Ford's near misses counted and General Dynamics did not get credit for their near misses.	Both competitors were given equal credit for near misses. Test criteria for both systems were exactly the same.
The Army withheld information on lethality, reaction time, target identification, reliability, threat, electronic countermeasures and personnel hazards from the Defense System Acquisition Review Council.	The Army provided extensive documentation and has documents to show that all information was provided.
The Army overstated lethality by 300 percent.	The Department of Defense didn't agree with Army data. Recomputation showed results much closer to Army data. This was substantiated by the Department of Defense Inspector General.
The Army overstated reaction time by 400 percent.	This allegation was based on faulty analysis. "Waiting time" for targets to come into range had been erroneously included in reaction time. This has been substantiated by the Department of Defense Inspector General.
The Sergeant York must be combined with Stinger to compensate for its short range.	Hogwash! In some situations, Sergeant York outranges Stinger. But the Army wants to put Stinger on the Sergeant York in the future. The reason is to put Stinger under armor, to give Stinger the benefit of Sergeant York's alerting and cueing and possibly to save some Stinger manpower at the forward line of own troops (FLOT).
The Sergeant York's reliability is bad.	The Army's independent operation tester has said: "Observed performance of the system, operated by soldier crews, supports the estimate of performance which led to the initial decision to initiate the materiel acquisition process."
The identification, friend or foe, interrogator doesn't work.	The identification, friend or foe, interrogator worked well during the limited test, correctly identifying all targets.

ALLEGATION	RESPONSE
The Sergeant York has a problem with false targets.	False targets were a minimal problem during the limited test. All test data showed that the Sergeant York performed above performance requirements.



ALLEGATION	RESPONSE
The Sergeant York has resulted in $84 million in excess cost to the Army.	If this were true, the Army would request a refund from the contractor. The Army feels that a competition was conducted within acquisition regulations which yielded the best price possible. This allegation is the result of misleading information used by the Department of Defense Inspector General.
The procurement of the Sergeant York is a mistake and could cost taxpayers $4.2 billion or more and jeopardize the lives of American troops.	Secretary of Defense Caspar Weinberger, who personally talked with one of the soldiers who operated the system during its recent limited test, supports the Army's need for the Sergeant York. The secretary was impressed by the positive statements and confidence the soldier had in the Sergeant York. The Sergeant York has been designed to, and has been proven in years of testing to be capable of, providing more than adequate air defense protection for the front line soldier.

ALLEGATION	RESPONSE
Target reflectors had to be used to allow the Sergeant York to fire on a low-flying helicopter.	During the limited test, a stationary, non-flying helicopter was used during a live-fire test to simulate a low-flying helicopter. The Sergeant York relies on the symmetric doppler return from a hovering helicopter's rotating parts for detection and tracking. Since the turbine engine of the helicopter had been removed, two electric motors were used to drive the rotor. The normal rotor speed could not be achieved with these motors. The low-rotor speed, coupled with the helicopter having only two blades (compared to five blades on a Soviet Hind helicopter) made it necessary to augment the helicopter with Luneberg lenses. The installation and use of radar augmentation is an acceptable practice in both developmental and operational testing.

ALLEGATION	RESPONSE
Sergeant York maneuverability is suspect because of its top-heavy M-48 chassis.	The Sergeant York demonstrated its tactical maneuverability during the limited test by accompanying elements of the 3rd Armor Cavalry Regiment.
Sergeant York costs have multiplied.	There has been less then three percent real growth since 1977 estimates.

ALLEGATION	RESPONSE
The target price of the system is $6.8 million, but the price will be negotiated upward after the current contract is fulfilled.	The $6.8-million figure is the ceiling price of the Sergeant York contract. The ceiling price is 30 percent higher than the target price. The Army plans to award a follow-on contract only after assessing Ford's performance on the early production options. There is no intention to negotiate an increased price for later quantity buys.
Ford Aerospace & Communications Corp., the Sergeant York manufacturer, went begging to the Reagan Administration for defense business when the corporation was near bankruptcy a few years ago.	Ford Aerospace & Communications Corp. has been a Department of Defense contractor for many years. It was selected as the Sergeant York contractor after a very extensive source selection process.
The Sergeant York is a different caliber from other NATO guns.	There are about 2,000 40mm guns in use by friendly nations and several million rounds of inventoried ammunition. No other gun or ammunition is a better choice for NATO interoperability.
The Army was not impressed with the Soviet ZSU-23-4 (Shilka), which the Army copied to produce the Sergeant York.	The Army was quite impressed with the ZSU-23-4 during tests. While it does have limitations in its ability to engage maneuvering targets, the Soviet system does have high reliability and good performance within its range capability. The Army considers it a formidable threat. The Sergeant York, however, is not a copy of the ZSU-23-4. It has been designed to meet specified threat aircraft and has surpassed its reliability and operational availability performance measures.

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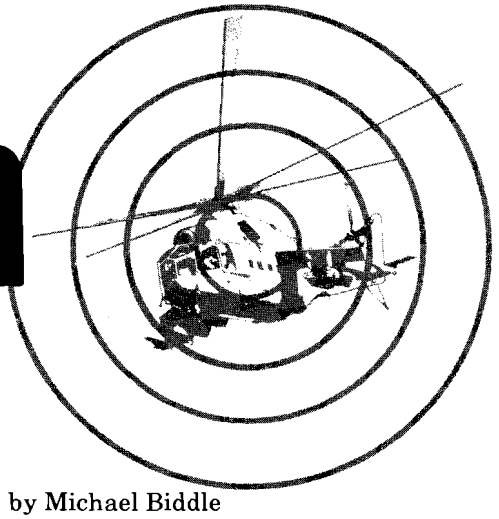
Aiming With New Sights



by Michael Biddle

The art of aiming a weapon as quickly and accurately as possible has changed over the years. Until World War II, soldiers still looked through sights to aim guns. Since then, ever increasingly sophisticated ways to aim weapons have been developed. First came mechanical computers with optical sights, then electronic computers with radar, and now digital computers with laser rangefinders. Even more astounding advances are predicted for the near future.

The Fire Control Division of the Armament Research and Development Center, Dover, N.J., is helping make these advances, directing numerous research and development projects with the objective of aiming weapons faster and more accurately than ever before.

The Fire Control Division's basic mission is to develop fire control systems for all Army large- and small-caliber gun systems and to support major weapon systems armed with a gun-missile mix.

Always with an eye on the future, division personnel must annually develop projections for fire control needs for the next five years as part of the long-range plan.

The division's customers include many of the Army's major laboratories as well as project managers' offices for the SGT York Gun, the Abrams tank, the Apache attack helicopter, the Cobra helicopter and cannon artillery weapon systems.

The division is divided into four branches which deal with all life-cycle phases of a fire-control system: basic research, exploratory development, advanced development, testing, production and diagnosis for maintenance and repairs.

The Systems Branch supports production of a technical data package for two high-priority programs, the SGT York Gun and the Apache. The Fire Control Division manages the total software, including review and corrections of software packages, to ensure the computer programs run as intended.

The SGT York Gun has search-and-track radar and a fire-control computer, a combination capable of performing millions of calculations a second to keep the gun pointing at the target.

The Apache fire-control-system computer has 10 microprocessors using 17 computer languages to handle different fire-control functions.

The Research and Development Branch uses very high speed integrated circuits (VHSIC) for Army fire-control needs.

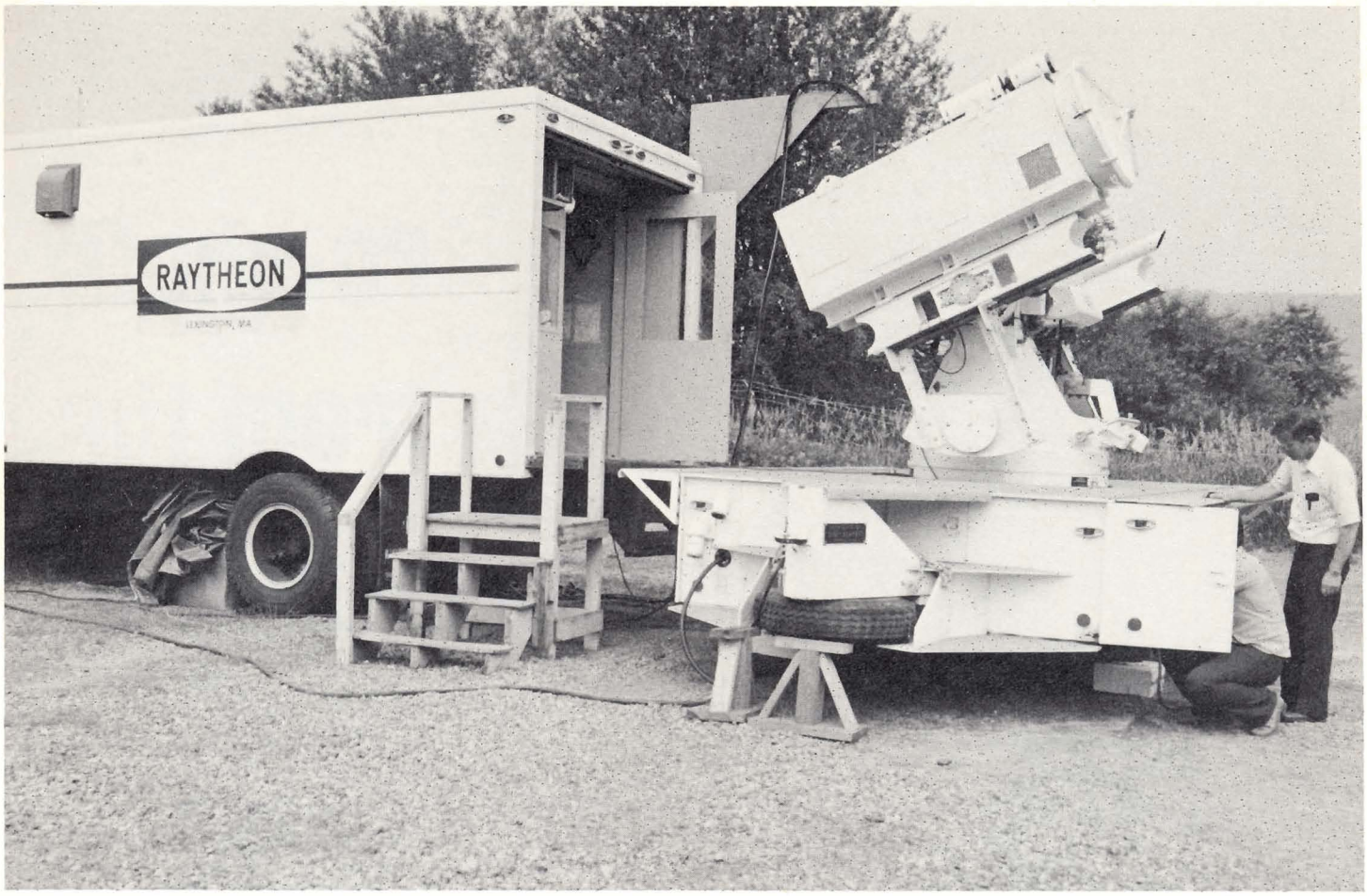
In a typical VHSIC, an integrated-circuit chip will contain about 100,000 transistors in a silicon wafer about half-an-inch square. Fifty to 60 of these circuit chips make up a microprocessor. A microprocessor can perform a billion operations a second and store millions of bits of data. This opens the door to futuristic systems which can be intelligent, that is, adapt themselves to changing battlefield conditions. VHSIC will make it easier for the soldier to aim his weapon and thus reduce his stress level.

Six manufacturers are presently working on VHSIC variations, and a demonstration of the system is planned for 1986.

In a related area, Research and Development Branch personnel are also conducting artificial-intelligence research in hopes of developing a fire-control computer that has some of the abilities of a human, such as deciding which system to employ when faced with a particular battlefield situation. For example, when a vehicle is hit with a laser designator, decisions must be made to deploy smoke, get out of there quickly, or employ some other tactic. A human might not have the time to think through all the options and quickly reach a conclusion. The computer can rapidly determine the proper tactic and help the soldier make the right decision.

In addition, electro-optics engineers in the Research and Development Branch, as well as engineers in the laboratory's systems and armament divisions, are developing a command-adjusted trajectory 40mm air-defense weapon. Milliseconds after firing, the computer recalculates where the target is and whether the projectile is going to hit it. If not, the computer sends a command to correct the projectile's flight to hit the target, all in one-twentieth of a second—ample time for a projectile that is in flight anywhere from 4 to 11 seconds.

In the Design and Production Branch, engineering personnel review mechanical configurations and designs of fire-control devices submitted by contractors. Mechanical analyses are conducted to ensure that fire-control instruments both "fit" and perform properly within the various vehicles they are designed for. Consideration is given to the man-machine interface. Another reason for the review is to assure standardization of engineer-



Two Armament Research and Development Center employees work on an advanced fire control radar system used for tracking low-flying aircraft.

ing processes and specifications and that drawings are prepared in a format common to most manufacturers. Standard formats (military specifications) enable the Army to later purchase spare parts competitively instead of being forced to buy them from the original contractor. There are nearly 500 type-classified fire-control instruments used by the Army. Some of these come up for review each year by the branch, which may do 50 to 100 technical-data-package reviews annually, each involving as many as 6,000 drawings.

In addition, the Design and Production Branch manages the manufacturing, methods and technology program for fire-control instruments. In this program, personnel develop fire-control projects that are submitted in the Congressional budget to improve the way a contractor produces components. One such project involves using diamond tooling to polish lenses for optical sights. In another project, computerized "group technology" is used to reduce production costs. Branch personnel feed manufacturing data into a computer to determine which parts have enough similarities to be made in the same production run. The computer "finds" the related parts, and the list is given to the manufacturer to reduce production costs.

One of the main roles of the Computer Applications Branch is to develop automatic test measurement diagnostic equipment for components. This enables components to be plugged into a computer designed to diagnose them for maintenance and repair purposes.

Personnel in the branch develop the software which enables EQUATE, one of the most modern diagnostic computers, to guide the repair person who consequently does not have to have detailed knowledge of the system being diagnosed. For example, the five or six circuit boards inside a laser rangefinder may have to be sent to a depot for repair. The operator plugs one of the boards into the EQUATE system. The computer then "walks" the operator through the correct diagnostic procedure to find out what's wrong with the board and repair it.

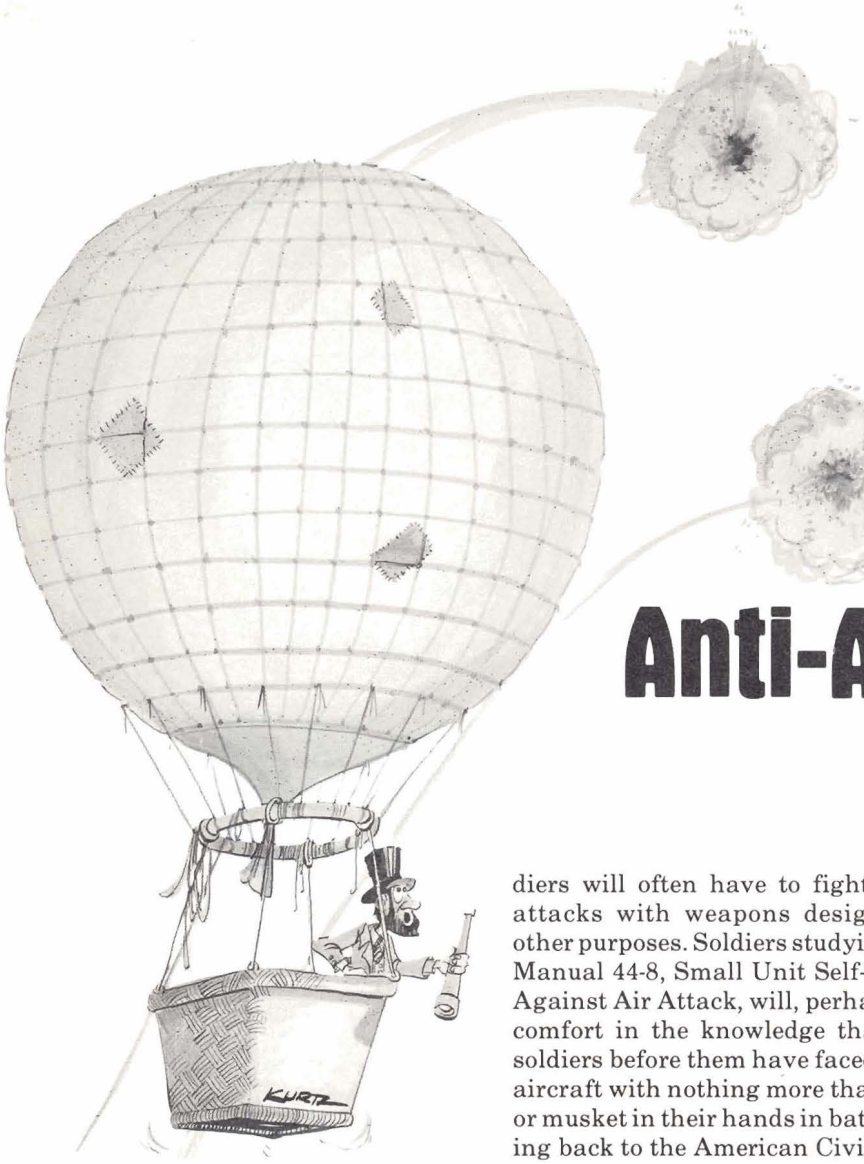
Diagnostic software is available for fire-control equipment for air-defense systems, tanks, helicopters and artillery.

The Computer Applications Branch is also responsible for reviewing and writing computer programs used to perform various fire-control functions, such as calculating ballistic trajectory.

Other new areas being studied by the Fire Control Division include passive sensors that locate targets without releasing detectable emissions; integrated optics which dramatically improve fire control by combining laser, optical and electronic technologies; and robotics, in which machines replace humans to perform fire-control tasks on the battlefield.

And to think, until 40 years ago, there were only sights to aim guns.

Michael Biddle *has recently been assigned to the Public Affairs Directorate, Military District of Washington, Fort McNair, Washington, D.C. When he wrote this article, he was command information officer in the Public Affairs Office of the U.S. Army Armament Research and Development Center, Dover, N.J. He received a bachelor's degree in secondary education (English) from Pennsylvania State University and a master's degree in English literature from Villanova University, Pa.*



Potshots from the Anti-Aircraft War

by Blair Case

In a scene from the Academy Award-winning film, *Patton*, actor George C. Scott, as the flamboyant World War II armor leader, stands in the middle of a North African street, blasting away with his famous ivory-handled pistol at strafing German aircraft as bullets kick up the dust about his feet. The scene, based on an actual event, demonstrates that military legends feel the same sense of frustration that ordinary soldiers feel when they are forced to confront an air attack with inadequate means of air defense.

In the past, the U.S. Army has fought on the battlefield with little concern about attack from the air. Troops and convoys were occasionally bombed or strafed with machine gun or cannon fire, but our forces enjoyed the luxury of air superiority most of the time.

All that is behind us now.

Since AirLand Battle Doctrine allots air defense assets sparingly, the threat will be guaranteed complete air superiority over certain portions of the air-land battlefield. This means U.S soldiers will often have to fight off air attacks with weapons designed for other purposes. Soldiers studying Field Manual 44-8, Small Unit Self-Defense Against Air Attack, will, perhaps, find comfort in the knowledge that other soldiers before them have faced enemy aircraft with nothing more than a rifle or musket in their hands in battles dating back to the American Civil War.

The Air Threat First Appears

Confederate officers facing the Union Army of the Potomac on the outskirts of Richmond, Va., at the beginning of the Peninsula Campaign were not much concerned when the Federals put up history's first military aircraft—an observation balloon. The ball of red and white silk rose on a light wind off the James and, anchored by hawsers, dangled over the Federal lines. The Confederates knew who was in the balloon, an early aviation enthusiast, Professor Thaddeus Lowe, they had read about prior to the war and considered mildy eccentric. The gray-clad officers worried less about the balloonist's spying than they did about the balloon's affect on their troops. All up and down the skirmish line, Rebel sharpshooters, who must have known the balloon was hopelessly out of range, were unable to resist the temptation. They began banging away, revealing their positions and wasting precious ammunition. The Southerners finally wheeled a field artillery piece out of battery and, after many adjustments made difficult by the notorious unreliability of Confederate time fuzes, put air bursts sufficiently close to the balloon to persuade the professor to descend.

The anti-aircraft war had begun, but it was slow to escalate.

Biplanes and Pigeons

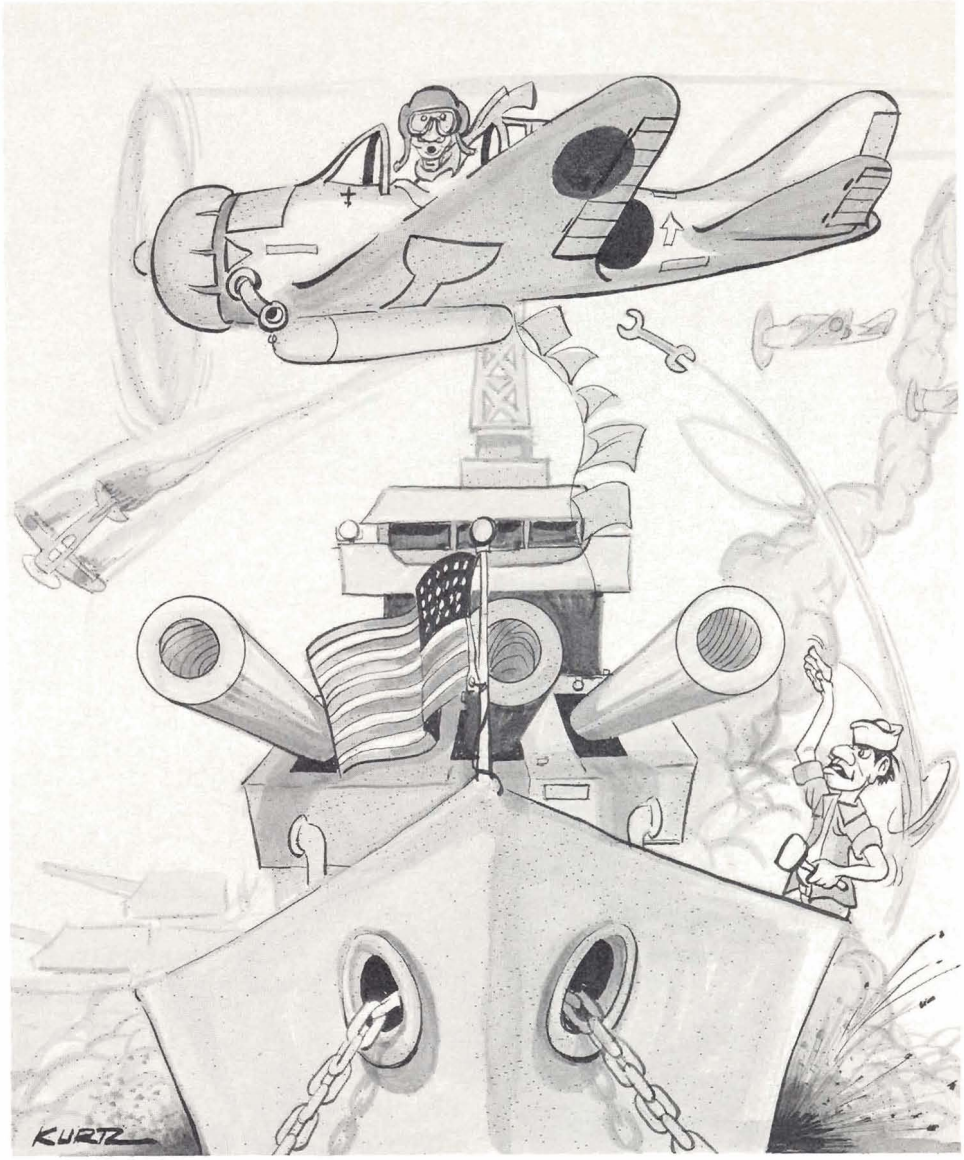
World War I aviators considered the war in the trenches to be, both literally and figuratively, beneath them. During the early years of the war, they refused to strafe or bomb infantry, an activity they considered both ungentlemanly and unsportsmanlike even though the word strafe derives from *Gott strafe England* or God punish England, the German slogan of the Great War.

The mud-caked infantrymen and machine gunners mired in the trenches shared none of the aviators' outdated notions of gallantry. Trench lines bristling with machine guns made no-man's-land extremely unhealthy for slow-moving biplanes. Revisionist historians now credit an Australian machine gun crew, rather than British flyer Capt. Roy Brown, with bringing down Manfred von Richthofen (the Red Baron). Most World War I biplanes served primarily in a reconnaissance role, and would have been considered little more than nuisances had it not been for their ability to spot artillery targets and troop concentrations.

World War I's most plentiful aerial targets were the thousands of carrier pigeons who carried messages for both sides. The birds proved amazingly adept at flying through intense anti-pigeon barrages to deliver their messages, despite wounds that won them decorations for valor.

The most celebrated was an Allied bird named Cher Ami who braved gunfire from both sides of the lines (the pigeons presented a tough visual recognition problem) to fly 25 miles in 30 minutes with a message from the Lost Battalion. The bird winged home with a shredded wing and a broken leg that had to be amputated.

An American Expeditionary Force pigeon named Mocker was given a message with the coordinates of an enemy artillery battery during the U.S. assault on St. Mihiel. Despite being hit by a piece of shrapnel that cost him his right eye and lacerated his skull, Mocker winged his way to headquarters and the big guns were silenced. The feathered hero was awarded the Distinguished Service Cross and the French Croix de Guerre, lived to the ripe old age of 21 and was stuffed and mounted when he died in 1937.



The Air Threat Grows Formidable

The air threat grew much more intimidating between the wars. During World War II, technological advances and improved ordnance made air power a dominant, some say decisive, factor in both the European and Pacific Theaters of the war. The development and fielding of anti-aircraft weapons kept pace with the manufacture of high-performance aircraft, but units with no organic air defense artillery weapons faced a tougher challenge. World War II airplanes, though lightly armored compared to modern attack aircraft, flew at the same approximate speed—450 knots—as attack aircraft on a ground-run fly today. American sailors and soldiers quickly discovered aircraft could be more than a nuisance at Pearl Harbor. They were caught with their anti-aircraft defenses down, most of the ammunition being stored under lock and key to guard against saboteurs. Botswain's Mate Thomas Donahue, assigned to the destroyer *Monaghan*'s No. 4 gun, whiled away the time, while other sailors sawed the locks off magazine cabinets, by slinging wrenches at low-flying planes. Someone called up from the magazine and asked him what he needed. "Powder," Donahue called back. "I can't keep throwing things at them."

Captain Frank W. Ebey of the 55th Coast Artillery set up machine guns on the tennis court at the rear of his quarters at Schofield Barracks. The four Japanese aircraft shot down in the first wave that hit Schofield Barracks were all attributed to machine gun and Browning Automatic Rifle (BAR) fire.

At Bellows Field, also on Oahu, an aviation ordnance man named Sands armed himself with a BAR, stepped outside a hangar and took on a Japanese warplane in a shoot-out reminiscent of Hollywood westerns. He hit an aircraft piloted by Lt. Fusata Iida with a burst from the BAR. Iida, his aircraft leaking fuel and aware he had no chance to return to his carrier, signaled his mates that he intended to crash his plane into the hangar.

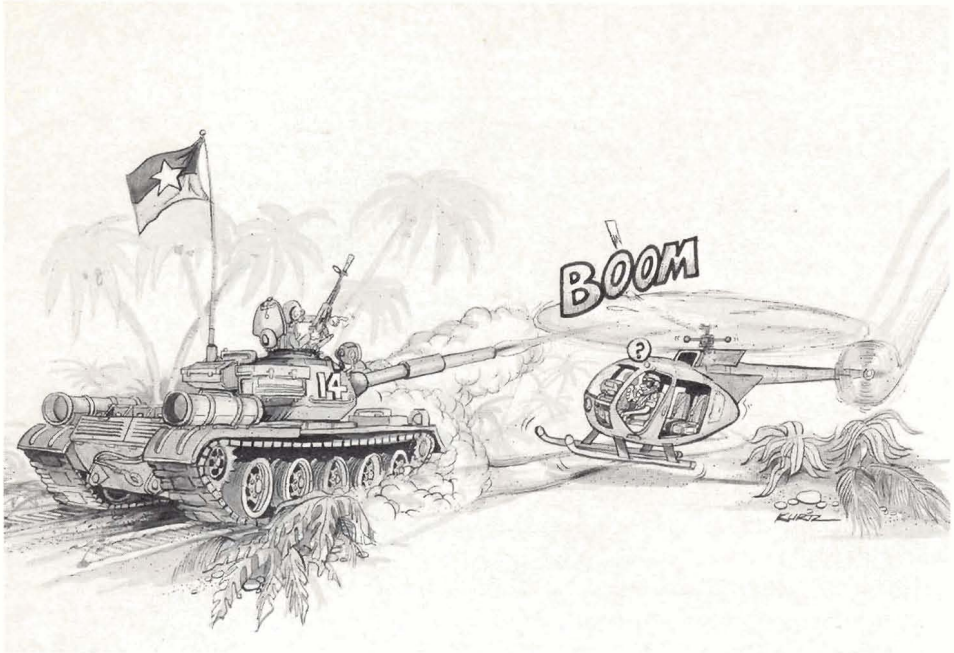
"That sonofabitch is coming back," someone yelled to Sands.

With Iida's tracers kicking up dust at his feet, Sands emptied a full clip into the cockpit of the approaching aircraft. The pilot slumped over in his cockpit as the plane slammed into a hillside near the hangar and burst into flames.

The Japanese lost 29 aircraft at Pearl Harbor, but most of the anti-aircraft fire seems to have hit Honolulu. Following the Pearl Harbor raid, the government awarded Honolulu residents $500,000 for damages done by misdirected rounds.

Whirlybirds Replace Pigeons

The jets which flew in the Korean war were virtually invulnerable to anything but sophisticated anti-aircraft weapons. Even FM 44-8 seems to admit shooting at high-performance aircraft with small arms is apt to prove futile: "It may be that your best bet is to seek cover. That way you will survive to fight again." The field manual, however, goes on to point out fighting back has its advantages: "You gain two things by fighting back. The morale and spirit of your troops will be improved by the act of shooting back at the attacker rather than standing



helpless before this threat. Also, you may kill or drive the attacker off."

Helicopters, only slightly more difficult to down than World War I carrier pigeons, appeared on the battlefield, just as other martial aircraft achieved virtual immunity to small arms fire, to give ground gunners new and more fruitful targets. During the Vietnam War, North Vietnamese and Viet Cong soldiers became the world's foremost authorities on shooting down helicopters. Field Manual 44-1, Air Defense Artillery Employment, recounts one instance in Vietnam when a Viet Cong bowman shot down an helicopter with an arrow.

On Nov. 24, 1963, members of the 21st Division, Army of the Republic of Vietnam, were ambushed as they mounted a heliborne attack against a Viet Cong battalion. The hidden enemy force, equipped with five 7.9mm machine guns and a twin .50-caliber weapon, shot down one helicopter and an armed T-28 trainer aircraft. They damaged 10 helicopters, two A-1H attack aircraft and one T-28.

North Vietnamese tankers probably weren't issued copies of FM 44-8 which suggests that "it makes no sense at all to shoot at a helicopter attacking you from a standoff range of three kilometers, except perhaps with the main gun of a tank." A North Vietnamese tank crew, nevertheless, shot down a U.S. light observation helicopter with its main gun, a feat of gunnery made only slightly less remarkable because the engagement range was only a few meters rather than a few kilometers.

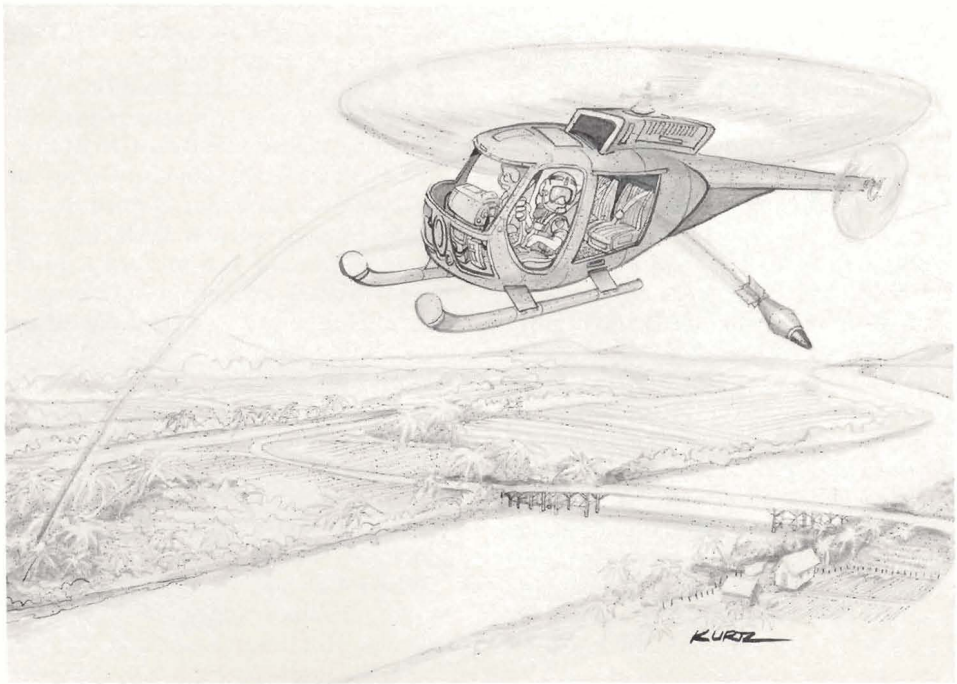
The improbable action occurred north of Quang Tri in 1972. A hunter-killer team (a light observation helicopter called a Loach and a Cobra gunship) was hunting NVA tanks that had crashed across the DMZ. The Loach pilot saw tank trails leading into the jungle and dropped down to the deck for a better look while the Cobra gunship circled above. The trail was wide enough and the canopy high enough that the Loach, flying beneath the jungle canopy, was able to follow the tank tracks through the jungle. As the Loach rounded a bend in the trail, it came face to face with the NVA tank and the pilot and co-pilot wound up looking down the tube of the tank's main gun. There was a loud boom. The round sheared off the rotor assembly and the Loach crashed onto the jungle floor. The pilot and co-pilot scrambled out and dived into the jungle. They looked up in time to watch the tank crunch their aircraft beneath its tracks.

The fervor to shoot at helicopters knew no bounds. S.L.A. Marshall cites an incident in which a U.S. company commander looked down and, to his amazement, spotted a VC mortar crew, their tube elevated to near verticle, firing mortar rounds at his airborne helicopter.

A *Washington Monthly* journalist, writing years after the American withdrawal from Southeast Asia, used the vulnerability of Vietnam-era helicopters to small arms to tag Army Aviation with the lable "Air Oblivion." Army aviators, however, are quick to point out that today's attack helicopters are heavily armored, will fight from stand-off distances and will use pop-up techniques that limit their vulnerability to ground fire.

None of this has stopped Afghan rebels from shooting down an occasional Soviet Hind-D with rifles and machine guns. The rebels, however, have had no success with small arms against the Soviet's Su-24 Frogfoot attack aircraft or Tu-16 high-altitude bombers.

As Dan Rather of CBS News pointed out in a nightly news broadcast, the Afghan experience shows that while shooting down heavily armored attack helicopters with rifles and machine guns is difficult enough; shooting down sophisticated, high performance jets without equally sophisticated anti-aircraft weapons is virtually impossible.



Grace Under Pressure

Soldiers, however, will doubtless never stop trying, no matter how great the odds. For one thing, the confrontation between man and airplane offers the soldiers a chance to demonstrate "grace under pressure," the attribute novelist Ernest Hemingway considered mankind's most admirable. Hemingway never read the FM 44-8 paragraph which tells machine gunners how to go about shooting down aircraft: "The gunner needs to get the weapon up in the air. It can be held up or some support can be used. In a real emergency, another soldier can act as a hasty firing support." When confronted with a "real emergency," however, Hemingway's characters follow the prescribed technique almost to the letter in the novel *For Whom the Bell Tolls*.

The scene, torn from the Spanish Civil War, is from the novel's famous "Fight on the Hilltop" segment. El Sordo's small band of Loyalist guerrillas, trapped on a hilltop, hear the drone of fascist warplanes and recognize their doom:

The planes were coming on steadily. They were in echelon and each second they grew larger and their noise was greater.

"Lie on your backs to fire at them," Sordo said. "Fire ahead of them as they come."

He was watching them all the time. "Cabrones! Hijos de puta," *he said rapidly.*

"Ignacio!" he said. "Put the gun on the shoulder of the boy. Thou!" to Joaquin, "Sit there and do not move. Crouch over. More. No. More."

He lay back and sighted with the automatic rifle as the planes came on steadily.

"Thou, Ignacio, hold me the three legs of that tripod." They were dangling down the boy's back and the muzzle of the gun was shuddering from the jerking of his body that Joaquin could not control as he crouched with bent head hearing the droning of their coming.

Joaquin, the band's youngest soldier and its only devout communist, attempts to recite the act of contrition over the roar of the automatic rifle, but cannot remember the words.

Then there were the hammering explosions past his ears and the gun barrel hot against his shoulder. It was hammering now again and his ears were deafened by the muzzle blast. Ignacio was pulling down hard on the tripod and the barrel was burning his back. It was hammering now in the roar and he could not remember the act of contrition.

All he could remember was at the hour of our death. Amen. At the hour of our death. Amen. At the hour. At the hour. Amen. The others all were firing. Now and at the hour of our death. Amen.

Then through the hammering of the gun, there was the whistle of the air splitting apart and then in the red black roar the earth rolled under his knees and then waved up to hit him in the face and the dirt and bits of rocks were falling all over and Ignacio was lying on him and the gun was lying on him. But he was not dead because the whistle came again and the earth rolled under him with the roar. Then it came again and the earth lurched under his belly and the side of the hilltop rose into the air and then fell slowly over them where they lay.

The result was not the happy ending FM 44-8 writers may have preferred, but then Hemingway was a fatalist.

Dennis Kurtz *is a U.S. Army Air Defense Artillery School illustrator who is seldom given a chance to unleash his talent as a cartoonist in the pages of Army field manuals and training circulars.*

As the most sophisticated air defense artillery weapon in the U.S. Army inventory, the Patriot missile system is vital to the AirLand Battle Doctrine. The Patriot's role is to protect deep-strike assets commanders must use to disrupt enemy follow-on echelons before they reach the main battle areas.

Highly mobile and capable of engaging multiple targets simultaneously, Patriot will replace the Nike Hercules surface-to-air missile system in providing air defense against high-to-medium air threats.

Following a 15-year Patriot test and evaluation program, the first U.S. Patriot battalion has deployed to Germany. This special section briefly describes the system and its employment and chronicles the weapon testing and troop training which paved the way for the arrival of 4th Battalion, 3rd Air Defense Artillery, in Giessen, West Germany, earlier this year.

PATRIOT

The Patriot is the first Army weapon system designed with an electronic-scanning radar and computers to track and shoot down many aircraft simultaneously while counteracting and evading enemy electronic jammers.

The Patriot fire unit's mission is to provide very low- to very high-altitude air defense for ground combat forces and high-value assets as determined by the force commander.

Patriot is 100 percent mobile and performs its mission with less tactical equipment, greater fire power, improved electronic counter-countermeasure capability and simplified logistics and maintenance requirements.

Patriot's requirements were based on established levels of capability against tactical threat aircraft characteristics, such as altitude, speed, maneuver and radar cross section.

The number and performance of threat aircraft requires that the system be capable of multiple, simultaneous engagements with a rapid rate of fire. The system's reaction time must be short and it must be capable of sustained operations in a severe electronic countermeasure environment.

With this in mind, the Patriot engineering effort led to a design based on three essential requirements:

- Patriot equipment must perform multiple functions.
- Patriot's missile must out-perform all known threat aircraft.
- Patriot must perform operations with minimum reaction times. (In the complex scenario of air defense, automatic control relieves crewmen of as many actions as possible.)

Patriot is the first automated, fully software-driven U.S. air defense artillery weapon system. Software—a combination of associated computer programs and data—enables the Patriot computers to perform computational and control functions. The computers, in turn, regulate engagement actions and monitor the operational status of equipment subsystems. The Patriot system can be operated in an automatic or semiautomatic mode.

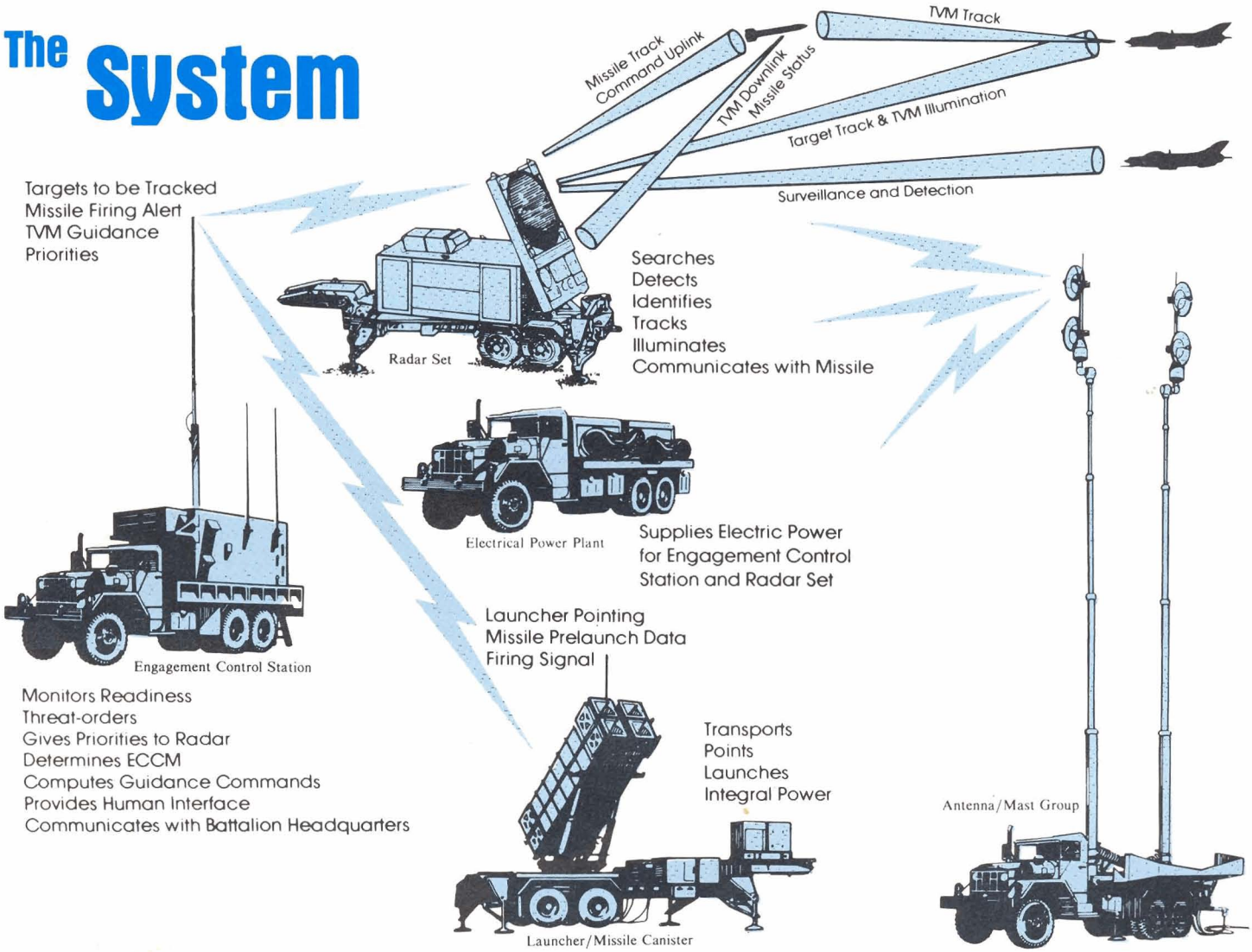
This state-of-the-art computer technology offers air defense artillerymen increased effectiveness by enabling the Patriot system to maintain track on large numbers of targets while conducting multiple simultaneous engagements.

Patriot fights as a battalion; however, its basic operational element is the firing battery. Normally six firing batteries are in a Patriot battalion. More than half of the personnel in a Patriot battalion have non-Patriot military occupational specialties.

Battalion Equipment

The Patriot air defense artillery battalion is organized into a headquarters

The System



and headquarters battery with six firing batteries. Major items of Patriot equipment at the battalion level include the information and coordination central (ICC), the communications relay group (CRG), the electrical power unit and the antenna mast group.

The fire direction center for air defense operations in the Patriot battalion is the ICC. The ICC controls up to six batteries and coordinates their operations with those of adjacent battalions and higher headquarters.

The CRG allows non-line-of-sight deployment between the ICC and the engagement control station. It provides both a radio-wire integration capability within the battalion and an entry and exit point for inter-battalion communications.

Firing Battery Equipment

There are only five major items in a Patriot firing battery, a factor that increases supportability. Only three soldiers are needed to operate a battery during combat. The number of repair parts has been reduced to approximately one quarter of the number of line items required in other systems. In addition, the Patriot has exceeded its meantime between failures requirements. (See related story Page31.)

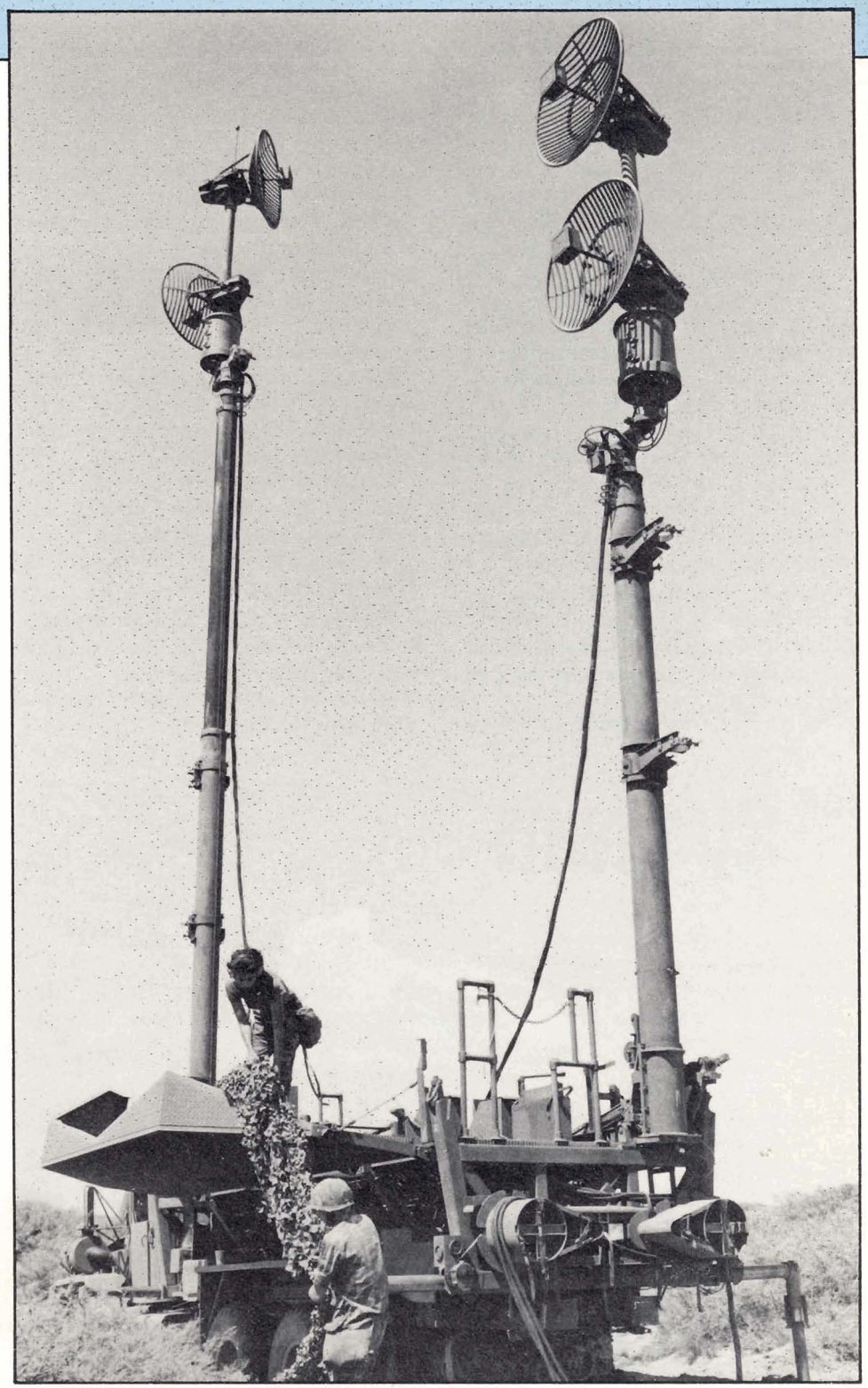
Each firing battery is divided into a headquarters section and three platoons: maintenance, fire control and launcher. The Patriot firing battery is made up of a fire control section and its associated launching stations. The fire control section consists of a radar set, an engagement control station (ECS), an electric power plant, an antenna mast group and launching stations.

The ECS is the only station in the fire unit manned during the air battle and is the command and control center for Patriot firing battery operations. Via the weapons control computer (WCC), the ECS controls the radar functions and launching stations and provides guidance commands to the missile.

The ECS controls up to eight launching stations through a VHF radio data link. The display and control group provides the operators with the data required to operate and control the system. Two operators, an enlisted Patriot system mechanic, military occupational specialty 24T, and a Patriot air defense artillery officer, specialty skill indicator 14E, monitor and activate displays.

The operators can select the automatic or semiautomatic engagement mode. The automatic mode allows the system to automatically engage targets. In this mode, the operators primarily monitor engagements but can manually override the system and engage targets. In the semiautomatic engagement mode, the operators select and engage targets that the system has detected and processed.

The WCC is the brain of the engagement control station. It controls the other major blocks of hardware and provides many processes and functions in order that the ECS can perform its air defense mission. The WCC monitors data from and delivers data to all major elements. Through the target



PFC Wonda Ashley (above) and SSgt. Timothy Gondek remove the camouflage covering an antenna mast group after A Battery, 4/3 ADA, received its marching orders. Considerable training emphasis was placed on breakdown, movement and set up of the system. (Photo by Sp5 Craig Strawther)

evaluation, launch decision and weapon assignment functions, it appraises the threat and selects an appropriate response. Patriot firing battery software provides centralized, real-time control of all elements of the fire unit.

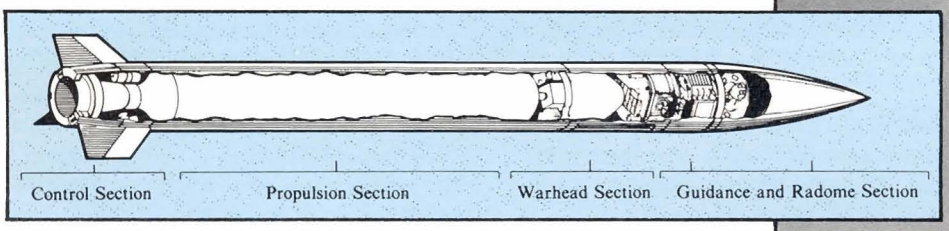
The radar set is a multifunction, phased-array radar that performs very low- to very high-altitude surveillance, target detection, target identification, target track, missile track, missile guidance and electronic counter-countermeasure actions.

The radar set is not manned during operation. It is remotely controlled in the ECS. The radar performs functions that now require nine separate radars with other systems.

The antenna mast group provides mobile quick-erect antennas and amplifiers for UHF communications among the ICC, the CRG and the ECS.

Throughout the Patriot system, message traffic is transmitted over multiple routes, thus providing a high probability that, in an electronic countermeasure environment, every data message will reach its destination. Equipment at each ICC, CRG and ECS reads the address of each message, checks for errors and then complies with the message, passes it on or destroys the message it has already received.

Another fire-battery level piece of equipment, the launching station, is a remotely operated, self-contained unit with its own power plant. The launching station, under operational control of the ECS, can fire up to four Patriot guided missiles at designated targets.



The Patriot guided missile consists of a Patriot missile mounted within a canister that functions as both a shipping and storage container and a launch tube. The guided missile delivers a high-explosive warhead against advance threat targets. Command-guided through midcourse, the system automatically selects one of four terminal-guidance modes depending upon the sensed nature of the target or the type of jamming being received.

In the fully automatic mode, the Patriot air defense equipment will detect a target, bring it under track, identify it and engage it all within a short reaction time. However, even in fully automatic operations, a variable review time enables the operator to override the system.

How It Works

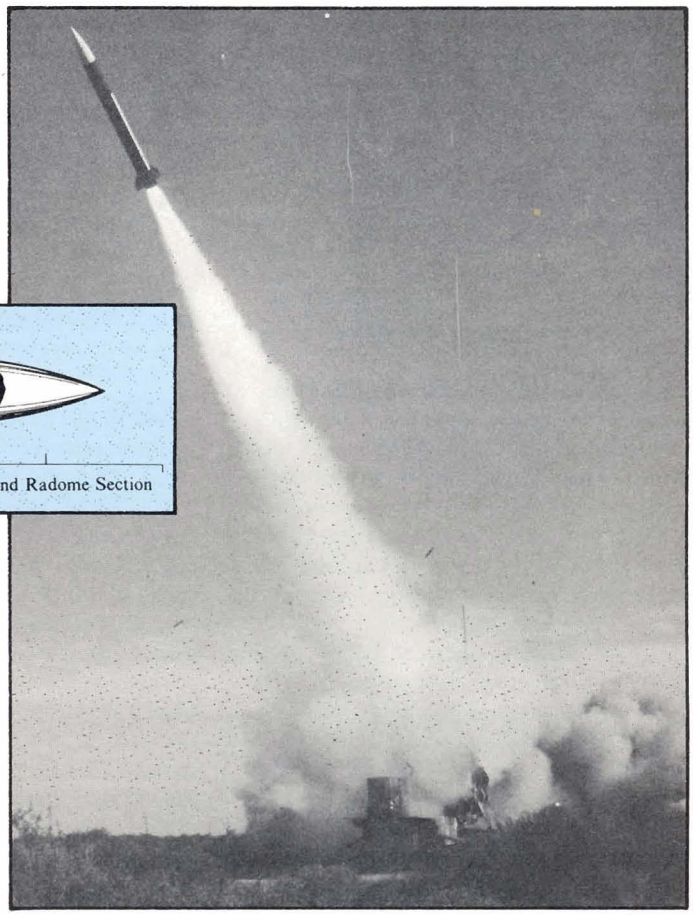
The radar searches its designated volume of air space. When a possible target is detected, the information on that possible target is relayed to the ECS where it is correlated against existing tracks. If the WCC determines that a new track does in fact exist, the target is brought under track. The target evaluation, launch decision and weapons assignment function of the WCC identifies the target, determines its engagement eligibility and threat orders the target.

Once the decision has been made to engage the target, the WCC relays launch information and time sequence to the launch station and radar. After launch, the missile completes an initial turn, is brought under track by the radar, and is command-guided to a point in the vicinity of the target.

The Patriot firing battery also uses the radar, under control of the ECS computer, to perform the surveillance function. It detects and establishes track on all targets which have entered the battery's coverage and provides track data on these targets for use by other operations. Surveillance must detect targets and place them under track at a range adequate to achieve the required reaction time and intercept range. Target evaluation, launch decisions and weapons assignment function progressively filters out targets which cannot or should not be engaged, until a single threat is selected for engagement. It then repeats the process to select another target for the next engagement.

Patriot brings to the battlefield new levels of automation. In the area of identification, Patriot's passive process will help relieve the operator of having to memorize large volumes of identification information as the present system requires.

Patriot's fast reaction capability, greater firepower and ability to operate in a severe electronic countermeasure environment meet the Army's requirements to defeat the air-supported threat estimated for the post-1980s.



With debris peppering the launch site, a Patriot guided missile is launched during testing. Although the missile is wingless, it does have four tail control fins. (Photo by Warren C. Weaver)

The Tactics

by Capt. Michael B. Bearce

Patriot will be the cornerstone of integrated air defense for the theater army. Although Patriot is classified as a high-to-medium altitude air defense artillery system, the role of the Patriot system is to perform the air defense artillery mission within the very low- to very high-altitude boundaries of the battlefield. This role may be tailored based on the capabilities of other available Army or Air Force air defense systems.

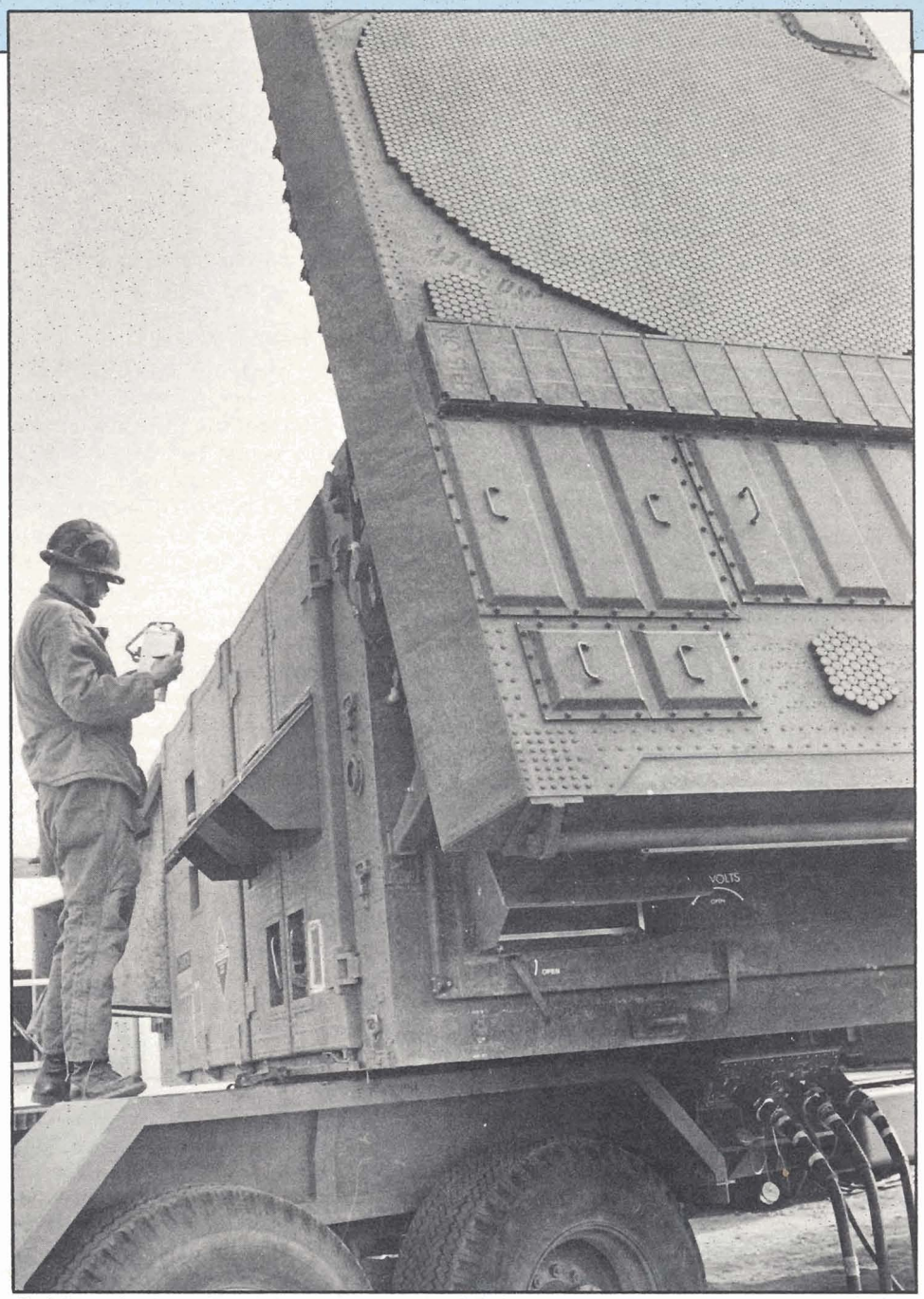
The mission of Patriot battalions is to provide very low- to very high-altitude air defense of high-value assets in the communications zone and of ground combat forces in the combat zone. This dual mission generally requires that Patriot battalions be deployed in both the tactical and the rear operations areas. Although there are many similarities in how the battalions in each area fight, there are many distinct differences—especially in defense design, command and control and movement doctrine.

In the air-land battle, the role of air defense artillery is to support the force commander's concept of the operation. Since Patriot battalions are a theater army asset, they are employed to support the theater commander's concept of the operation. Generally, this means that Patriot employment will be dictated by operational rather than tactical objectives.

Patriot battalions in the combat zone support the deep, close-in and rear battles defined by the AirLand Battle Doctrine. Patriot coverage over the divisional close-in battle area complements the coverage provided by organic short-range air defense battalions. It denies medium- to very high-altitude attack options to the enemy.

The air defense protection provided by Patriot battalions contributes to the rear battle by engaging and destroying enemy deep-strike aircraft overflying the divisional area before they can reach the rear area.

Patriot coverage also provides defense of the division and corps commander's deep-battle assets. Patriot units would move farther forward, but not necessarily with the maneuver force, to support the force in deep-attack maneuvers.



Sp4 Byron Lockwood, a systems operator with 4/3 ADA, checks the Patriot radar system during testing at White Sands Missile Range, N.M.

Patriot battalions in the communications zone provide dedicated point defense of the theater commander's deep-attack assets. Because these deep-attack assets are critical to the success of the theater campaign and are likely to be high-priority enemy targets, their protection from air attack is paramount. The area coverage provided by these Patriot battalions contributes to the air component of the rear battle for selected airspace within the communications zone.

Defense Design

Because Patriot is a sector system, the orientation of the firing batteries takes on additional importance. The use of electronic countermeasure tactics increases the need for multiple unit coverage for triangulation. Effective Patriot defenses can be designed by using the tactic of convergent primary target line orientation. Using this tactic, the primary target line of one battery crosses the line of at least one other battery. The exact orientation of the battery's primary target line depends on the tactical situation (Fig. 1).

This tactic maximizes mutual support, overlapping fires and defense in

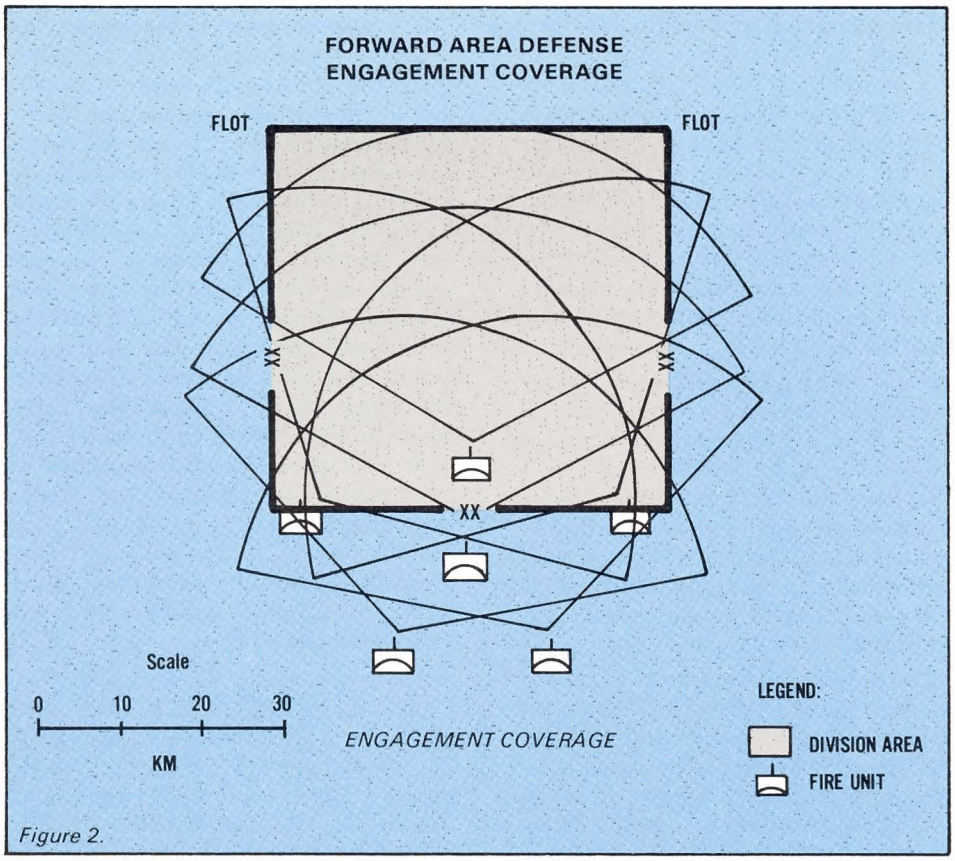


Figure 2.

depth. It does so by sacrificing some of the additional area coverage which could be gained by using a divergent or parallel primary target line orientation.

Typically, Patriot battalions establish area defenses in the tactical operations area. Against an initial air operation, the purpose of the area defense is to counter enemy attempts to penetrate into the rear operations area to attack deep-strike assets. Against enemy air support of ground operations, the Patriot area defense purpose changes to protection of the front-line divisions.

Patriot battalions employed in an area defense should always position their firing batteries to achieve overlapping fires, defense in depth and weighted coverage. Early engagement and mutual support are also desirable traits of an area defense.

Patriot batteries should be positioned approximately 20 to 30 kilometers apart and 40 to 60 kilometers behind the forward line of own troops. Figure 2 shows a typical area defense design.

Usually, Patriot battalions establish point defenses in the rear operations area. A single point defense by the Patriot battalion may afford protection to more than one critical asset based on the relative geographic location of the assets. There are basically two types of Patriot point defenses—a weighted defense and a balanced defense.

The first type should be used only when there is very high probability the attack will come from one direction and there are sufficient air defense weapons whose fires can be brought to bear against an attacker who comes from a different direction.

Should the situation lack either of these conditions, the balanced point defense should be employed. The balanced point defense is the norm. The Patriot defense should be oriented on the highest-priority asset. When designing the defense, a kill zone for Patriot should be established to take advantage of Patriot's high rate of fire. The Patriot batteries should be positioned 15 to 20 kilometers apart from each other and from the defended assets. Figure 3 shows a balanced and a weighted point defense.

Movement Doctrine

Patriot units move to respond to major shifts of friendly forces, to reestablish defenses of critical assets when the assets move, to respond to changes in mission assignments, to displace to alternate positions for survivability and also to ensure overall defense integrity.

Patriot batteries in area defenses in the tactical operations should move twice a day. The Patriot battalion fire direction center should also move daily. These are planning factors and include moves for survivability and changes in coverage requirements. Remember though, that moving units cannot fire. Too many units moving at once reduces firepower. Generally no more than one-third of the battalion should be on the move at one time. The S-3 should keep two-thirds of the battalion

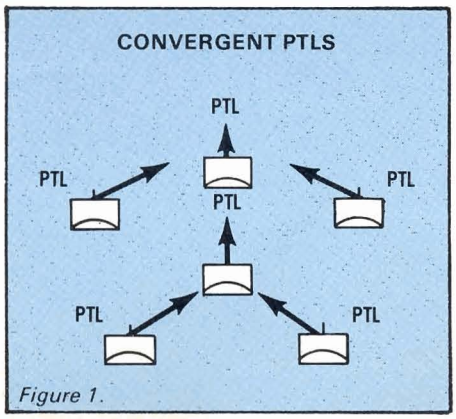


Figure 1.

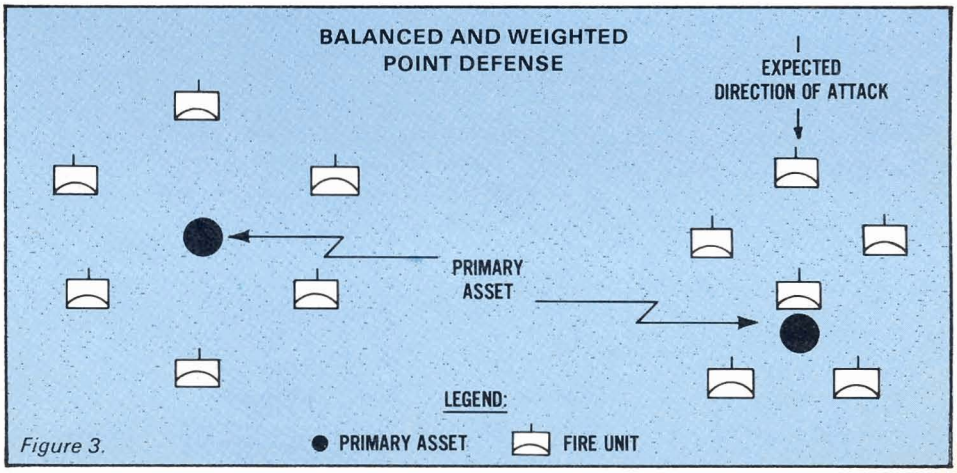


Figure 3.

available for the air defense artillery mission. No more than two firing batteries, or one firing battery and the battalion fire direction center, should move simultaneously. The movement of batteries should be randomly scheduled and planned to prevent the recognition of a template.

Naturally, movement for self-defense will disrupt the schedule, but it is better to vary from a plan than to have no plan at all. Movements should be made when the air threat is at its lowest, usually at night or in adverse weather; however, moves will also be made during daylight hours.

Command and Control

The command and control structure for Patriot units is identical to that of Hawk units since both Patriot and Hawk are currently theater army assets. The Army of Excellence transition will make Hawk a corps asset. The command chain for Patriot consists entirely of "green suiters" from the battery through the Army component of the theater. However, the control chain for Patriot has a "blue suiter" component. Typically, the Air Force exercises operational control of theater army air defense artillery forces.

But the nitty-gritty of command and control is in the application of the rules of engagement and supplemental fire control measures. The Patriot system's software embeds and automates many of these standard command and control procedures. Yet, it contains the flexibility to activate selected rules and measures and to change parameters quickly. Much of what the Hawk and Nike Hercules tactical control officers had to mentally keep track of is now managed by the Patriot system. We should take advantage of the automated capabilities of the system in our doctrine—and we do.

Some of the key points to Patriot command and control doctrine are founded on the philosophy of fighting as a battalion rather than as individual fire units. The right of self-defense is applied on a battalion level. A Patriot battery should engage in self-defense if an aircraft attacks an adjacent Patriot battery, since this engagement would protect the battalion as a whole.

The normal wartime level of control is the Patriot battalion, because the Patriot battalion is the echelon which can best fight the air battle. Higher echelons, due to their communications and automated data processing equipment, are best equipped to handle massive saturation raids. Likewise, the recommended wartime modes of control for Patriot are decentralized at battalion and centralized at battery. Once again, this reinforces the concept of fighting as a battalion.

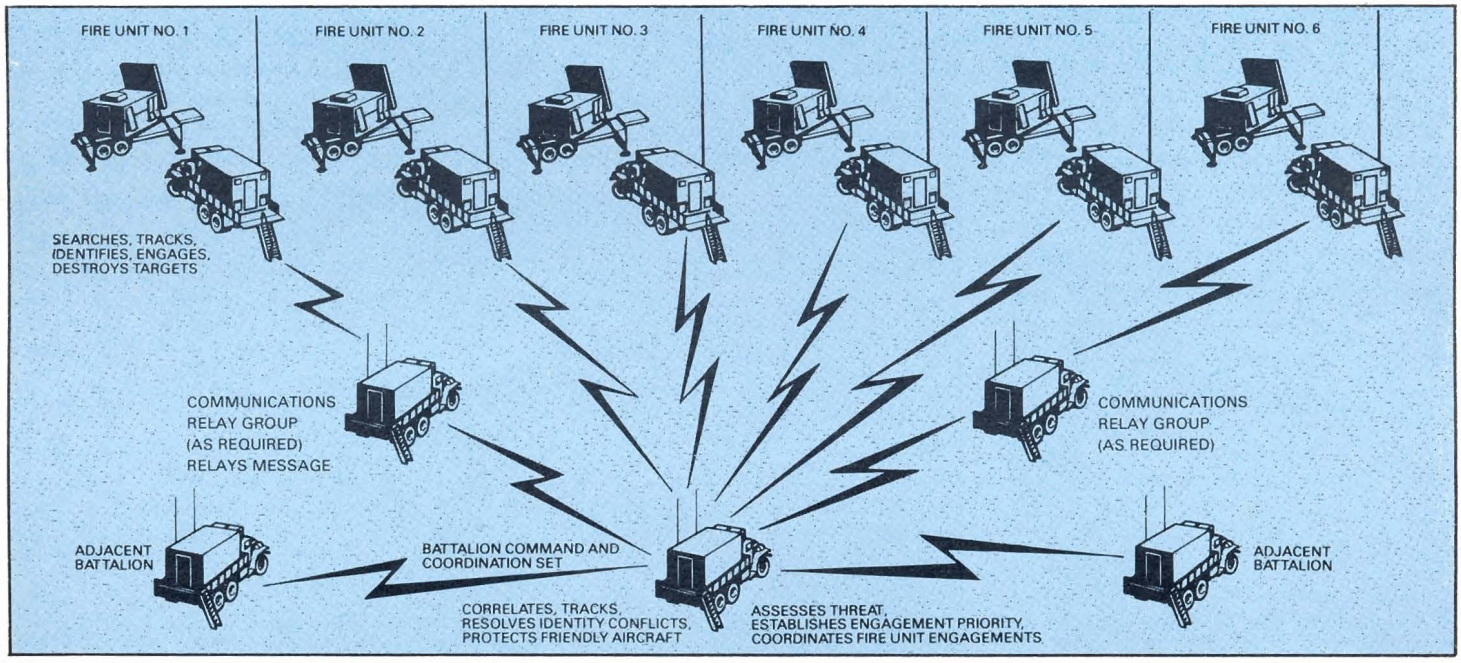
Of particular importance are the doctrinal recommendations for the use of the automatic engagement and identification modes. Some soldiers will point out that Hawk also has an automatic engagement mode, but Hawk has never been allowed to use it. That's because it has never been in our doctrine. But now, Patriot doctrine clearly recommends the use of both the automatic engagement and automatic identification modes. By using the automatic modes, the operators are free to make decisions which the system cannot make and to review, approve, or disapprove computer decisions instead of performing second-by-second bookkeeping on scores of air targets. Use of the automatic modes with operator override results in more effective air battle management and thus better air defense for the force.

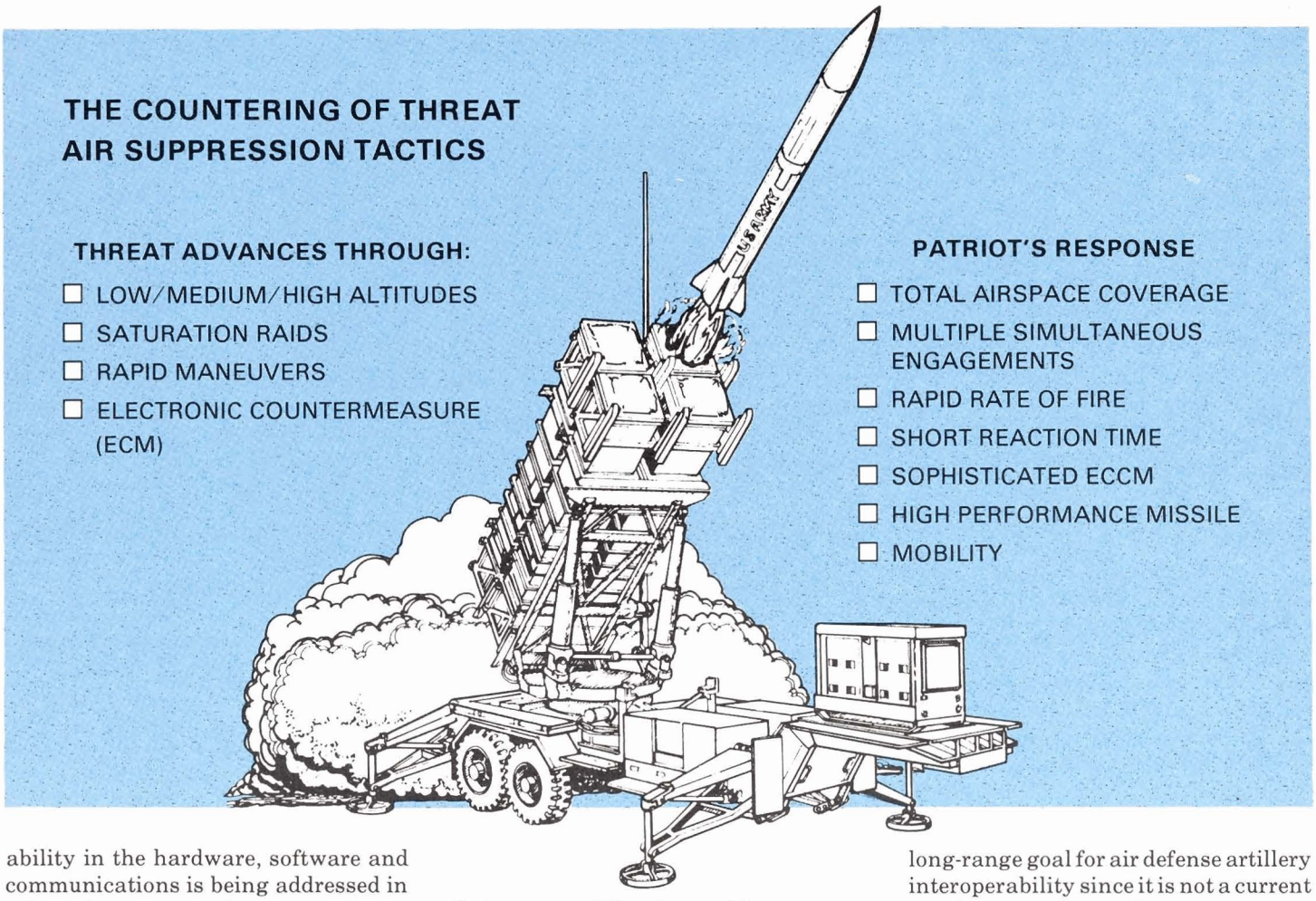
Patriot and Hawk Interoperability

One of the key areas in command and control is the technical interoperability between Patriot and Hawk through the AN/TSQ-73 Missile Minder Command and Control System. Air-Land Battle Doctrine and composite deployments in NATO and contingency areas, plus the need for rapid reconstitution with command and control flexibility, indicate that interoperability is essential.

Developing the technical interoper-

Schematic organization of a Patriot battalion, with links to adjacent battalions. The eight launchers for each fire unit are not shown, as well as all the logistic support vehicles, the prime movers, the generator sets, etc.





ability in the hardware, software and communications is being addressed in a four-phase approach.

Phase I interoperability between the Hawk and Patriot only occurs through the air defense artillery brigade Missile Minder. Software modifications to the Missile Minder have been made to incorporate Patriot weapons' assignment and display requirements. Due to data link and software limitations, direct Patriot battalion to Hawk battalion exchange cannot occur as long as brigade is "in the loop." Brigade is the normal joint and combined interface with the Air Force.

In the event of loss of the brigade Missile Minder, any Hawk battalion can assume brigade fire direction center functions and re-establish links with Patriot battalions, other Hawk battalions and the joint and combined air defense force.

Phase II interoperability is aimed at achieving direct Patriot battalion to Hawk battalion exchanges even with the air defense artillery brigade "in the loop." The Joint Tactical Information Distribution System, with its associated message standard and data link protocol, will ensure compatible links. Software modifications will be made to the Missile Minder and to Patriot to allow command and control exchanges and to incorporate the firing doctrine for composite brigades.

This phase will include modifications to interoperate with and support short-range air defense command and control. It will also improve the air defense artillery unit's ability to operate in the normal joint and combined air defense environment.

Phase III is a continuation of Phase II efforts. The Joint Tactical Information Distribution System will be embedded in the Hawk system down to platoon level. With the appropriate software modifications to allow command and control exchanges and information displays, this phase will allow the integration of Hawk platoons with the Patriot battalion. This will provide flexible employment and reconstitution options to air defense artillery commanders. The data message standard will additionally allow Hawk fire units to interoperate in the absence of a battalion fire direction center.

Phase IV should be considered a long-range goal for air defense artillery interoperability since it is not a current requirement. Phase IV is an extension of Phase III interoperability in which the Joint Tactical Information Distribution System would be embedded into each Patriot battery. This would allow interoperability for Patriot fire units to Hawk fire units while retaining the ability to command and control fires at battalion and higher echelons.

Patriot doctrine is constantly being upgraded and revised based on system changes, new air defense artillery operational concepts and input from the field. Tactical units are incorporating the doctrine into tactical and field standing operating procedures, operations plans and supporting plans, as Patriot takes its place as the cornerstone of theater army air defense artillery.

Capt. Michael B. Bearce *is a doctrine writer in the Tactics Department, U.S. Army Air Defense Artillery School, Fort Bliss, Texas. A graduate of the U.S. Military Academy, his previous assignments include commanding a Hawk battery and working as a Patriot tactical director and weapon employment analyst.*

The Testing

by Brig. Gen. Donald R. Infante

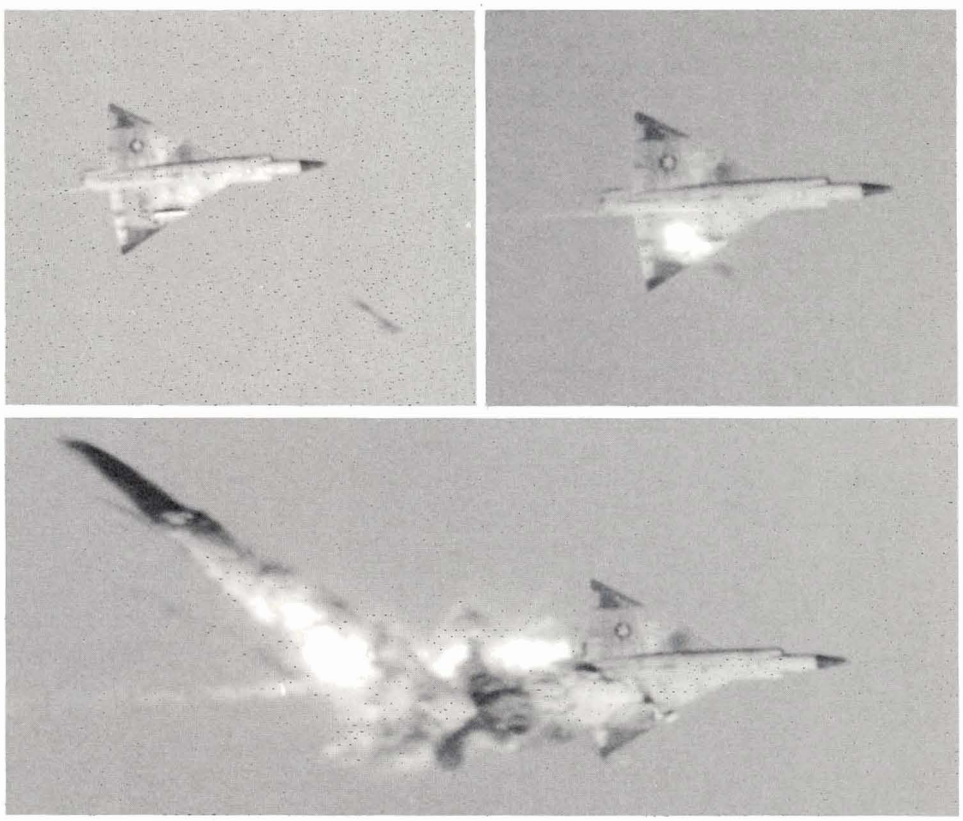
Patriot, perhaps the most tested and proven weapon system ever to hit the field, is now taking its place on the front line of defense. The decision to deploy Patriot to West Germany followed a rigorous, highly successful 10-week operational test, conducted by the Army's Operational Test and Evaluation Agency, involving more than 2,000 people.

This operational test, Follow-on Evaluation (FOE) III, was designed to test Patriot's ability to shoot, move, communicate and sustain. In every area, Patriot met or exceeded test criteria. The successes of FOE III prompted a decision by Secretary of the Army John O. Marsh Jr. to initiate deployment of Patriot to Europe. The first unit deployed, FOE III's 4th Battalion, 3rd Air Defense Artillery, will soon be joined by six additional U.S.-manned battalions. Additionally, several allies are actively pursuing acquisition of Patriot or have expressed interest in the system.

Patriot is the world's most capable air defense system. Its automation, electronic counter-countermeasure capabilities, multiple-simultaneous engagement capabilities, self-diagnostics and growing availability rate make it Air Defense Artillery's premier weapon. Its reliance upon easy-to-update software will permit Patriot to remain ahead of the manned air threat far into the future.

Its capabilities were substantiated through FOE III which tested mission performance, reliability, availability, maintainability, training interoperability and survivability. During its research and development, Patriot was subjected to hundreds of search and track tests and more than 80 firings. Of those firings, every missile with a tactical warhead destroyed its target.

FOE III focused on demonstrating system reliability improvements above the previous year's performance in FOE II. In July 1983, a decision to delay Patriot's European deployment until the system's reliability matured to an acceptable level was made by Undersecretary of the Army James R. Ambrose.



A "tied back" Patriot missile heads for a proximity intercept with a full scale QF-102 target. The intercept was so accurate that the missile sheared the pod and wing from the aircraft.

Growth in availability is a natural phenomenon for new systems. Availability rates grow with emerging expertise in manufacturing, training and field operations. Normally this process takes several years. However, during the year between FOE II and FOE III, factory testing of components and assembled end items and the period of collective training for the newly formed Patriot battalion were beefed-up. Several hardware and manufacturing improvements were implemented and new training devices were fielded. A period of system "burn in" was initiated. The fire control section major end items were operated as an integrated unit for more than 1,000 hours to eliminate problems of "infant mortality" before the Army would buy the production set. The result of this strenuous year of activity was the gratifying performance of equipment and soldiers during FOE III.

The operational environment in which the system was tested included an extended field problem involving multiples of tactical movements, emplacements and return to the air battle under varying conditions of day, night, adverse weather and nuclear, biological and chemical (NBC) protective postures. Intermeshed with the maneuver phase were 16 large-scale search and track trials during which instrumentation captured every tactical decision by man or machine in the conduct of the air battle against 600 sorties of U.S. Air Force, Navy, Marine Corps and Air National Guard aircraft.

As a finale, FOE III concluded with four successful live-fire engagements against full-scale fighter aircraft, all of which employed electronic countermeasures (ECM). In all, more than 60 days of intensive operations were executed by the 4/3 ADA during a test designed to induce human fatigue as an operational factor.

Operational measurements revealed an astonishing 100 percent increase in fire unit availability over the previous year's experiences. This operational availability combined with Patriot's tremendous increase in firepower and Patriot's super performance in heavy ECM environments provides a quantum leap in defense capability above currently fielded systems. The overall Patriot battery-level operational availabilty, achieved in FOE III, exceeded that of many systems that have been in

the field for a number of years. The mean time between failures for the overall system was 117 percent of the requirement stated in Patriot's specifications. Firepower capability was demonstrated by the high launching availability. Ninety percent of the time, at least 13 of the 15 launchers in the battalion were operational. Plans are to increase the number of launchers by 60 percent in the near future, thereby improving an already awesome firepower capability.

Movement Survival Key

Patriot is designed for rapid mobility, a primary key to survival for an air defense system. The only cabling required is between the elements of the fire direction center which are about 100 feet apart. The battery's engagement control station (ECS) and its launching stations are joined by VHF links. The heavy expanded mobility tactical truck (HEMTT) was selected as the prime mover for the radar set and launching stations to ensure cross-country mobility of the system. A maneuver phase integrated into a large-scale search and track phase began FOE III. During the maneuver phase, the Patriot batteries made 93 moves in 30 days. The battalion information and coordination central (ICC), which served as the tactical command post, conducted 18 moves. Communications relay groups (CRG) conducted 12 moves. The heavily stressed maneuver scenario put all of Patriot's mobility design features and the 4/3 ADA operator training to the test.

Moves were executed in response to controller movement orders and performed during day, night and NBC conditions. Mother nature added environmental stress with an inordinate amount of rainfall for the desert. The resulting quagmires sank one commercial 4X4 to the roofline and victimized many more controllers, but the HEMTTs pulled through to prove their mettle.

Despite conditions intended to induce soldier fatigue, 85 of the 93 battery moves were conducted within the standards established by the U.S. Army Air Defense Artillery School and concluded with the successful return to operational condition by the batteries. The ICC relocations were completed within the time standards every time and the ICC and CRGs never experienced a maintenance failure that significantly extended relocation time.

Soldiers ready Patriot major end items for another move on a heavy expanded mobility tactical truck. Patriot's mobility was exhaustively tested during the recent FOE III.

Little difference was noted in mobility under nighttime, adverse weather or NBC conditions. The test's maneuver phase clearly proved Patriot hardware's ability to withstand the shocks and vibration of tactical movement and the 4/3 ADA soldiers' superb training, leadership and motivation as well as Patriot's ease of operation.

Search and Track

Live aircraft were used in the 16 large-scale search and tracks conducted in FOE III. Air Force F-4s, F-111s, F-15s and New Mexico Air National Guard A-7s were scripted in realistic hostile and friendly flight profiles to test Patriot's ability to detect, track, identify, threat order and engage. Formation spacing was timed to induce operator stress in the conduct of the air battle. Also Air Force EF-111As, NKC-135 (Big Crow), T-39 (Little Crow) and Navy EA-6B electronic warfare aircraft provided stand-off jamming. This jamming, combined with 18 chaff pods and 14 jamming pods carried onboard ingressive attackers, created a realistic ECM environment.

Patriot's missions were varied between area and point defenses. Trials were structured to test the semiautomatic modes of engagement and identification from battery through brigade control levels. The automatic identification and engagement capabilities were also evaluated. Patriot tactical software is designed to automatically process radar returns to determine precise target information. This information is compared to passive identification criteria and entered into the software during emplacement to determine target identity. Automation continues by threat-level ordering the targets and optimizes the launch decisions to protect assets while maximizing kill probability.

Finally and most importantly, Patriot's automation permits time sharing of the radar among search and track; identification, friend or foe, and missile guidance. Most significant of all is Patriot's multiple simultaneous engagement capability which provides the firepower previously requiring many batteries.

Of the 262 threatening hostile target presentations scripted for engagement, Patriot successfully engaged more than 90 percent. Although that figure exceeds the standards, corrective action is already underway to close in on the 100-percent mark.

Availability was good, air battle was great, but in air defense, nothing beats live fires, and FOE III's were fantastic. The first shot employed a new capability being tested for the first time, Patriot's strobe engagement mode. This feature permits operators to engage any jammer within the missile's effective envelope, even though target range is being denied by jamming. For this live-fire test, the missile's warhead was "tied back" in attempts to score a proximity intercept without loss of the valuable jamming pod and full-scale QF-102 target. The intercept was so accurate that the missile sheared the pod and wing from the aircraft.

The second live fire included Patriot ripple fire against a jamming formation from one battery while a sister battery engaged a third low-level jammer. All three engagements resulted in

A test helicopter suffers the consequence of its close proximity to a high-explosive Patriot guided missile warhead during evaluations at White Sands Missile Range, N.M. A direct hit is not necessary to destroy the target.

immediate catastrophic destruction of the targets, putting the icing on the cake.

Participating Agencies

Several agencies participated in the conduct and evaluation of FOE III. The U.S. Air Force, Navy, Marine Corps and Air National Guard executed several hundred sorties of live aircraft presentations. The Joint Electronic Warfare Center structured communications jamming against the Patriot battalion's multirouted digital data links and brigade communications links. The Office of Missile Electronic Warfare provided the electronic jamming equipment against both Patriot and Hawk. The 11th Air Defense Artillery Brigade, Fort Bliss, Texas, provided Hawk units and a brigade fire direction center to conduct interoperability trials with Patriot.

In addition to providing well-trained Patriot battalions, the U.S. Army Air Defense Artillery School provided the issues and criteria to be evaluated by FOE III activities. The Air Defense Board concurrently evaluated Hawk in its FOE III participation. Test and Evaluation Command resources and White Sands Missile Range (WSMR), N.M., were used extensively during the exercise.

The Army Test and Evaluation Agency provided test conduct support and sponsored the WSMR activity. WSMR provided all range support, including four live-fire targets, missile tracking and missile telemetry. Invaluable optics tracking provided spectacular photos of the four Patriot kills and WSMR computer facilities digested tons of data extracted from 16 large-scale search and track exercises and the live fire.

Also participating were personnel from Harry Diamond Labs, the Air Defense Command and Control Systems Project Office, the Hawk Project Office, U.S. Army Training and Doctrine Command, the Army Missile Maintenance Center and School, 32nd U.S. Army Air Defense Command and the Army Materiel Systems Analysis Activity.

Individuals from all agencies formed the data analysis group which participated in the test planning and the data collection, reduction and analysis. The primary job of the group was to report the facts occurring from the test activity. All of these agencies were required to plan, stage, conduct, analyze and report FOE III.

Most important, however, were the soldiers of 4/3 ADA who actually executed FOE III. In the final analysis—their outstanding performance made it happen. The entire air defense community benefited from their numerous sacrifices and their superb performance.

It would be unfair not to point out that FOE III included two successes. Certainly the Patriot system emerged successfully, however, the test itself was also a success. Such intense activity, involving so many people from so many organizations, could not have succeeded without complete professionalism and cooperation among agencies.

FOE III proved Patriot's and 4/3 ADA's readiness. Patriot's future is just beginning as it assumes a vital role in maintaining peace on the front line of defense.

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The Support

by Capt. Howard B. Bromberg

The Patriot system's design eases the field logistics burden because its increased effectiveness is achieved with less equipment, fewer operational people and fewer repair parts than the systems it replaces.

The Patriot battery is comprised of 11 major end items, as against 27 for Nike Hercules. A Patriot battalion requires 765 people while 878 are required for a Hawk battalion and 1,030 for a Nike Hercules battalion. A Patriot battery calls for less than 150 people and only two are actually needed to operate it once it is emplaced. And on the maintenance side, Patriot has significantly fewer repair parts peculiar to its system compared to Hawk and Nike Hercules.

With Patriot's revolutionary design also comes new concepts in maintenance support. The Patriot maintenance structure is organized into three levels, organizational maintenance, intermediate maintenance and depot maintenance.

Organizational maintenance is performed at unit level by a military occupational specialty 24T, Patriot operator and maintainer, and a senior maintenance technician (SMT) warrant officer with MOS 222C. They use organic tools, test equipment and procedures. This includes using technical manuals, equipment publications and display-aided maintenance software. This software program runs a series of fault isolation checks on the complete system and displays the degrades or no-go conditions in the engagement control station for use by the 24T and SMT.

A fault may be detected during periodic services, but more likely it will be pointed out by the status monitor portion of the operational software. If faults are found during air battle operations, the unit commander decides, based on inputs from the operator and maintenance personnel, whether to initiate maintenance action to isolate and repair the fault. This procedure is known as the "fight-or-fix" criteria.

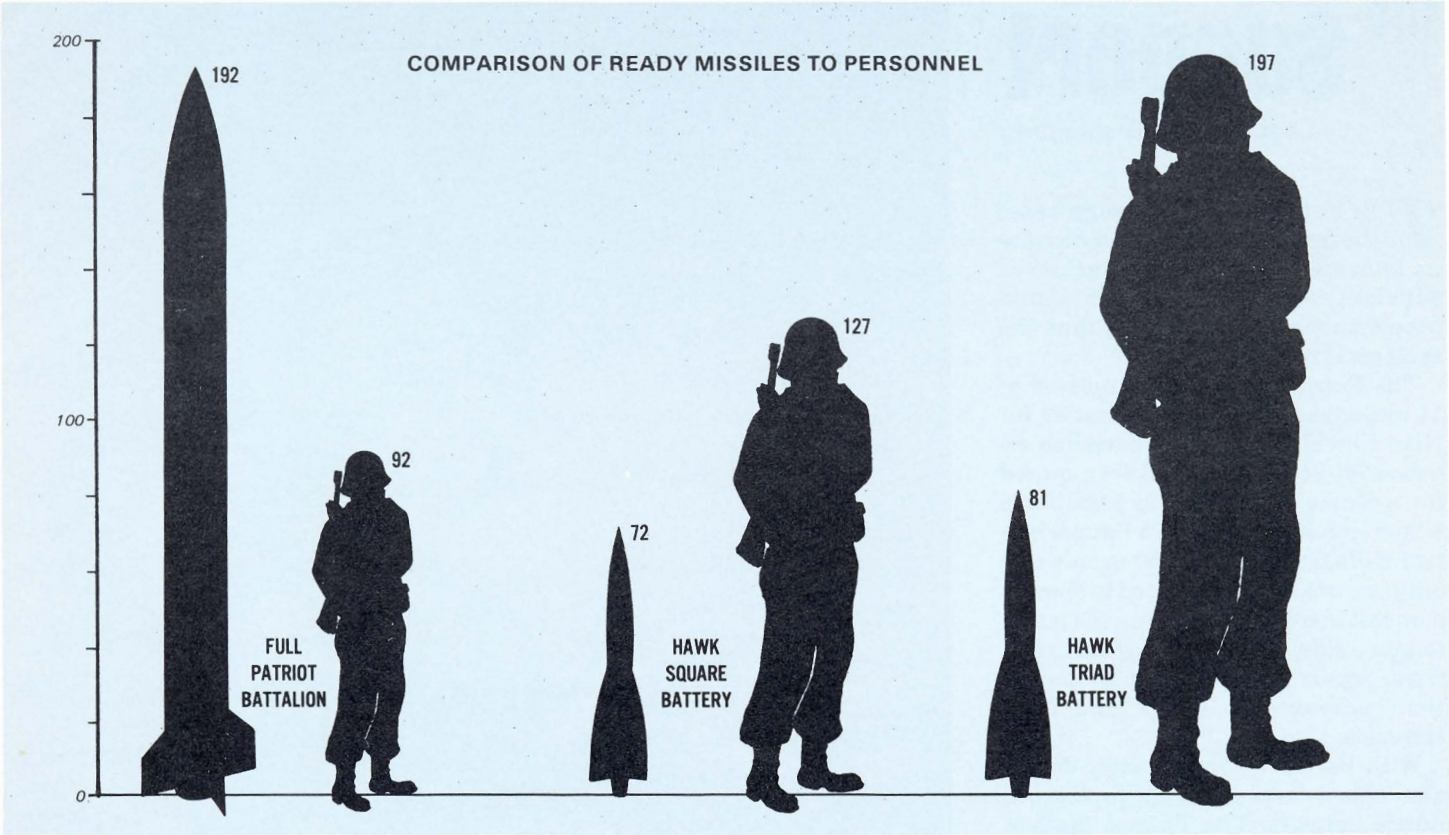
If the degrade or no-go situation is to be corrected, the 24T immediately begins fault isolation procedures. The SMT assists the 24T with additional troubleshooting techniques if the 24T cannot correct the fault.

Mechanics PFC Troy Barmore (left) and Sgt. Michael Phillips work to "keep 'em rolling" in the 4/3 ADA's field motor pool. Support to the unit had to be provided in a 100-mile radius. (Photo by Sp5 Craig Strawther)

More than 90 percent of system faults will be detected and corrected by the substitution of battery replaceable units (BRU). If the BRUs have been exhausted, the unit SMT may call a Military Command logistics assistance representative (LRT), or a contractor-furnished technician (CFT) for assistance in troubleshooting. The LRT and CFT are not part of the formal maintenance structure but provide advice and assistance to Patriot units at all levels of maintenance. The LRT or CFT are called for assistance as soon as the unit feels they are needed or when directed by local standing operating procedures. The unit may also call upon intermediate maintenance (IM).

Intermediate maintenance is provided in the Patriot platoon of the Guided Missile General Support Company. The platoon is centrally located at the Patriot field army support center (PFASC). The PFASC is a building that houses a combination of soldiers, Department of the Army civilians and civilian contractors who work as a cohesive unit under the control of an Army captain, with a 73A specialty. Intermediate maintenance is further divided into two distinct categories, forward and rear.

Forward IM is provided by the intermediate support element (ISE) located near the supported unit to provide quick response time. The ISE team travels to the site and, following coordination with unit personnel, begins to troubleshoot with resources available to the team. If the ISE exhausts all



available means of detection and repair and the fault still exists, IM rear or backup IM support will be called forward.

The rear IM element located at the PFASC can execute its mission in two ways. The PFASC can execute an immediate float transaction to the unit and bring the non-operational item back to the PFASC for repair, or the IM personnel from the PFASC can go to the unit and provide assistance with or without a float item, depending on the situation.

The PFASC has special diagnostic software tools and other test equipment available for extensive troubleshooting, but performs best in a shop environment.

It is important to understand that IM personnel are system repairmen, not the repairers of broken parts or chassis. Because of this new approach to repair, the soldiers are extensively trained in system diagnostics and fault isolation procedures.

Depot-level support is currently provided by interim contractor support. The depot-level support has two elements, one located forward in the PFASC and one in the continental United States. The PFASC-located depot support provides quick turnaround on high-cost depot repairable items. Letterkenny Army Depot, Chambersburg, Pa., has been designated the CONUS depot where facilities are being expanded to provide secondary item repair in FY86 and major item rebuild by FY89.

HAWK battery as compared to PATRIOT

1 BATTERY	1 FIRE UNIT
PAR	MULTIFUNCTION PHASED ARRAY RADAR
ICWAR	
ROR	
HPI (2)	
LAUNCHERS (6)	LAUNCHERS 5-8 (POSSIBLY MORE)
BCC	ECS
ICC	FLEXIBLE NUMBER 20-32 (POSSIBLY MORE)
(18)	

Patriot's maintainability and availability were tested and proven during Follow-on Evaluation III by a set of rigid standards, such as mean time between failure, mean time to repair and system availability.

A set of data collectors were always present to assess system availability. Not a minute was missed or overlooked. For example, when the unit was in stand down (a scheduled break in the evaluation), no maintenance, including preventive maintenance, could be performed. The unit could stand down from fully operational or degraded status. To ensure this, the equipment was placed under lock and key when the evaluators were not present.

The standards were either met or exceeded during FOE III, proving Patriot is tactically capable and that its support structure maintains the system.

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The Network

by CWO 4 Jerry Morgan

The Patriot Readiness Center, a new concept in logistics management, smoothes Patriot's trip from production lines to firing sites and helps air defense artillerymen keep the Army's most sophisticated weapon system ready to fight.

The Patriot Project Manager established the Patriot Readiness Center within the Patriot Project Office, Redstone Arsenal, Ala., to facilitate Patriot's transition from development to fielding and to provide Patriot battalions with speedy solutions to problems encountered in the field.

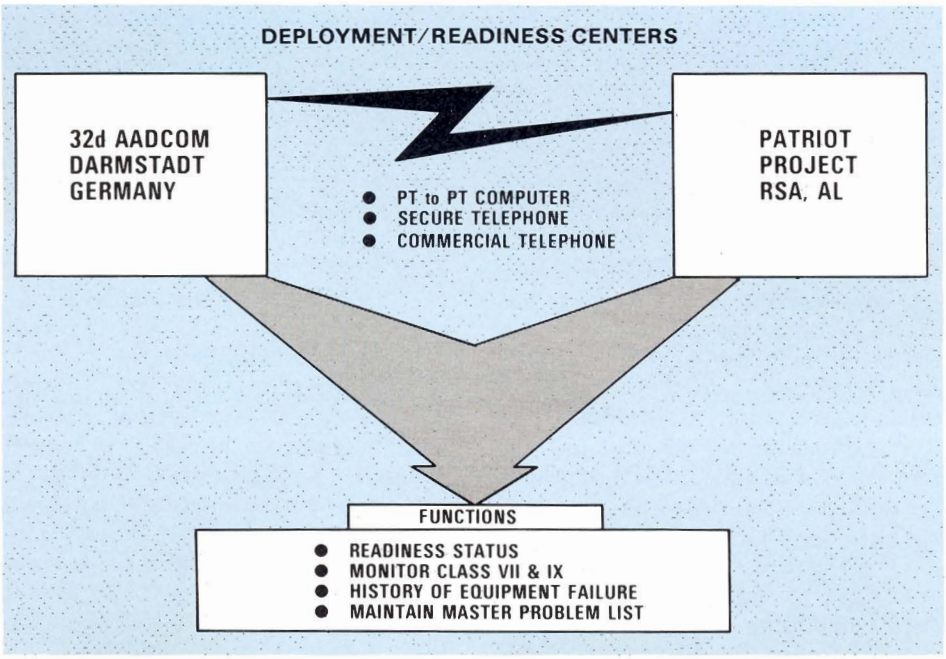
The center bristles with display units that chart Patriot system readiness around the world. But the center owes its true effectiveness to less conspicuous computer data links that tie the Patriot community together. A data link with the Defense Data Network permits the Patriot Project Office staff access to the Missile Command's Logistics Intelligence File. Direct data links to the Patriot Support Office, Fort Bliss, Texas, and the Patriot Field Office, White Sands Missile Range, N.M., were established during August 1984, in time to help Patriot pass its crucial Follow-On Evaluation III last September.

During October 1984, in preparation for the deployment of the 4th Battalion (Patriot), 3rd Air Defense Artillery, to West Germany, the center established direct data links to the 32nd Army Air Defense Command, U.S. Army Europe and to Patriot's prime contractor, Raytheon Co. Data lines to the Patriot Field Army Support Center at Fort Bliss and Miesau, West Germany; to the 200th Theater Materiel Management Center, Zweibrucken, West Germany; and to Headquarters, U.S. Army Europe, Heidelberg, West Germany, followed.

The combination of data links allows the Patriot Project Office to interface from field unit to contractor and creates a rapid flow of accurate information. The Patriot Readiness Center considers the field units' needs and serves as a management tool for the Patriot Project Manager, redirecting the activities of the Patriot Project Office in order to aid units in the field.

The Patriot Readiness Center has many functions of which the following are of major importance:

- Report readiness status of all deployed Patriot units through automated data processing.
- Monitor the disposition of Class VII and Class IX supply items.
- Provide a history of equipment outages through automatic data processing.
- Act as the Patriot Project Office's equipment status and readiness interface point with major commands.
- Maintain a master program list of critical readiness issues for use by the Patriot Project Office and the user community.



The way the Patriot Readiness Center works is best explained by example. A major and basic problem list format is programmed into Patriot Readiness Center computers. When a unit identifies a problem with Patriot equipment, the unit notifies the Patriot Support Office in its area. The Patriot Support Office enters the problem in its computer's basic problem list file and the list is immediately printed out at the Patriot Readiness Center. Center personnel then query the Patriot Project Office staff, major commands or contractors to find a solution. If a solution is available, it is immediately entered into the Patriot Project Office computer and printed out at the Patriot Support Office which, in turn, relays the solution to the unit. If no solution is immediately available, the problem is added to the master program list by Patriot Readiness Center personnel and is reviewed by the Patriot Project Manager.

Display units within the Patriot Readiness Center allow the Patriot Project Manager or any member of his staff to monitor the status of the Patriot systems from production line to field units. The display charts, for example, display authorized stockage lists and prescribed load list zero balances for individual battalions, equipment statuses of individual fire units, production and contract schedules, deployment schedules and the master problem list.

During the first Patriot battalion's deployment to West Germany, the Patriot Readiness Center tracked critical spare parts for oversea shipment as well as Material Review Release Board factors that had to be worked out to achieve a full release status. As more Patriot battalions are activated, the Patriot Readiness Center will continue to help the soldier maintain the Army's most sophisticated weapon system in a superior readiness posture.

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The Communications

by Capt. James G. Van Patten

Patriot's full potential is realized as an integrated battalion. But without a fast moving, highly reliable and jam-resistant communications system, an integrated air defense command and control would not be possible. Patriot's full potential is assured by one of the U.S. Army's most sophisticated, battalion-level communications systems—the Patriot UHF multirouted digital data link system.

Although Patriot batteries are fully capable of fighting the air battle independently, they are designed to fight as a battalion. And Patriot's extensive engineering efforts have created a highly advanced missile, radar and tactical automation system. The missile, with its high-G capability, easily outflies any currently manned aircraft. Patriot's multifunction, phased-array radar determines precise target information and takes advantage of the jamming that would blind other radars. The weapons control computer conducts the air battle in the automatic mode and assists the operator in the semiautomatic mode while simultaneously monitoring equipment status, directing the radar and controlling displays.

An equally extensive engineering effort was dedicated to the creation of a communications system, using currently available equipment, that makes communications jamming extremely difficult; that can operate over the propagation distances required by air defense artillery; and which compensates for normal equipment outages. These features are provided by equipment redundancy, computer assistance, highly directional antennas, power amplification and communications relays.

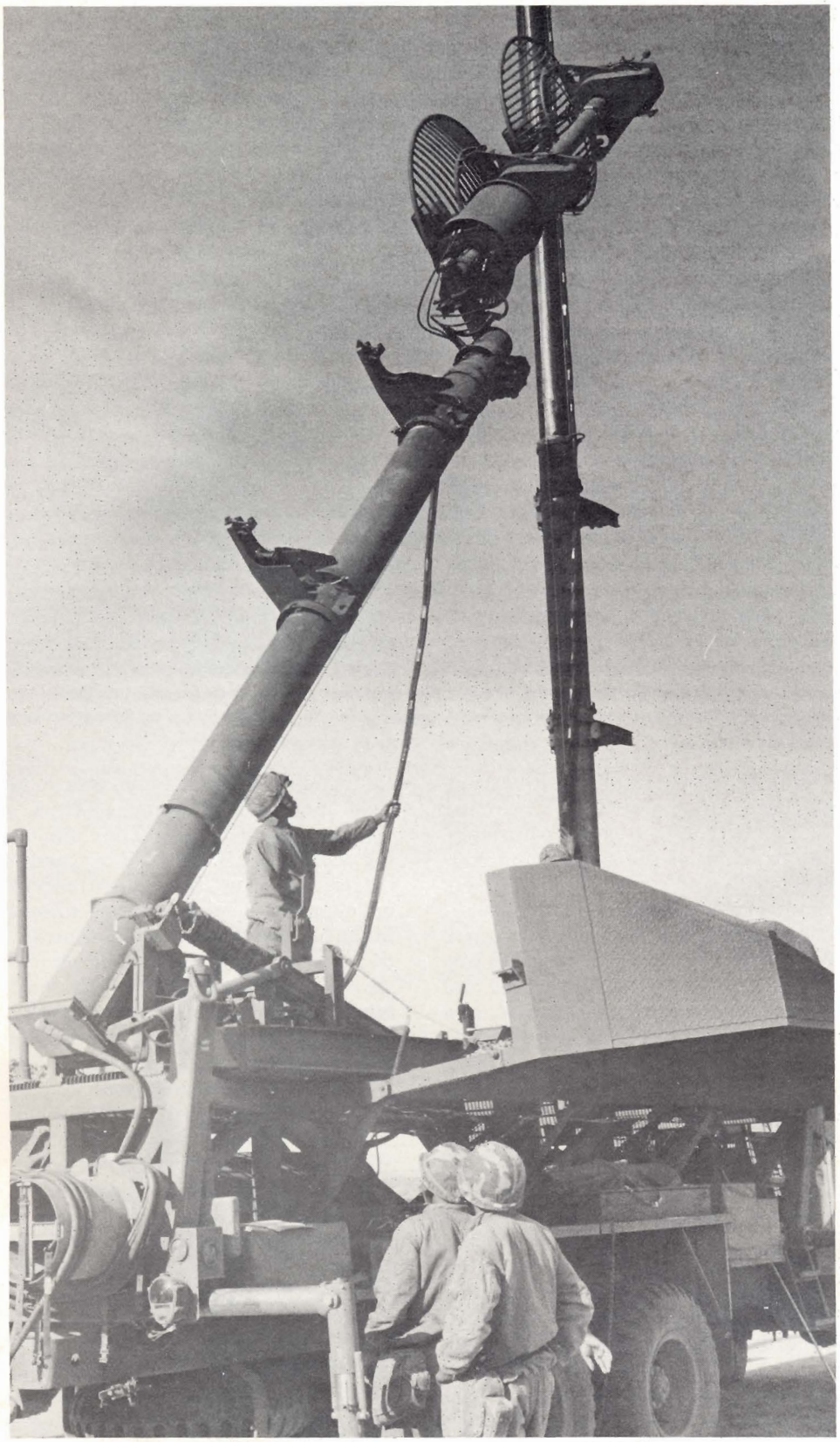
Each battery's engagement control station (ECS), the battalion's information and coordination central (ICC) and all four communications relay groups (CRG) function as relay terminals in the battalion digital data net. The same basic set of equipment is found at each of these locations.

The basic equipment consists of a routing logic and radio interface unit (RL/RIU), three stacks of AN/GRC-103 UHF radio stacks (four at the CRG) with TD-660 multiplexers and TD-1065 high-speed data buffers. The RL/RIU accomplishes all communications processing necessary except message formatting. It checks all messages for errors and redundancy and maintains error statistics by data link to aid in status monitoring. Additionally, the RL/RIU ensures correct messages are sent on all available links throughout the multirouted system.

The corner reflector antenna for the Patriot ECS, ICC and CRG is being erected. Patriot's multirouted communications are enhanced by highly directional antennas.

The ability to provide three different UHF paths from each unit and the use of RL/RIU permit the multirouting of communications within the battalion net. This multirouting technique assures that, although isolated links may be jammed, the network will provide alternate and multiple paths for data traffic. A spin-off advantage of this redundancy is the virtual assurance that at least one stack of radios will always be operational.

In addition to multirouting, digital data messages are prioritized by a software program in the weapons control computer. Each ECS, ICC and CRG is equipped with an antenna mast group (AMG), another Patriot innovation, which provides four highly directional antennas mounted atop two hydraulically and pneumatically erected masts. Like all other major end items in



Securing communications equipment for field deployment kept 4/3 ADA soldiers busy. FOE III tested both the Patriot's and soldiers' ability to move rapidly.

Patriot, the AMG is designed for rapid emplacement and road march. Power amplifiers attached to the mast provide optional high power to further assure uninterrupted communications in the presence of hostile communications jamming. The directional antennas are steered by remote control from within each van.

Follow-on Evaluation III extensively tested the robustness of Patriot's communications. First and foremost, the large number of moves tested the mobility of the battalion communications system and its ease of emplacement and road march. The dynamic nature of the maneuver phase placed constant demands on 4th Battalion, 3rd Air Defense Artillery, signal personnel to plan, execute and maintain the numerous radio links.

A typical battalion emplacement required a UHF system of 10 links. The movement of any one unit required the updating of the entire network. This was done without problem throughout FOE III. The Patriot communicators responded outstandingly, with the result that intrabattalion communications were available for all required test phases.

Another aspect of FOE III was communications jamming. The difficulty in executing communications jamming for test purposes dramatized the difficulty that hostile electronic warfare planners will face in attempts to deny Patriot its command and control. Despite the best efforts of the Joint Electronic Warfare Center to conduct jamming against Patriot's data link, communications were never denied between the battalion ICC and any of its battery ECSs.

Besides doing its intrabattalion job, Patriot communicates beyond the battalion level. The system is designed to interoperate with Hawk, U.S. Air Force and Marine Corps systems via the brigade AN/TSQ-73. If for some reason the brigade is not available, Patriot will soon be able to provide a continuity of operations capability with the U.S. Air Force command and reporting central and the Marine Corps tactical air operations center.

Rigorous testing during FOE III proved that Patriot's communications system is capable of meeting the demands of the modern battlefield.

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The Soldiers

by Lt. Col. Robert E. Huston and Maj. John M. Hutchison

Fragments, sprayed from a drone hit by a Patriot missile and snatched up by participating soldiers, were the only tangible souvenirs of 13 months of fierce training the artillerymen carried with them when 4th Battalion, 3rd Air Defense Artillery, deployed to become the first overseas U.S. Patriot battalion.

The success of the firing, which climaxed Follow-on Evaluation III, was a tribute to everyone involved in the fielding of the Patriot. Especially important were soldiers who tolerated family separations, extreme heat and cold, intense pressure from working under close scrutiny; long, tiring field exercises; and ultimately, final preparation and actual participation in Follow-on Evaluation III.

The planning for the training necessary to deploy 4/3 ADA from Fort Bliss, Texas, to West Germany began long before the July 1983 battalion activation ceremony. Commanders and key staff met in February 1983, assimilating all the requirements necessary to build a collective training plan. The 16-week collective training plan, formally accepted Sept. 1, 1983, focused on tasks necessary to complete the Air Defense Artillery Center certification, a combination of the Patriot ARTEP and a European tactical evaluation.

From the July activation until the unit received the equipment in early September, the unit concentrated on standard training tasks, including common tasks and individual weapons qualification. To help build a solid base of professionally trained soldiers, unit personnel attended many military schools.

Collective training for 4/3 ADA was originally scheduled to begin after the conclusion of FOE II which was conducted by another unit to examine Patriot's operational capability. The test was terminated early because of equipment and training problems. There was a delay of more than two months while the contractor made necessary equipment modifications and upgrades before 4/3 ADA could begin collective training.

Broken into a series of long and short weeks, the 16 weeks of collective training began in October 1983. A "building block" method was used for the training, starting at the section and crew level drills and gradually progressing to integrated battalion operations.

Patriot soldiers work quickly to camouflage their equipment during a field exercise. As part of the 4/3 ADA's continuous training, soldiers checked out their camouflage by taking helicopter trips over the area.

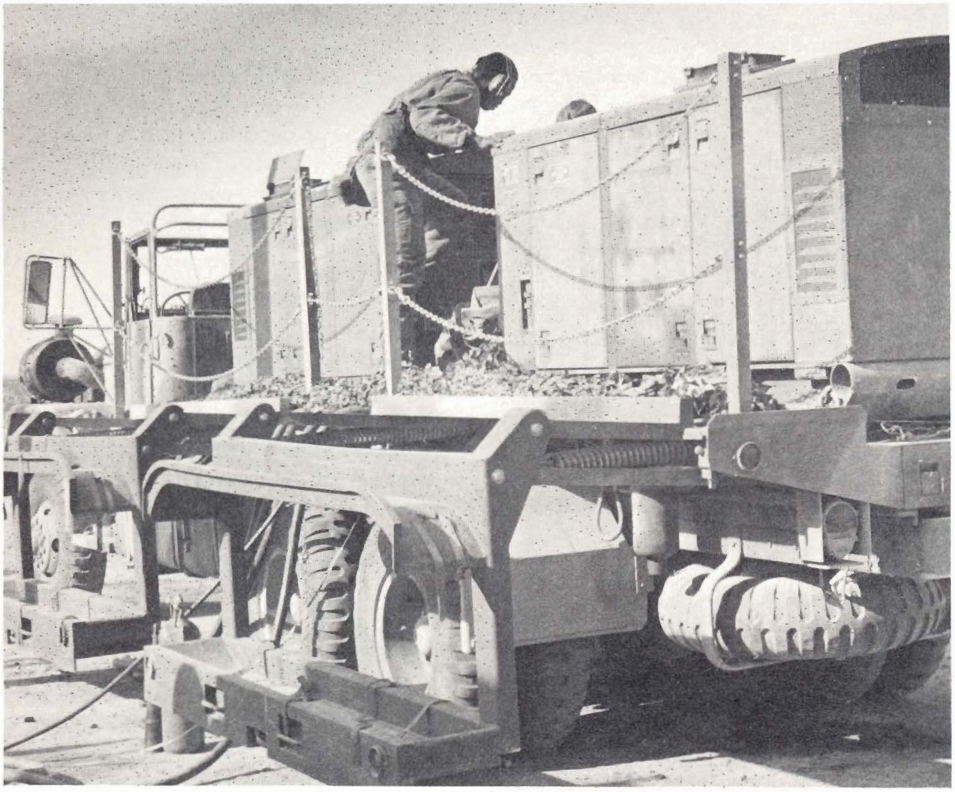
Away from the distractions of garrison life, the field training exercise was the focal point of the series of long and short training weeks. Each week had its own set of objectives. A long week, lasting from eight to 11 days, was actually a sequence of two- or three-day field exercises with a break on location for 24 hours of maintenance. A long week might include giving the soldiers an opportunity to take helicopter rides to visually check their camouflage and their convoy discipline effectiveness.

The short weeks were three to six days of maintenance or maintenance training in garrison. Toward the end of collective training, these short weeks also included extensive air-battle management training for tactical control officers using troop proficiency trainers in garrison. (See related story Page 39.)

Soldiers were challenged mentally and physically by the extensive field training during the coldest months of the year. With only a two-week break for Christmas, the battalion was in the field, moving a minimum of twice a day, in excess of 50 days. The challenging field training included successive exercises to bring the soldier's individual capacity to operate up to six hours in the highest mission-oriented protective posture level. Even field church services were conducted by the chaplain in chemical protective equipment, including boots, hooded masks and gloves. Only during Communion were the protective masks removed.

The Air Defense Artillery Center certification, Feb. 6 to Feb. 10, 1984, culminated a lot of hard work by battalion personnel under extreme pressure.

Individual training and manning of the newly upgraded equipment on hardstands at White Sands Missile Range, N.M., filled the period from the end of collective training to the start of FOE III. The reliability, availability and maintainability data gathered during this time was needed to verify the adequacy of the equipment to undergo FOE III. Using a forward base camp at Oro Grande, N.M., the battalion supported this data collection effort while adding to the crews' knowledge of the system, especially UHF communications and air-battle management.



A soldier checks the electric power plant used to operate the Patriot engagement control station and the radar set. The power plant consists of two 150-kilowatt turbine generators mounted on an M-811 five-ton truck chassis.

This upgrade period ended in a four-week recertification effort. It required the battalion to verify that both the equipment and training were indeed ready to start FOE III. This was done through four three-day field exercises and four two-day search and track phases which closely resembled the FOE III scenario. The battalion met or exceeded all required levels of performance.

July 16, 1984, FOE III began with a 14-day pilot phase. During this time, Operational Test and Evaluation Agency personnel sorted out the data collection method and gave soldiers a feel for the scenario to be used during the 30-day search, track and maneuver phase.

Again using Oro Grande base camp as the staging area, the battalion started the first of three 10-day cycle tests during the hottest time of the year. The 10-day cycle called for two days of maneuvers, two days of search and track and one stand-down day, then two more days of maneuvers, two more days of search and track and the final stand-down day.

The soldiers had been in a non-garrison environment for more than three months, yet their performance was even better at the end of the last 10-day cycle than it was at the beginning of the first week of the pilot phase. Of exceptional note was the administrative and logistics support for operations that took place over a 100-mile area. With many days of temperatures soaring above 115 degrees and fire units moving as many as five times in 48 hours, the readiness of both the equipment and the soldiers was demonstrated.

Adding to the intensity of the training, soldiers were exposed to many high-ranking visitors wishing to witness Patriot operating in the field. The soldiers responded eagerly to the opportunity to demonstrate their field-operating abilities. Visitors included Vice Chief of Staff of the Army Gen. Maxwell R. Thurman and Under Secretary of the Army James R. Ambrose.

On Aug. 28, 1984, a direct hit by C Battery, using the strobe engagement method, became the first of four successful live firings as FOE III was nearing its end. Immediate positive feedback from the 200 guests and family members, on site for the firing, accentuated the morale-boosting direct hit.

The battalion then moved to unprepared sites at North White Sands for the remaining missile firings. In September, B Battery, using the ripple method of fire, engaged two F-102 drones, flying in formation at medium altitude. Seconds later, A Battery, using the shoot-look-shoot method, engaged a drone at low altitude.

The outstanding performance of the soldiers during this time was emphasized by the fact that no major training accidents occurred even though the soldiers were operating some of the Army's newest vehicles—the 10-ton heavy expanded mobility tactical truck and the commercial utility combat vehicle.

Even during the critical FOE III testing, soldiers managed to cope with the pressure-filled environment. Since all work and no play could have been devastating, innovative soldiers found constructive ways to relax. The men's softball team took first place in the brigade tournament and the women's softball team took third place in the post tournament.

The 4/3 ADA, after successfully wrapping up FOE III, turned over most of their equipment to the 2nd Battalion, 43rd Air Defense Artillery, so they could begin their collective training in November 1984.

Having deployed to West Germany in January, the first 30 days in Europe were used to inprocess the 4/3 ADA personnel and sign for the installation and tactical equipment. The next 60 days are being spent in extensive training and field exercises to successfully stand a 32nd Army Air Defense Command tactical evaluation. Once the battalion passes the evaluation, it will be required to assume a readiness status—the intangible payoff for more than 13 months of fierce training and sacrifice.

Lt. Col Robert E. Huston, *4/3 ADA commander, was graduated from the U.S. Military Academy in 1966. He is also a graduate of the Air Defense Artillery Officers Advanced Course and the Air Command and Staff College. He holds a bachelor's degree in engineering and a master's degree in physics from Purdue University.*

Maj. John M. Hutchison, *S-3, 4/3 ADA, holds a bachelor's degree in education from Oklahoma State University and a master's degree in international relations from the University of South Carolina.*

The Manual

Currently Patriot doctrine can be found in four sources. The doctrine is constantly being updated based on field input and new concepts.

The capstone air defense artillery doctrinal manual is Field Manual 44-1, U. S. Army Air Defense Artillery Employment, dated May 9, 1983. It bridges the gap between the Army's AirLand Battle Doctrine and the Army air defense functional area doctrine. This manual explains air defense artillery doctrinal principles such as mix, mass, mobility and integration and how each relates in AirLand Battle Doctrine. Patriot organization, defense design and communications are referred to in FM 44-1. The next change to the manual will incorporate the new air defense artillery operational concept and Army of Excellence organization.

Field Manual 44-15, Patriot Battalion Operations, dated April 4, 1984, is the primary doctrinal field manual for the tactical employment of Patriot. It specifically addresses the role and mission of Patriot in the air-land battle, including organization, command and control, communications, defense design, reconnaissance selection and occupation of position, operations security, combat service support and battery and battalion air-battle operations.

Yearly changes to FM 44-15 are programmed so that doctrine can keep pace with system hardware and software changes, new operational concepts and user input.

The first change has been fully coordinated and approved as air defense artillery doctrine. It specifically further incorporates AirLand Battle Doctrine's organizational changes such as deletion of the support platoon and addition of the "living" TOE concept. It will also address deliberate and hasty survey procedures, approval of the operational concept of the air defense support command, reconstitution, refinements to air battle operations, techniques for use of "fight-or-fix" guidelines and the fault alert filter.

Future changes will address Patriot and Hawk interoperability, antiradiation missile decoy employment, tactical ballistic missile defense and the doctrine resulting from the preplanned product improvement program and post deployment software support.

The companion manual to FM 44-15 is FM 44-15-1, Operations and Training, dated June 13, 1984. Its primary emphasis is on the procedural aspects of Patriot doctrine. It addresses Patriot organization, system support; command and control, with emphasis on communications planning; system operations; operations in a nuclear, biological and chemical environment; training concepts and materials; nonline-of sight procedures; and radar coverage diagrams.

Field Manual (C) 44-1A, U.S. Army Air Defense Artillery Materiel (U), with Change Three, dated Feb. 4, 1983, contains the classified capabilities and limitations of the system such as range, altitude, probability of kill, employment data and initialization value recommendations. The manual has been completely revised. When the revision is published, (C) FM 44-1A will be titled Air Defense Artillery Operational Planning Data (U). It will contain an extensive section on battery and battalion air battle operations, starting with the search process and continuing through kill assessment. Each function is described, operator controls and displays are discussed, interaction with higher or lower echelons is detailed and firing doctrine considerations are presented. The manual is scheduled for a further change which should be published and distributed to the field between January and March 1986. The projected change will include updated portions of the manual on the Patriot system based on the post deployment software change.

Projected Publications

Training Circular 44-15-1, Standardized Air Defense Artillery Patriot Crew Drills, will provide standardized crew drills for Patriot air defense guided missile system crewmembers. Drills which will be addressed are march order, emplacement, initialization, ready for action and missile reload. An integration drill may also be developed if required.

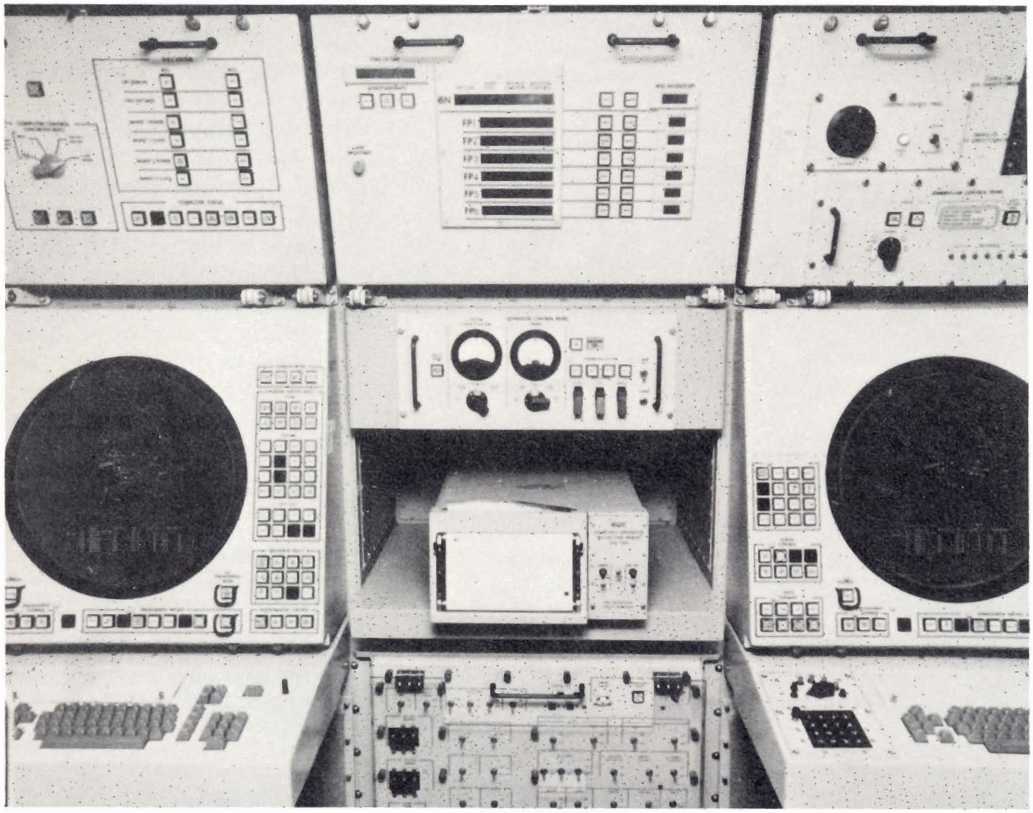
Field Manual 44-32, Army Air Defense Command Operations, is a new manual which is being developed to describe Army air defense command support of a theater army and air defense of the theater of operations. While its primary emphasis will be on Army air defense command level operations, FM 44-32 will discuss Patriot brigade and Patriot and Hawk brigade operations as well as maintenance support of the Patriot system. The chart shows worldwide coordination and distribution of all currently projected Patriot doctrinal publications.

PATRIOT DOCTRINAL PUBLICATIONS

PUBLICATION	WORLDWIDE COORDINATION	DISTRIBUTION
FM 44-1	Completed	May — July 1983
Change 2	April — June 1985	January — March 1986
(C) FM 44-1A, w/C1-3	Completed	March — May 1983
(SNF) Revision	Completed	January — March 1985
Change 1	April — June 1985	January — March 1986
FM 44-15	Completed	April — June 1984
Change 1	Completed	April — June 1985
Change 2	July — September 1985	April — June 1986
FM 44-15-1	Completed	July — September 1984
Change 1	October — December 1985	July — September 1986
FM 44-32	July — September 1985	July — September 1986
TC 44-15-1	July — September 1985	October — December 1986

The Trainer

by James J. Crouch



Patriot operators may now train on their own system. The troop proficiency trainer is embedded software that resides in the computer of the engagement control station.

Have you ever wished for a training device that did not require disconnecting your system's cables and connecting the simulator's cables?

Have you cursed that *&%#* simulator because your system didn't work with the simulator connected?

Have you wished that you could train on your own system, instead of traveling to another site for operator training?

Have you wished that you could train your fire units with the battalion, using the tactical communications and a simulated enemy air strike?

Wish no more! If you are a Patriot air defense artillery missile system operator, your wish has been granted in the form of the Patriot troop proficiency trainer.

With the fielding of the Patriot system, operators will maintain their abilities using the troop proficiency trainer, or TPT as the simulator is called. But just what is the TPT? It is an embedded set of software that resides in the computer of the engagement control station (ECS) and the information and coordination central (ICC) computers. The embedded software provides the Patriot operator with the capability to practice air defense artillery exercises against an air threat on the ECS or ICC using simulated radar signals and launches.

This training is performed at the fire unit or battalion level in what is called a "stand-alone" configuration. However, an added enhancement of the TPT is its netted capability. It can combine the fire units' ECSs with the battalion ICC. Netting requires that the training officer select an air defense scenario that has been designed for the netted configuration at each fire unit. By synchronizing each fire unit's time with the battalion, the netted scenario provides the soldiers with the ability to maintain proficiency in the normal mode of operation—a battalion-directed air defense posture.

Since the TPT is embedded software, it does not require connecting or disconnecting cables. A mere electrical reconfiguration of the Patriot system allows the TPT software to be used and at the same time restricts the use of the actual radar and launchers. The reconfiguration requires operator's entries in a tabular display. An operational system is needed for only the ECS or ICC, since the real radar and launchers are disabled. Also, soldiers use their own systems, so travel to another location is not required.

A set of five air defense artillery scenarios, simulating the air threat, is installed in the computer for selection by the training officer. Each scenario has a maximum duration of 45 minutes. However, the training officer may select a shorter time. To maintain operator alertness, the training officer has a library of 17 air defense artillery scenarios that are replaced each quarter with a new set.

If you have wished for all of the above, the Patriot troop proficiency trainer is your wish come true!

James J. Crouch, *chief, Software Branch, New Systems Training Office, Directorate of Training and Doctrine, U.S. Army Air Defense Artillery School, has worked in air defense artillery for more than 17 years on systems such as the Nike family, Hawk, Safeguard and Patriot. He has a master's degree in business administration from the University of Texas at El Paso.*

The Deployment

by Capt. Stephen T. Jordan

The one-year delay in the Patriot deployment may have had many far-reaching ramifications in the world, but to 19-year-old Renee Matthews, it simply meant her wedding day would have to be rescheduled.

In 1982, believing the date to be approaching quickly, Renee had agreed, in accordance with her parents' wishes, to delay her marriage to Pvt. 2 Mark Gabel, 4th Battalion, 3rd Air Defense Artillery, until just before his unit's deployment to Giessen, West Germany. However the deployment, along with her wedding date, was delayed by equipment malfunctions and training problems associated with the non-availability of Patriot hardware.

Both Renee and the 4/3 ADA waited for a date to be set—Renee so she could send out wedding invitations, and the 4/3 ADA so it could issue travel orders.

The battalion deployed this January, exactly one year after the originally planned deployment date. Delays impacted heavily on the 4/3 ADA's schedule. As early as May 1982, soldiers earmarked for assignment to the Patriot battalion began to arrive at Fort Bliss, Texas. Many came with their families, even though they believed their stay at Fort Bliss was to be relatively brief and the training ahead promised to be as intensive as any undergone by an air defense artillery battalion.

Patriot equipment and soldiers spent many consecutive days being moved over the sagebrush desert of Fort Bliss, Texas, during FOE III. Both have since deployed to take their place among the pines of Giessen, West Germany.

Pvt. 2 Mark and Renee Gabel listen to instructions during an out-briefing at the Fort Bliss Transportation Office, as they make plans for their assignment with the Patriot battalion in Giessen, West Germany.

Soldiers continued to arrive so that by July 1, 1983, the battalion was close to 100-percent strength for its activation. These soldiers held 39 different military occupational specialties. Patriot-trained officers and warrant officers and support technicians also arrived during this time.

The months ahead were devoted to common skills training, collective training and preparation for and participation in Follow-on Evaluation III. Four textbook-perfect missile launches against high-performance targets culminated FOE III in September 1984.

Because of the massive amount of data reduction needed to determine definitely that FOE III was a success, the actual deployment date remained uncertain until November. This impacted on the soldiers and families who were unable to make concrete arrangements concerning their departure.

The battalion received its deployment date in early November, and deployment actions quickly dominated the soldiers' time. Deploying the equipment was relatively simple since, with the exception of seven items, the equipment used for training was inspected and turned over to another Patriot battalion. The seven items, the information and coordination central, radars and the engagement control stations, were inspected and shipped to West Germany.

As soon as the deployment date was announced, families turned to accomplishing the many tasks associated with being transferred. Deciding what to ship and what to store; obtaining passports; selling homes and terminating leases; applying for housing in West Germany and planning family moves in the United States due to possible housing shortages or children's school year schedules, were just some of the concerns.

Fort Bliss and battalion commanders decided early that the nearer the deployment resembled a large number of individual permanent change of stations, the better for individual soldiers and their families. For example, an individual port call would allow a soldier to take leave and travel time to drop off his vehicle at a port of his choice at government expense. In a mass deployment, a soldier would need to take ordinary leave to ship a car from a selected port of choice and then be required to return to Fort Bliss at his own expense, since the Army pays only one way to port. Also, orders were cut based on individuals' unique situations and not on particular unit assignments.

The flexibility and assistance of many Fort Bliss agencies to the battalion provided constant support to soldiers and families despite the circumstances.

Anticipation grew steadily, as families became anxious to deploy. Everyone had been told about the brand new facilities awaiting the battalion in Giessen. All of 4/3 ADA's troop billets, maintenance facilities, tactical sites and dining facilities in Giessen had just been built.

The advantages in housing did not stop with troop facilities. The Giessen community sought to maximize housing availability for married soldiers, thus maximizing the eagerly wanted concurrent-travel authorizations for battalion soldiers. In fact, out of approximately 200 requests for housing and travel for family members, close to half were approved by Giessen and 1st Personnel Command. This figure represents soldiers from private to lieutenant colonel, displaying a breakthrough in deploying soldiers E-4 and below with less than two years in service. Before, these soldiers had rarely been authorized concurrent travel to Europe.

Shown here while still under construction, newly built facilities await 4/3 ADA soldiers and family members in Giessen, West Germany.

Rhonda Johnson, wife of Sp4 Arcel Johnson, 4/3 ADA, had mixed emotions about the delay in deployment. "It was difficult to make any long-term plans not knowing how long we would be here. Also there were a number of working wives who had to make important career decisions. I worked, but at a restaurant where I didn't need to give more than two-weeks notice. The good thing about the delay was that my son is now 19 months old and it's easier to travel with him."

The arrival in West Germany by battalion personnel was quick and efficient as the 32nd Army Air Defense Command, acquiring the battalion, devised an inprocessing plan to incorporate the entire battalion into the community quickly. To aid in the processing, a 28-member advance element from 4/3 ADA arrived in Giessen last fall.

As with all weapon systems, Patriot can only be as good as the personnel whose mission is to operate it. Battalion training was accomplished to the point that these soldiers have been called "the best trained unit in the Army," by high-level Department of the Army officials. With the system and the unit training deemed "combat ready," the next concern was to see that these soldiers and their families deployed to West Germany with minimum inconvenience, and that was accomplished as well.

Private 2 Mark Gabel's new bride, Renee, explained the impact of the unit's deployment on her life, "I thought it was going to be soon, it turned out to be over a year from when Mark had said he'd be going. But this extra time gave me a chance to get to know some of the people in the unit also going to Germany."

Capt. Stephen T. Jordan, *adjutant of The School Brigade, U.S. Army Air Defense Artillery School, Fort Bliss, Texas, was assigned as 4/3 ADA adjutant during its deployment. He is a graduate of the Air Defense Artillery Officers Advanced Course and holds a bachelor's degree in economics from Georgetown University.*

Soviet Doctrine Stresses Electronic Warfare

by Edwin J. Elmore III

This unclassified study is provided to keep the reader apprised of Soviet developments in force modernization. It is not a complete threat assessment but is in concert with the TRADOC Threat Assessment to Mission Area Program.

The Soviets have long recognized the value of electronic warfare. This has resulted in the development of extensive capability for electronic surveillance and countermeasures. The use of electronic warfare in routine training operations indicates that the Soviets consider it a vital part of all combat operations.

Colonel General of Artillery Yu Boshnyak, chief of the Soviet Air Defense Forces Military Command Academy, said in 1983 that success on the modern battlefield results when commanders are able "to rapidly find the only correct solution, to forestall the enemy from employing the most unexpected and efficient actions, and, on this basis, to achieve the requisite superiority over him. This often is the only route to victory."

By Soviet doctrine, the use of electronic warfare as part of an integrated system is referred to as radioelectronic combat. It is employed in all types of Soviet operations and consists of the total use of available Soviet assets to disrupt or destroy U.S. and NATO command, control and communications systems. Radioelectronic combat combines signals intelligence, direction finding, intensive jamming, deception and suppressive fires to attack enemy organizations and systems through their means of control.

EW Tactics

The purpose of radioelectronic combat is to limit, delay or nullify the enemy's use of his command and control systems while protecting Soviet systems by electronic counter-countermeasures. An estimated goal of radioelectronic combat is to destroy or disrupt at least 50 percent of the enemy's command and control or weapon system communications, either by jamming or destructive fires. Radioelectronic combat is also intended to disrupt the enemy's critical time phasing to the extent that perishable information on which decisions and orders are based is obsolete; therefore, the enemy cannot meet his original goal.

Radioelectronic combat units gather signals intelligence by intercept and direction finding. Direction finding is used to locate transmitting stations. The Soviets have an extensive ground-based and airborne signals intelligence capability targeted against radio emitters and radars.

Ground-based radioelectronic combat assets are generally located within five to 10 kilometers from the forward line of own troops. Radioelectronic combat units move forward immediately behind leading regiments and can intercept enemy transmissions (both communications and non-communications) within the following distances from the forward edge of the battle area:

- Artillery ground radar — about 25 kilometers
- VHF (e.g., PRC-77 and VRC-12 series) — about 40 kilometers
- HF ground wave (e.g., GRC-106) — about 80 kilometers
- HF skywave (e.g., GRC-193) — unlimited.

Both fixed and rotary-wing aircraft can use radars and other acquisition devices for target location and subsequent destruction. The Soviets have an extensive inventory of forward area mobile radioelectronic combat elements. Figure 1 depicts a VHF tactical radio direction finder, a pole dish radar direction finder and a VHF/FM radio jammer. These are the primary assets that will be directed against U.S. and NATO transmitters or receivers.

Critical targets are assigned a priority according to their expected relative impact on the battle and, based on this priority, are selected for monitoring, direction finding, jamming or destructive fires. It is unlikely that our own command, communications and control at company level and below will be identified as priority radioelectronic combat targets. If a transmitter is located, disruptive or destructive action may be taken against it. Disruptive action is usually in the form of jamming targeted receivers, while destructive actions include the use of indirect fire (artillery, mortars, rockets and surface-to-surface missiles), ground attack and air attack.

Although radioelectronic combat target priorities are dependent on the command level and may be altered as the tactical situation develops, they are generally established as follows:

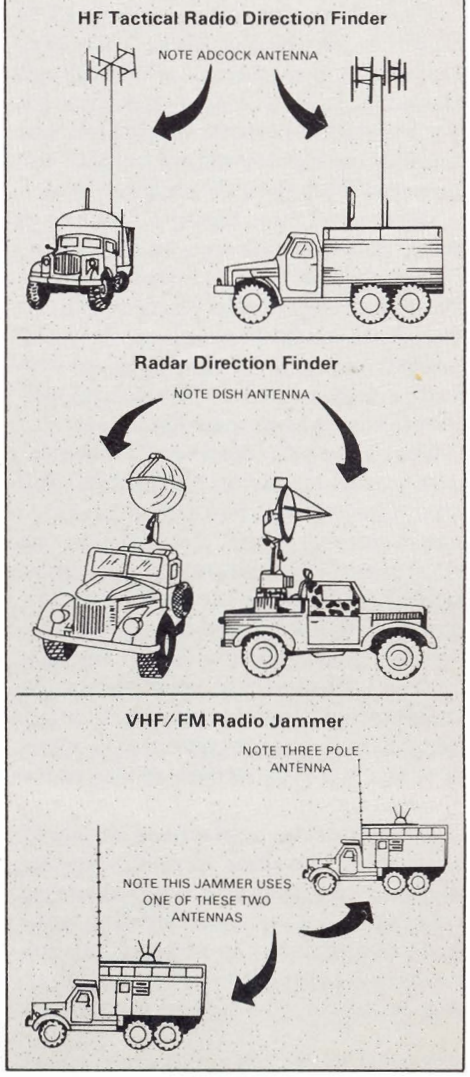
- Artillery, rocket or air force units that possess nuclear projectiles or missiles and their associated control systems.
- Command posts, communications centers and radar stations.
- Field artillery, tactical air force and air defense units limited to conventional firepower.
- Reserve forces and logistics centers.

Employment

A Soviet commander may employ

SOVIET GROUND-BASED REC ASSETS

Figure 1.



his direction finding units when his objective is to obtain bearings to tactical transmitters operating within a narrow divisional area of the forward line of own troops. To accomplish this, the commander locates his direction-finding assets on a straight or concave baseline. The grouping or massing of radioelectronic combat assets in this manner is one indication of a possible major penetration attempt by Soviet forces.

Prior to the attack, radioelectronic combat radar direction finding units scan the battlefield for enemy radar signals. If these radars are located and destroyed, the enemy is prohibited from electronically seeing the battlefield. Radio transmitters are also monitored or located and assigned a priority for disruption or destruction.

At the onset of the attack, radioelectronic combat units launch an intense barrage of jamming against predetermined targets. Jamming in support of ground operations will result in the suppression of nuclear delivery systems, radars, radio control links for air-to-surface missile systems, surface-to-surface missile systems, command posts and communications centers. Both ground-based and airborne platforms have jamming capabilities. At this point, artillery and rocket fires are released against known enemy radio and radar locations, intercept units continue to monitor new transmissions and new emitters are located, exploited or destroyed. These actions isolate enemy units from their command and control elements, leaving them confused and slow to react to the rapidly changing battlefield situation.

Figure 2 shows Soviet intercept, direction finding and jamming units deployed in a division slice prior to an attack against a defending enemy. The ground-based radioelectronic combat assets are well forward and move with the leading regiments to ensure maximum impact on the battle. Also shown are regimental artillery groups and a division artillery group as they would be doctrinally located. These groups may be used in support of radioelectronic combat elements to bring fire on located targets. Airborne radioelectronic combat assets are located at further distances from the forward line of own troops, but will also move forward in support of the attack. Use of fixed or rotary-wing radioelectronic combat assets greatly increases the ranges at which intercept, direction finding and jamming can be used.

Any adversary should be credited with having an electronic warfare capability, but the Soviets have an extensive capability and integrate it under radioelectronic combat doctrine. Radioelectronic combat units are numerous and well-trained. Any soldier operating a communication device, radio, radar or active electronic equipment that emits a signal must be aware of the potential dangers. Transmissions may be exploited for message content, location of transmitter or targeted for disruption or destruction. Electronic warfare has become a formidable combat multiplier. What can be seen electronically on the battlefield can be exploited or destroyed.

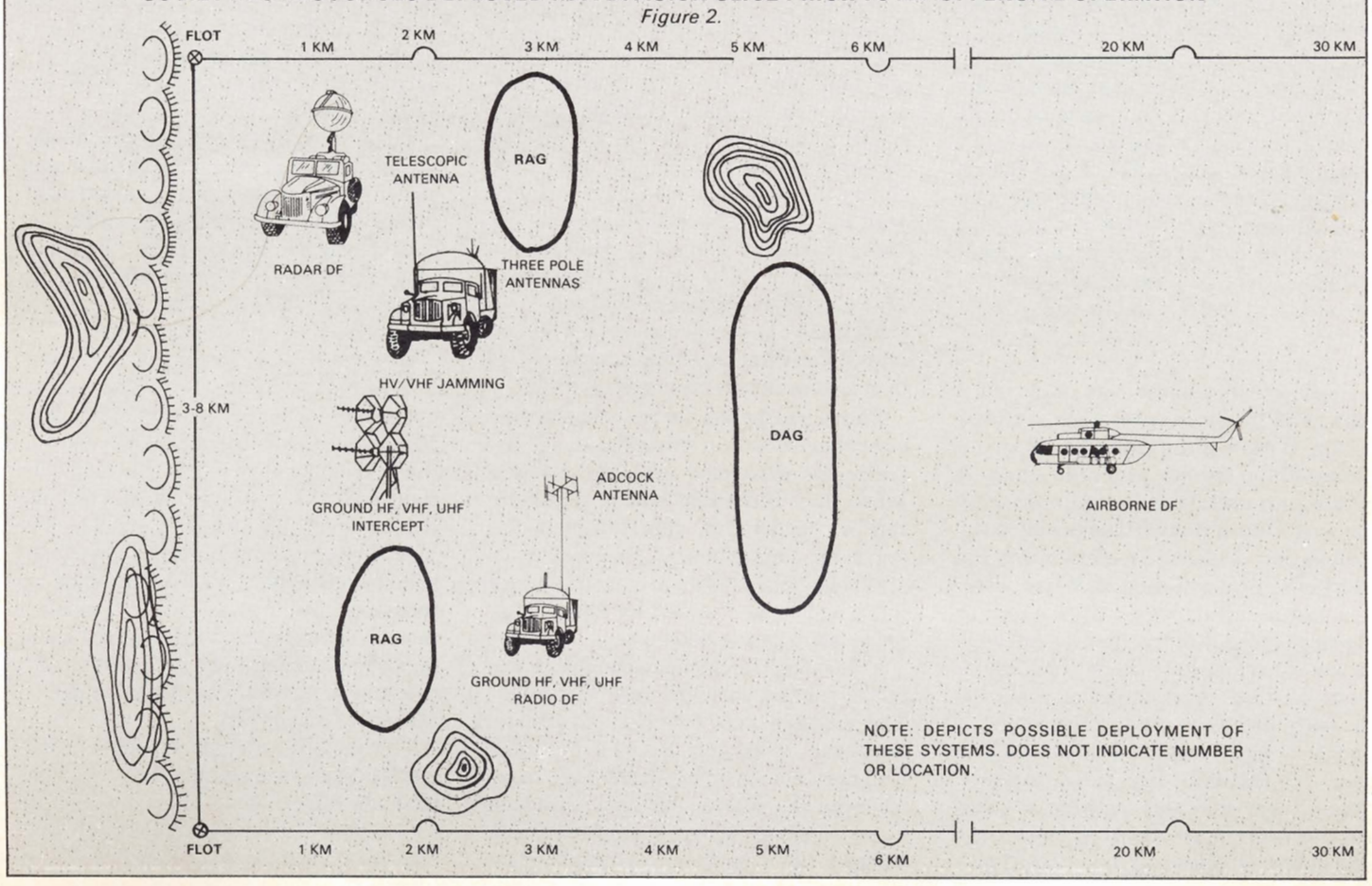
For further explanation or clarification about radioelectronic combat, refer to the following publications:

- FM 100-2-1 (TBP FY84), Soviet Army Operations and Tactics, August 1982.
- Threat Handbook—The Radio Direction Finding Threat (U), HQ TRADOC, February 1983.

Edwin J. Elmore III *is assigned to the Threat Directorate, Office of the Deputy Chief of Staff for Doctrine, U.S. Army Training and Doctrine Command, Fort Monroe, Va.*

SOVIET REC RESOURCES DEPLOYED IN A DIVISION SLICE PRIOR TO AN OFFENSIVE OPERATION

Figure 2.



The 563rd at War

by Frederic MacMaster

The 40mm guns rarely jammed. Seven-round clips were passed up to the loader and firer who stood on a raised platform, his right foot controlling the trigger pedal.

Forty years ago, author Frederic MacMaster served with the 563rd Anti-aircraft Battalion, a unit that, after months of relatively soft duty, found itself engaged in the Battle of the Bulge.

The truck convoys that carried the 563rd Anti-aircraft Battalion to battle were reminiscent of the Keystone Kops. Once, during the Battle of the Bulge, 563rd drivers carrying paratroopers up to Bastogne encountered a convoy of German trucks at night in a Belgian village. There was no gunplay, just a gnashing of gears as both convoys reversed gears and headed in the opposite direction.

Even a unit as small as ours had a fleet of 64 trucks, one for each of the 32 40mm Bofors guns and the 32 quad-mounted .50-caliber machine guns. A 40mm gun section was a mini-convoy in itself. One of its two trucks towed the Bofors gun, while the second towed the M-51 machine gun mount. When a section was at full strength, 12 men rode in the back of the gun truck and eight rode in the machine gun truck. The equipment carried in the trucks included shovels; pickaxes and other tools; a pyramid tent, pole and stakes; rifles and .30-caliber rifle ammunition; 40mm anti-aircraft and anti-tank ammunition; gun-cleaning materials and solvents; sleeping bags; hand grenades; TNT; food supplies and stove; and a variety of extraneous impedimenta picked up along the way.

When the 563rd reached Belgium's Ardennes Forest, our first job was to dig in the guns and wait to see what would happen. One of the earliest revelations was the discovery that the electronic gun-aiming device called the director could not follow low, fast-flying aircraft because its rate of turn was too slow. The directors, cumbersome boxes of gadgetry that sat on tripods and had to be laboriously leveled, were abandoned along with their heavy power generators. The gun crews went back to cranking in elevation and azimuth changes by hand.

Snow, an obstacle to movement, also concealed German mine fields. As the Germans retreated into the Fatherland, they hurriedly sowed mines on top of the ground, depending on the snow for concealment. Positions with suitable field of fire for anti-aircraft guns had to be checked by Army engineers using mine detectors.

Following the Battle of the Bulge, the 563rd inched forward into Germany. The villages were deserted. At Sinzig, near the Remagen Bridge, civilians had moved into caves in the hills overlooking the Rhine. At the bridge, a German plane, moving at great speed, let go a bomb and disappeared before the 40mm gunners could pick it up in their target sites. "What the hell was that?" the gunners asked. It was the German Me-262, the world's first jet fighter.

March orders were frequent. Guns dug in one day were apt to be moved the next. Each move involved a tremendous amount of pure physical labor: loading and unloading the trucks, manhandling the guns into and out of revetments and digging new revetments, a chore that took four or five hours under the best of conditions and even longer when the earth was frozen and had to be blasted before the shovel work could begin.

A revetment was not carelessly constructed. It was hexagonal in shape, about 20 feet long, 10-feet wide and 3-feet deep, not counting the sandbagged embankment which normally added another two feet to the depth. Ideally, when the muzzle of the 40mm gun was depressed to near horizontal, it almost touched the top of the emplacement. The gun was unhitched from the truck and backed by hand into the revetment, then lowered onto four jacks—two on outrigger extensions—which were leveled to provide a solid firing platform. Meanwhile, the heavily armored M-51 had been placed. The work often did not end till daybreak. Some camouflage was attempted, but it was next to impossible to conceal a gun position which sat at the terminus of a set of truck tracks entering and leaving a snowy field.

The 40mm guns rarely jammed. Seven-round clips were passed up to the loader and firer who stood on a raised platform of the 40mm gun, his right foot controlling the trigger pedal. Pressing and releasing the trigger allowed single shots, while holding the trigger down resulted in automatic fire.

Hard on the heels of military necessity—providing air cover over an objective—came personal comfort. The Marmite cans for bringing hot food to the gun sites had been discarded in Belgium and replaced with portable stoves. Nestling atop one another, the Marmite cans had a design flaw that allowed slop-over, which made for interesting but not visually tempting menus. The mashed (powdered) potatoes often turned orange if placed in a can under carrots. The coffee tended in all cases to be green.

The battalion struggled across northern Germany spasmodically, crabbing first one way, then another, in response to march orders; trudging through winter into spring through a succession of

places with harsh-sounding names that grated on American ears. By the time the battalion became fairly adept at its work, the war ended, and the need for expert anti-aircraft gunnery vanished.

In his new book, *To Save Bastogne*, Robert F. Phillips recounts the exploits of an anti-aircraft artillery unit's efforts to delay German forces driving toward Bastogne.

Three miles to the north, Battery C, 109th Field Artillery Battalion, was hard hit in its positions near Brockholz. Despite the pressure of the enemy infantry, the battalion held fast, firing its 105mm howitzers, with one and two second fuse settings, directly into the face of the attacking German infantry of Grenadier Regiment 77. The 40mm Bofors and quad .50 (Battery A, 447th AAA Battalion) raked the commanding ground the enemy had gained in his initial attacks, creating additional devastation in the German ranks.

In fact, one of the 447th half-tracks, mounting quad .50s, had been instrumental in enabling Battery C, 109th Field Artillery, to retain its positions. That morning a company of German infantry, presumably in the process of deploying to attack the artillery battery from one flank, approached the crossroads where the half-track was standing. The enemy paused when they saw the vehicle, but when one of the artillerymen waved them forward in a friendly fashion, they thought the half-track was just another American vehicle their forces had captured and were now using. Reassured, the German infantry company continued down the road leading to the half-track. When they were less than 100 yards away, the quad .50s went into action. When they ceased firing, nearly 100 German dead were scattered around the crossroads.

Despite their devastating firepower, the AA gun sections, located at various points on the southern edge of Consthum, were finally overrun around noon. The gunners continued to fight with small arms, but were finally driven back from the southern part of the town by overwhelming numbers of German infantry. The gunners, in turn, organized a counterattack and drove the enemy back by approximately 1400 hours. The men of the 447th once more took over their guns and quickly put them back in action.

The mashed potatoes often turned orange. The coffee tended in all cases to be green.

Frederic MacMaster, *a World War II veteran, lives in Wilton, N.Y.*

Squad Training 'Rodeo' Style

by Lt. Col. Michael F. Bremridge
MC Royal Artillery

We could learn to determine the level of our training using the British "rodeo" system. I am convinced that there is a place for it in our training programs at battery and battalion levels. Unlike our ARTEPs, which require attainment of a minimum standard, the "rodeo" system tells a commander exactly where his shortcomings are and gives him a road map for additional training.—Col. Travis N. Dyer, chief of staff, U.S. Army Air Defense Artillery Center and Fort Bliss.

A recurring lesson of war has taught us that a key battle-winning feature is the individual performance of a squad, whether it be armor, infantry, artillery or air defense. This has been reinforced by recent conflicts, particularly the Grenada Operation. It is also fair to say the air defense squad has to be far more self-sufficient than its infantry or armor counterpart since assets tend to be more dispersed.

The air defense squad has the basic mission of destroying enemy aircraft and, perhaps in the future, remotely piloted vehicles. To accomplish this, it is necessary for members to move to the right place, in a timely manner, by a prescribed route, day or night, by land, air or sea. Having arrived at the right place, the squad is of no use unless they can survive, be commanded and be controlled in battle. Equally, they have to be sustained and be able to sustain themselves for indefinite periods while keeping confidence in their ability to do all this.

Having set the scene with a bit of philosophy, I would like each reader to imagine he is a squad leader about to take part in a battalion rodeo. The squad, for this purpose, is any group of men who are expected to live and fight together as a team, whether they be a Stinger crew, a Vulcan or Chaparral squad or a Patriot launcher team.

You arrive at Stand One with your squad and are met by a member of the directing staff who briefs you. "You are to follow the marked route which represents part of your route to the next location. The battery frequency is 36-8."

You establish communications and set off with your squad along the route. The first thing you encounter is an ambush. The squad is expected to follow the drill laid out in the battle book. Having satisfactorily dealt with the ambush, you are met again by the staff member who points out a casualty lying beside the road. The squad is expected to give first aid and make the appropriate casualty report.

Stand Two is about driving and maintenance. The staff member asks simple questions about the maintenance of the vehicle, asks for specific tools to inspect and carries out some checks with the squad on the vehicle. The squad is then asked to complete a short maneuvering test against the clock, preferably involving some difficult ground.

At Stand Three, the squad leader is briefed. "I will show you where your weapon site is. The center of arc is 6,400 mils, and the arcs I wish you to cover are 800 mils right and left. Each member of the squad is to take off his boots and lie down on his sleeping bag beside the equipment. When I blow the whistle, you are to bring your equipment into action and camouflage up. The maximum time you have is 15 minutes."

By now, you, the reader, should have gathered that the rodeo subjects are those which a commanding officer wishes to ensure his squads are good at. The list might include loading for war, bringing equipment into action, engaging the enemy, camouflage, movement and map reading, driving and maintenance, IFF and communications, first aid, NBC, aircraft recognition, ambush drills and local defense. This list, of course, may vary depending on the unit's mission.

The British Army uses many variants of this form of training to raise standards and ensure those who are at the focus of attention are capable of doing their job, whether they be young officers or squad members. Using the rodeo, the commander can better assess the strengths and weaknesses of his unit and take immediate remedial action if necessary.

The ARTEP, in its design, serves only as a guide for training objectives by specifying the minimum standard of performance for combat-critical missions and tasks. The ARTEP does not usually quantify the results to show where the real strengths and weaknesses of a unit are.

In a rodeo, the squad leaders are not given any training objectives for the day other than the subjects in which the commander is interested. The subjects introduced at each stand are those which a squad leader can reasonably be expected to know and to have trained his squad on. It is desirable to have some easier tasks for the less experienced so that each member of the squad makes a contribution to the success of his squad.

Ideally, advanced notice of rodeo day is given, preferably six weeks to three months before the date. This enables the squad leaders to use their training time more effectively. The S-3 is tasked with organizing, monitoring the stands and coordinating the results. The key to success is to use imagination so the soldiers can enjoy the day and have fun. The cynics will ask, how can the evaluation be fair? The answer is: Whatever is fair in war. It must be remembered that in wartime-operations, the unexpected tends to be the norm.

The rodeo should take place at a training site or a combination of training area and camp. If one assumes there are 40 squads to be practiced and 10 stands to be used, provisions could be made for two squads to be at each stand at any one time. The time allowed for each stand could be 20 minutes, 15 minutes to carry out the briefing and task with five minutes for the staff to coordinate the results and debrief, if necessary. If the traveling time between stands is less than 20 minutes, the 40 squads should complete 10 stands in six hours and 40 minutes.

Some of the advantages of this form of training are:

- The commander becomes fully aware of the strengths and weaknesses of his squads on subjects of his choosing.
- The standard of training improves as squads try to reach the highest standard.
- Squads are actively encouraged to train whenever time allows.
- Squad pride, sense of purpose and responsibility for equipment improves.
- FTX can be used to build sound fighting units rather than being spoiled by squads who do not know the basics.
- The planning, preparation and execution of such a day is a good challenge to the S-3 if it is to be fun and interesting to the squads.

Lt. Col. Michael F. Bremridge *is the British liaison officer at the U.S. Army Air Defense Artillery Center, Fort Bliss, Texas. He commanded a field battery in West Germany and an air defense battalion assigned to the British Army of the Rhine. He also served in Malaya, Kenya, Northern Ireland, Rhodesia and the United Kingdom.*

Air Defense Artillery in the Canadian Forces

by Maj. D.R. Hopper

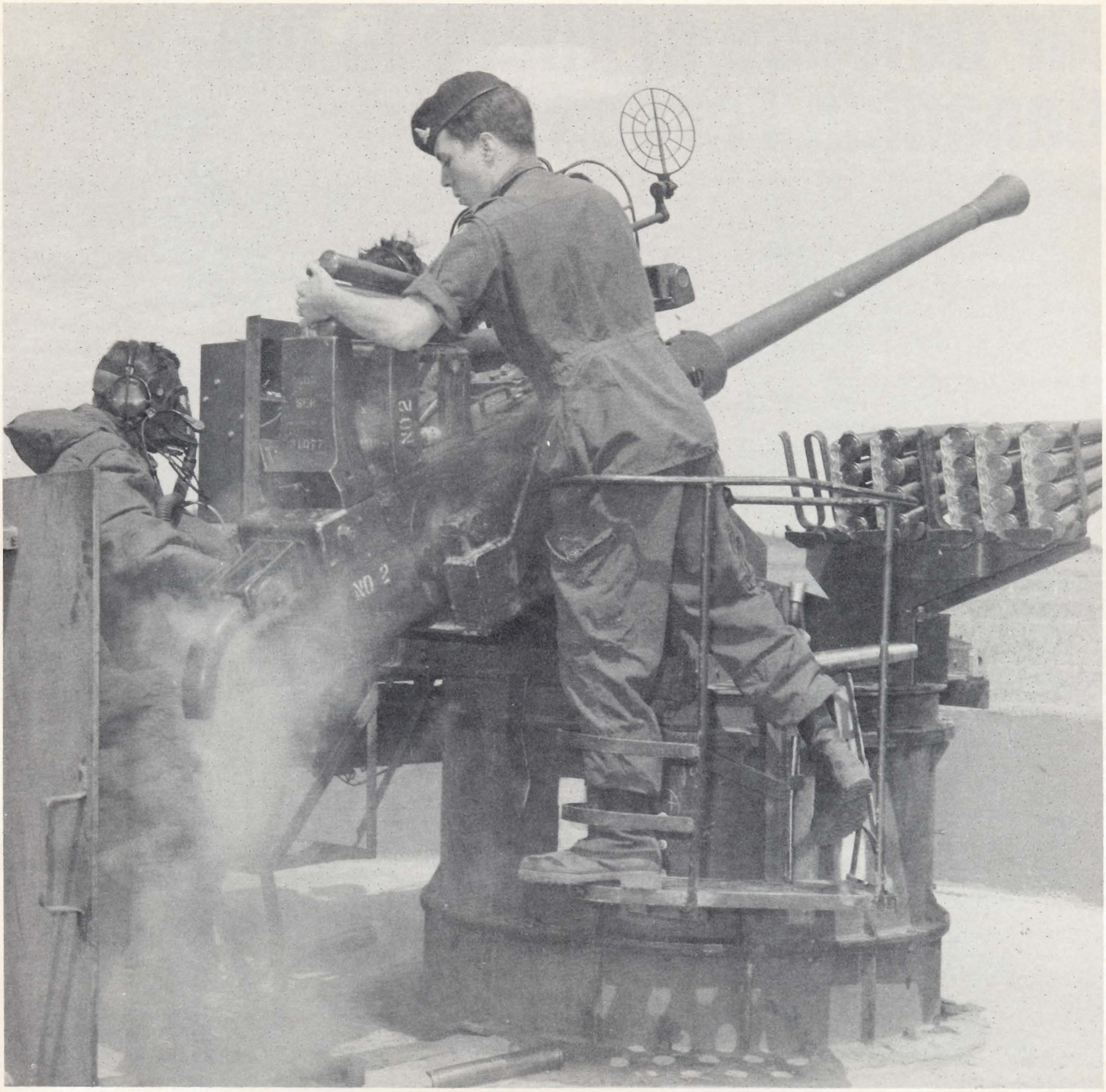
Canadian air defense gunners fire a Blowpipe manportable air defense system at the Combat Training Center, Gagetown, New Brunswick. The sandbag wall is a peacetime safety fixture and is not intended to be tactical. A misfire stand can be seen at the right.

Canada has always faced defense problems unlike those of most other nations. The basic problem has been to defend a vast area and long coastlines with a relatively small population and industrial base upon which to draw. Standing armed forces of sufficient size to unilaterally ensure a reasonable defense simply cannot be maintained.

Canada's traditional defense policy has consequently been based upon contributing to collective defense, maintaining small peacetime forces and mobilizing large numbers in war. Although the nature of the alliances has changed, the basic policy remains in effect.

The history of air defense artillery reflects these two characteristics. During World War II, Canada was one of the major Allied military powers with more than a million uniformed military personnel. Of this total, there were 11 anti-aircraft regiments (equivalent to U.S. battalions) on home-defense duties and eight overseas.

After the war, the army dwindled to one small active division, spread across the country, containing one light (40mm) anti-aircraft regiment. Changing defense commitments, priorities and emphasis eventually resulted in the complete disappearance of the divisional structure of air defense artillery from the Canadian forces in 1960. Even in the NORAD role of continental air defense, there was no place for air defense artillery as the air force-operated Bomarc unmanned interceptor was selected for this role. Since the withdrawal of the Bomarc from service, Canada's commitment to NORAD has been fulfilled by air force-manned interceptors, early warning systems and command and control facilities.



These Canadian gunners are manning a 40mm Boffin air defense gun of the type used on Canadian airfields in West Germany. The gunner on the left is wearing NBC warfare protective clothing in the open state.

This is not to say that the Canadian forces did not recognize the need for air defense artillery. On the contrary, the army has always been acutely aware of the necessity of air defense for deployed forces. The problem has been one of being unable to justify this traditionally divisional-level capability in an army consisting of independent brigade groups.

In 1975, in response to NATO requirements for national contingents to provide for the air defense of European airfields, the Royal Canadian Artillery was assigned the responsibility to provide two air defense artillery batteries. These were for the defense of the two Canadian airfields in Germany: Lahr and Baden. Restrictions on the total number of troops which the armed forces were authorized to maintain in Europe resulted in these being manned at a cadre level, but the capability for immediate reinforcement by trained personnel in an emergency was essential. While not a great start, this task brought the Canadian armed forces back into the air defense artillery world after a 15-year absence.

Defense Commitments

In addition to maintaining sovereignty over its own territory, Canada has tasked its armed forces to meet commitments to NATO, the United Nations and the U.S.-Canadian arrangements for mutual defense of North America. Specific tasks which require air defense artillery are:

- an all-arms brigade task force and a fighter group stationed in Germany.
- a brigade task force for deployment to Norway.

■ a task force based on an infantry battalion with supporting arms and services and two fighter squadrons to NATO's Allied Command Europe mobile force.

■ an airborne-airportable task force for the defense of northern Canada and Alaska in cooperation with U.S. forces.

The air defense organization which now exists to perform these tasks consists of two airfield air defense batteries in Germany; an air defense troop in the Germany-based brigade task force; an air defense troop in the Special Service Force task force (airborne/airportable); two air defense batteries, one in each of the Canada-based brigade groups; and an air defense training battery in the Artillery School.

Airfield Air Defense

As an expedient, interim measure to meet NATO's requirement for airfield air defense, a number of static, naval, single-barrel 40mm Boffin (L40/60) guns were withdrawn from storage and emplaced around the Canadian airfields at Lahr and Baden. These are supplemented by Blowpipe manportable air defense systems, generally deployed farther away from the airfield on likely routes of air approach.

Early warning is provided by the airfield surveillance system and observation posts deployed away from the airfield. Additionally, the battery command post is located in the base operations center. This gives the battery access to warning information and control orders from the air force command nets as well as to information concerning friendly aircraft movements. It also permits the base commander to exercise direct, positive control over his SHORAD resources.

The airfield air defense batteries are manned at cadre level in peacetime. Personnel of the Canada-based air defense artillery batteries are designated as wartime augmentation. Non-artillery personnel based at the airfields are trained to provide the immediate augmentation until their arrival.

Fixed Boffin firing sites are established at three locations in Canada for continuant firing and augmentation training.

Field Force Air Defense

The air defense establishments of the field force consist of air defense batteries and independent troops assigned to brigade groups. In wartime, a battery would have 27 Blowpipe teams while a troop would have 15 teams. Each team consists of three men manning one system. The Special Service Force (Petawawa, Ontario) and the Fourth Canadian Mechanized Brigade Group (West Germany) have a troop each, while the First and Fifth Canadian Brigade Groups have a battery each.

The air defense artillery elements are an integral part of the close-support artillery regiment of the brigade. In operations, they would conduct their tactical operations virtually independently but would continue to draw administrative and logistic support from the parent field artillery regiment. The air defense artillery battery commander is the advisor to the brigade commander on air defense matters.

Blowpipe sections consist of five teams but, in the concept of tactical employment, would be assigned the number of teams which the battery commander deems appropriate to the task and priority. The sections would be assigned either "in support" or "in location" of maneuver or support units. When assigned "in support," sections would be governed by the priorities of the supported unit. When "in location," they are tasked by the battery commander.

There are currently no early warning devices deployed.

The Future

Canada is in the process of selecting a new short-range system for low-level air defense. Reorganization and expansion of Air Defense Artillery to accommodate this system are now in progress.

The eventual organization will consist of an Air Defense Artillery Center and School at Canadian Forces Base Chatham, New Brunswick; a battery on each of the two Canadian airfields in Germany; a battery with the brigade group in Germany; a central air defense support element in Germany; a battery based in Canada to accompany the brigade assigned to Norway in wartime; and a number of reserve Blowpipe batteries.

The acquisition program is top priority for the Canadian army and has attracted seven major bids which are now being evaluated. The systems involved are Rapier missiles with Oto Malera quad 25mm guns; air defense/anti-tank system missiles with Skyguard radar and twin 35mm gun system; multiple-Stinger with Wildcat 30mm twin-gun system; Roland with Wildcat gun system; Sparrow/Skyguard with ADAK-35 (Improved GEPARD) gun system; Crotale missile system; and Bofors RBS-70+ missile with 40mm gun system.

It is also intended to eventually replace the Blowpipe with an improved system in the near future.

Trade Structure

Air defense artillery officers begin their careers in the field artillery and usually serve one tour of duty as a field artillery officer before being trained and employed in air defense. Subsequent employment will consist of staff, air defense and field artillery duty and advanced training.

Enlisted personnel begin their training with 10 weeks of basic training followed by specific artillery training. Air defense artillerymen then become a separate trade from the field artillerymen. They are trained as system operators, drivers, communicators and command and control technicians.

Of particular interest are the air defense instructor courses. There are separate courses for enlisted personnel (senior NCOs) and officers (captains), although many phases are combined. The course is approximately one-year long and includes science and technology, equipment, tactics, staff duties and command and control. Not all air defense personnel take these courses, but all who are employed as instructors at the school do so.

Conclusion

The next few years will be interesting and challenging for Canadian air defenders. Introduction of new equipment, establishment of an Air Defense Artillery Center, expansion of the branch and reintroduction of the role to the Reserves will mean new demands and opportunities.

The Canadian Air Defense Artillery will provide an interesting forum for study. A lesson which can already be gleaned from Canadian experience is that it is very dangerous to allow the armed forces to lose a capability and expertise for reasons of economy or force structure. It is fortunate that Canada's response to NATO requirements for airfield defense provided a small but professional base upon which to build when the need for further expansion became apparent.

Maj. D.R. Hopper *has been a member of the Canadian armed forces since 1961 and a member of the Royal Canadian Artillery since 1963. He has served in a variety of positions in field and air defense artillery and on staffs of various types. He is currently the Canadian Forces Liaison Officer at Fort Bliss, Texas.*

Scanning

'Flycatcher' Joins Air Force Inventory

The Air Force has purchased the Flycatcher, an all-weather, low-level air defense system developed by Hollandse Signaalapparaten Co. of the Netherlands. The system will be used by the 3246th Test Wing, Eglin Air Force Base, Fla., for development test and evaluation of Air Force electronic countermeasure equipment.

Designed to detect and track low-flying aircraft under all-weather and electronic countermeasure conditions, the Flycatcher uses state-of-the-art computer technology and is able to control a combination of three guns and/or missiles simultaneously for an optimal short-range air defense. One operator can carry out the functions of the system, from detection of an enemy aircraft to firing of the weapons.

The system container can be transported by trailer, truck, fixed-wing aircraft or helicopter. The special construction of the undercarriage in the trailer configuration gives the system mobility, both cross-country and on the road.

New Publications Announced

An updated set of Field Manuals 25-1 through 25-4 will be introduced in the first quarter FY 85. These manuals are the basis for all Army training and training management in combat arms, combat support and combat service support units, both Active Army and Reserve Components.

FM 25-1, Training, covers the philosophy and principles of training. It is for leaders at all levels. FM 25-2, Unit Training Management, covers the Army training management process. It is for commanders and staffs of battalions and above. FM 25-3, Training in Units, provides the "how to" for the conduct of training. It is for leaders at battalion level and below. FM 25-4, How to Conduct Training Exercises, describes the conduct and use of training exercises to sustain skills. It is primarily for commanders and staffs at battalion level and above.

These manuals contribute significantly to doctrine. Units must be certain to update DA Form 12A (by checking block number 159, Techniques of Military Instruction) or write the U.S. Army AG Publications Center, 2800 Eastern Blvd., Baltimore, MD 21220-2896 to obtain copies.

* * * *

The system by which Air Defense Artillery soldier training publications (soldier's manuals, trainer's guides and job books) could be ordered directly from the U.S. Army Air Defense Artillery School, Fort Bliss, Texas, was discontinued several years ago. All soldier training publications are now issued in the same manner as other publications and should be requisitioned through normal publications channels.

Since the Air Defense Artillery School maintains no stock of soldier training publications, order forms from old manuals can no longer be satisfied.

For more information, call Mr. Blum, Directorate of Training and Doctrine, at AV 978-4930 or commercial (915) 568-4930.

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Edition 4 of subcourse AD0574, Visual Aircraft Recognition, has been revised by the Air Defense Artillery School. Soldiers wishing to take the course can order it through the regular correspondence course catalog. See your unit education advisor for more information.

Humvee Series Grows

There are no fewer than 23 variants of the high-mobility, multipurpose, wheeled vehicle, known as Humvee. There are also a number of developmental vehicles currently under investigation, including a remotely piloted vehicle carrier.

One of these vehicles, a Stinger missile team vehicle, which is under development for the Army to replace the current M-151 Jeep and trailer combination used to carry Stinger, was recently shown to the Marine Corps. The Stinger Humvee can carry 10 Stingers, two in rapid-access racks along each side of the vehicle and eight more in special racks accessed through the rear hatch. The crew compartment, which holds a driver and gunner, is fitted with an M-8 chemical agent alarm system.

The research and development contract for the Stinger carrier was awarded by the U.S. Army Air Defense Artillery School, Fort Bliss, Texas, on behalf of the U.S. Army and Marine Corps.

Full production of the Humvee got under way in January 1985.

New Screening Point for Tool Ideas

The Army has established a new screening point within the U.S. Army Materiel Command to which new tool ideas or suggestions for minor items of equipment should be submitted. This is to assist and encourage tool users to submit their

suggestions to the Army's maintenance community for evaluation and possible acquisition.

New ideas may be sent to Commander, USAMC Materiel Readiness Support Activity, ATTN: AMXMD-MD, Lexington, KY 40511-5101. They may also be sent through SMART channels to Commander, U.S. Army Logistics Center, ATTN: ATCL-CST (SMART), Fort Lee, VA 23801-6000.

ADA Commander's Conference

The Air Defense Artillery Commander's Conference, May 6 through May 10 at Fort Bliss, Texas, is expected to draw approximately 175 officers and non-commissioned officers. The conference, designed to give field commanders a chance to interface with U.S. Army Air Defense Artillery School doctrine developers and field manual writers, will feature a tactical seminar presented by the U.S. Army 32nd AADCOM, update briefings on new weapon systems and a status report on the organization of new air defense artillery brigades.

PIVADS Kits Ordered

The Army has awarded $19 million to Lockheed Electronics Company to improve its Vulcan anti-aircraft gun. The order calls for delivery of 285 modification kits known as PIVADS, or product improved Vulcan air defense systems.

The PIVADS kit improves the gunner's sight, target tracking computer and turret drive gears. The PIVADS has a built-in testing system to identify problems and failures, thereby improving the Vulcan's reliability.

Setter Makes Its Debut

The new Setter light air defense weapon developed at the U.S. Army Missile Command, Redstone Arsenal, Ala., made its public debut in a roll-out ceremony Oct. 9, 1984.

The Setter is being hailed as a milestone in Army Missile Laboratory's program to cut weapon development time and save money by "focusing" technologies already proven in the laboratories.

In Setter's case, the well-proven Stinger missile, the laboratory's Spike hypervelocity rocket and a system of advanced target sensors have been packaged in a single firing unit and mated to the new high-mobility, multipurpose, wheeled vehicle. This combination forms an air defense weapon system suitable for the new light infantry division.

The Setter's gunner has at his command eight Stinger missiles and 36 Spike rockets that can be fired in volleys of three, six or nine at aircraft or lightly armored targets.

By focusing on existing Army missile technology, Setter evolved phenomenally fast, from drawings to the prototype stage in barely a year. What's more, its cost, including a year-long testing program that will soon begin, probably won't exceed $6 million. *(Redstone Rocket)*

Officer Voluntary Indefinite Status Changes

Since more other-than-Regular Army officers are requesting conditional voluntary indefinite (CVI) or voluntary indefinite (VI) status, a change to AR 135-215, Officer Records of Service on Active Duty, will maintain the necessary strength limits in both the high- and low-density functional areas, yet meet the basic needs of the Army. The new two-step process, scheduled for implementation in January 1985, requires the creation of a centralized board to review CVI/VI applications of all other-than-Regular Army officers requesting career status.

Conditional Voluntary Indefinite Status

Applications for CVI status will be evaluated by a panel board whose president will be, as a minimum, a colonel. Reserve Components, minorities and women will be represented by one member each. The board will select only those applicants who have the potential to serve 20 years active duty and whose manner of performance is competitive with contemporaries. Officers who represent a possible promotion risk will not be selected.

Other-than-Regular Army officers must complete at least two years continuous active service before submitting a request for CVI status. These officers will not be scheduled for advanced course attendance until CVI status is determined.

Applications must include a recommendation from the chain of command and be forwarded so as to arrive at the officer's career management division no later than the 27th month of active continuous service. Applications must also include a statement that the officer understands that he may be required to accept a branch transfer commensurate with the Army's needs in exchange for continued active duty. The officer must list three branch preferences should mandatory branch transfer become necessary. If the officer wants to voluntarily transfer to another branch, he must note it on the application.

Voluntary Indefinite Status

Other-than-Regular Army officers will be considered for VI status by the centralized selection board prior to completion of eight years continuous active service. Since all CVI-approved officers are identified automatically, no formal application is required for VI status. The board will vote on the officer's VI status at the seventh-year, six-month point of continuous active service.

If basic branch shortages still remain at the VI point, it may be necessary to transfer additional officers from overstrength to understrength specialties. If this occurs, every effort will be made to assess the impact of branch transfer on a specific officer's career.

Officers approved for VI status will be allowed to remain in the Army until selected for major and integrated into the Regular Army, unless separated sooner under other appropriate regulations.

All officers already approved for CVI or VI status will continue active duty service under the old criteria.

The proponent is MILPERCEN, ATTN: DAPC-OPP-M, 200 Stovall Street, Alexandria, VA 22332-0400. The point of contact is Personnel Actions Branch, Combat Arms Division, AV 221-0146/0147 or (202) 325-0146/0147.

Personnel File Now Available by Mail

Since the Army converted the paper official master personnel file to microfiche, soldiers can now review their records by requesting that their personnel file be mailed to them.

Soldiers may obtain a free copy of their file by writing to: Commander, USAEREC, ATTN: PCRE-RF-I, Fort Benjamin Harrison, IN 46249-5301. Requests should include complete name, Social Security number, return address and personal signature. It takes about 20 days to process a request.

Soldiers should request this free copy once a year to ensure that their file is accurate, according to Col. Donald Hall, commander of the Enlisted Records and Evaluation Center.

Officials also recommend that non-commissioned officers in the consideration zones of DA selection boards obtain a microfiche copy of their records at least four months before the board convenes. *(ArNews)*

OER, EER Appeals Standardized

In January 1985, an Enlisted Special Review Board standardized the procedure for both officer and enlisted evaluation report appeals.

The action, implemented at the direction of Army Chief of Staff Gen. John Wickham Jr., resulted from a recent review of the Officer and Enlisted Evaluation Report Appeal systems. The study revealed a need for clarification of regulations as well as improved performance counseling by rating officials.

Under this special review board, both the enlisted and officer review boards will report to

one overall president to ensure uniformity of purpose and control. These boards will come under the direct supervision of the deputy chief of staff for personnel's director of military personnel management.

In addition, AR 623-105 (Officer) and AR 623-205 (Enlisted) will be revised to standardize the appeal procedures for both officers and enlisted soldiers. Some changes have appeared in revised regulations with other major changes to follow. *(ArNews)*

New MOS Developed for Army Warrants

An operations research and systems analysis occupational specialty is being developed that will provide the Army increased quantitative analytical support.

Under the new specialty, warrant officers will join commissioned officers in gathering data and designing mathematical models that simulate military operations used to conduct cost and resource analyses.

Warrant officers entering MOS 750A may receive up to 18 months, or 24 months in exceptional cases, of full-time graduate education paid for by the Army.

Personnel interested in applying must hold a bachelor or master of science degree. Application procedures are outlined in Army Regulation 621-1.

For more information, call the Warrant Officer Professional Development Branch at the Military Personnel Center, AV 221-7844. *(ArNews)*

Officer Assignment Policy Changes

Officers attending advanced courses in 1985 should know not only where they are going but what their next job will be by the 10th week of training, according to a policy change announced recently.

The new policy will also identify the officer's duty position and type of assignment halfway through the school, said officials of the Military Personnel Center's Officer Distribution Management and Mobilization Branch.

When the schools begin to add branch-specific modules to the advanced courses, some officers will stay in school longer than others. The newly revised officer advanced course is 20 weeks long, and there will be from one to six weeks of intensive, job-specific, follow-on training available after the course.

About six months before the advanced course begins, officers will be asked to tell the Army where they would like to be assigned after training. Then, about two months before the course begins, assignment managers will write to officers about their tentative assignments.

Branch assignment managers who visit within the first two weeks of each advanced course will talk with the officers and make changes, if any, to the original assignments.

Shortly thereafter, requests for orders will be sent to gaining commands which will decide to what type unit or duty position each officer will be assigned. The schools will then decide what follow-on training is needed for the officers to do their new jobs.

Officers should visit their local military personnel offices for more information, or contact MILPERCEN, ATTN: DAPC-OPD-M, 200 Stovall Street, Alexandria, VA 22332-0400. Telephone numbers are AV 221-7883 or 221-7884; commercial (202) 325-7883 or 325-7884. *(MILPERCEN)*

Soldiers Needed for Sinai Duty

The Army needs combat support and combat service support soldiers who are MOS skill-level qualified and possess superior military bearing to fill current logistical-support vacancies within the Multinational Peacekeeping Force stationed in the Sinai.

Openings are available to soldiers with no assignment restrictions in CMF 31, 55, 57, 63, 64, 71, 73, 76, 91 and 95 for one-year tours of duty.

Soldiers who possess a history of financial instability, a special or general court-martial conviction, civil conviction or lost time will not be considered.

Interested soldiers should submit DA Form 4187 through channels to U.S. Army Military Personnel Center, 2461 Eisenhower Avenue, ATTN: DAPC-EPS-MT, Alexandria, VA 22332-0400. For more information, call MILPERCEN at AV 221-8979 or 221-9243. *(ArNews)*

Enlisted Soldiers Can Call Toll-free

You've been trying to get information from your career branch manager on that request for transfer you sent in two months ago. Frustration sets in as the busy signal keeps coming back at you as you try for an Autovon line. By the time you get your call through, everyone on the East Coast has gone to bed. What to do?

Seeing this as a real problem, the Information and Assistance Office at the Military Personnel Center's Enlisted Personnel Management Directorate has installed a commercial toll-free telephone number for enlisted soldiers to call.

Soldiers seeking personal assistance, such as contacting their assignment managers, or for other related matters, can now call 1-800-255-ARMY.

Developments

Army Tests New Mine-scattering System

Army field commanders may soon be able to emplace minefields when and where they desire at various patterns and densities in relatively short time using the new ground emplaced mine-scattering system.

The system is undergoing testing and evaluation at the Combat Systems Test Activity (formerly the Materiel Testing Directorate), Aberdeen Proving Ground, Md.

The system consists of an M-74 anti-personnel mine, an M-75 anti-tank mine, an M-79 practice mine and an M-128 ground vehicle mine dispenser. Its prime movers are the M-113 family of tracked vehicles and the M-800 series five-ton trucks. The M-128 is capable of dispensing mines while traversing any terrain negotiable by the prime mover. The emplaced minefield may be all anti-tank, all anti-personnel or mixed mines at predetermined ratios.

Several critical issues will be addressed during the tests, including assessing the performance characteristics of the production hardware to meet Army requirements. Test efforts will also determine if the human factor and environmental and safety aspects of the system are acceptable, and if the integrated logistics support elements are adequate to support the system in the field. *(RD&A Magazine)*

Copperhead Fielded in Europe

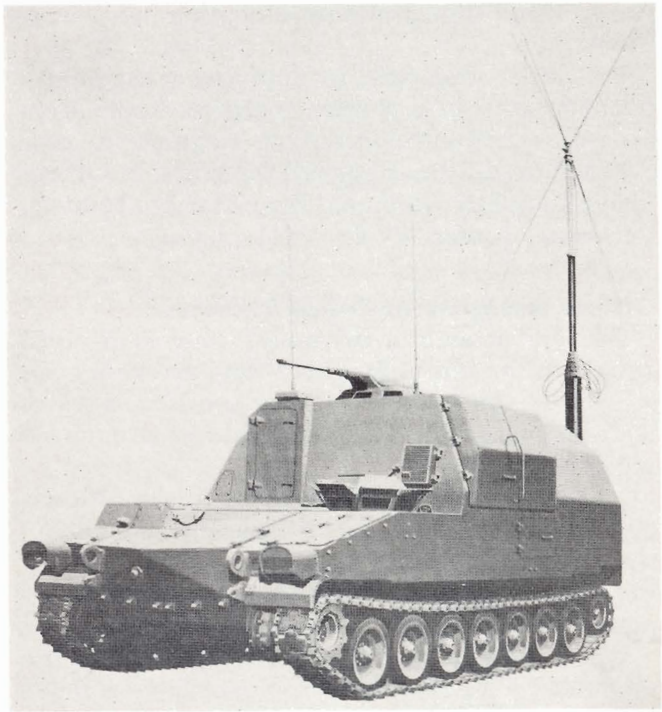
The M-712 155mm Guided Projectile, better known as Copperhead, program has reached another milestone. Following on the heels of its deployment to U.S.-based units and its introduction to service schools, Copperhead was deployed to Europe in October 1984.

In addition to receiving the laser-guided projectiles, U.S. troops were given total Copperhead logistics support. This included training rounds, extractors, repair parts and technical manuals. The laser designator that is part of the Copperhead system got similar logistics support.

Meanwhile, officials expressed elation over the test results of the last three production lots of Copperhead projectiles at White Sands Missile Range, N.M. Every round fired scored a direct hit on a tank target.

Copperhead is a modified 155mm artillery projectile that is equipped with a laser-seeker and control fins. In flight, the seeker senses reflected laser energy from a target designated by a laser-equipped forward observer and controls the trajectory to automatically home-in on the target, whether moving or stationary. *(The Voice)*

Army Tests 'Generic' Command Post Vehicle



The U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, Md., has designed and built a "generic" command post vehicle that will be used as a test bed to study command, control and communications operations in nuclear and chemical battlefield environments.

The command post vehicle, initially outfitted internally for the study of field artillery command, control and communications, is self-sufficient in

power requirements. An onboard auxiliary power unit and an environmental control unit provide all the power and air conditioning necessary to maintain the vehicle's extensive computer and electronic equipment.

Initial studies will focus on the nuclear, biological and chemical protection systems which are incorporated into the vehicle for use by individual soldiers. To study crew protective and life support systems, two operating modes will be tested.

One mode is for 12 to 24 hours of operations in a contaminated environment with the hatches open and the soldiers in protective clothing. The other mode is for 24 to 72 hours of operations with the hatches closed, but with provisions made for the crew to receive clean air as is provided for submarine crews.

During the open-hatch operations, the Army's current protective clothing will be evaluated along with a concept protective suit developed by the Human Engineering Laboratory. This suit, using items developed for the space program, allows the wearer to drink and eat newly developed special food and to eliminate body waste while wearing it. To cool the crew during warm-weather NBC operations, liquid or air-cooled vests, developed by the Natick Research and Development Center, will be worn by crewmembers under their protective suits.

In the closed-hatch operation, the crew will wear standard clothing since the vehicle is sealed. Pressurized filtered air for breathing, ventilation and cooling will be provided by the onboard systems. For the 24- to 72-hour continuous operation, the crew will use the vehicle's onboard facilities for food, rest and personal hygiene.

The command post vehicle is part of the soldier-machine interface vehicle test bed program in which researchers will gather data that the Army will use in future large-scale field tests. *(RD&A Magazine)*

Army Choppers Get Radar Jammers

The Army is equipping its AH-1S Cobra and AH-64 Apache helicopters with the new AN/ALQ-136 radar jammer that will significantly improve the tank-killing capability of attack helicopters on the future battlefield.

The AN/ALQ-136 is an automatic radar jammer that receives, analyzes and jams incoming radar signals from threat air defense acquisition and tracking units. It consists of a receiver-transmitter and antennas. The set is designed to work in conjunction with the AN/APR-39 radar warning receiver used on Army attack helicopters.

The addition of the radar jammer to the Cobra and the Apache rounds out the aircraft's survivability suit which includes a low electronic intelligence canopy, low infrared reflectant paint, an infrared engine suppressor, an infrared heat-seeking missile jammer and a radar warning receiver. *(AMC-WIRE)*

Cooling Clothing System for Tankers

An air-conditioned microclimate cooling clothing system, worn as an undergarment, will allow combat vehicle crewmen to wear their complete uniform protection against chemical and biological warfare threats while in their closed environment, and to continue their mission for extended time in relative comfort.

Although the protective ensemble currently used is most effective in protecting tank crewmen against toxic agents, it can induce considerable heat stress when worn in hot environments and cause heat casualties in less than 30 minutes.

Suited with the new undergarment system connected to a refrigerant source within the vehicle which distributes conditioned air over their torso, crewmen can perform their operational tasks efficiently in hot environments for 12 hours without experiencing ill effects from heat stress.

The system, developed by the Individual Protection Laboratory, U.S. Army Natick Research and Development Center, Natick, Mass., greatly increases the comfort, safety, efficiency and mission operational time of combat vehicle crewmen. It will be incorporated in all M-1E1 tanks coming off the production line in 1985.

Army Tests Natural Gas in Helicopter

Army aviation history was made at Fort Rucker, Ala., in November 1984. With test pilot Maj. David Anderson at the controls, an Army TH-55A helicopter using liquified natural gas as its fuel successfully flew for more than 30 minutes.

If the testing program proves successful, the conversion of Fort Rucker's fleet of 129 TH-55A helicopters to liquified natural gas fuel could result in savings in excess of $994,000 annually, according to Jerry W. Petrie, test engineer for the experimental fuel program. In addition, using natural gas in the reciprocating engine, rather than petroleum-derived aviation gasoline, would reduce the current drain on Department of Defense oil reserves. Tests have shown that the fuel may also be suitable for the Army's turbine-powered utility, scout and attack helicopters.

The primary attraction of using natural gas lies in its price. The cost of a gallon of liquified natural gas is about 42 cents, as opposed to $1.60 or more per gallon for aviation gasoline.

Another factor is safety. If an accident should happen, the liquified natural gas would evaporate harmlessly into the air as it leaks out of a ruptured fuel tank. The gas would rise above and away from any accident site, rather than pooling on the ground as is the case with aviation gasoline.

Another advantage to using liquified natural gas as a fuel lies in its octane level. Aviation gas has an octane rating of about 100. Liquified natural gas has a rating of 130. This means there would be far less engine "knock" with the new system.

Future testing will include ground checks, hover tests, level flight performance evaluation, vertical climb performance tests, forward flight tests, evaluation or response characteristics, engine start and shutdown assessments, low-speed evaluation, flying a simulated mission profile and flight involving two fuel tanks of natural gas.

A 60-pound fuel tank holds 23 gallons of liquified natural gas. Ground tests have shown that pilots can expect to fly for at least 1.2 hours with this amount of fuel. It is hoped that adding a second tank will extend the converted TH-55A's flying time to about three hours.

If all tests are successful, the decision for the final test phase could come sometime after January 1985. This test will involve using the new system to fly a full 100-hour primary flight training syllabus. *(TEC)*

Army Distributes New Airdrop System

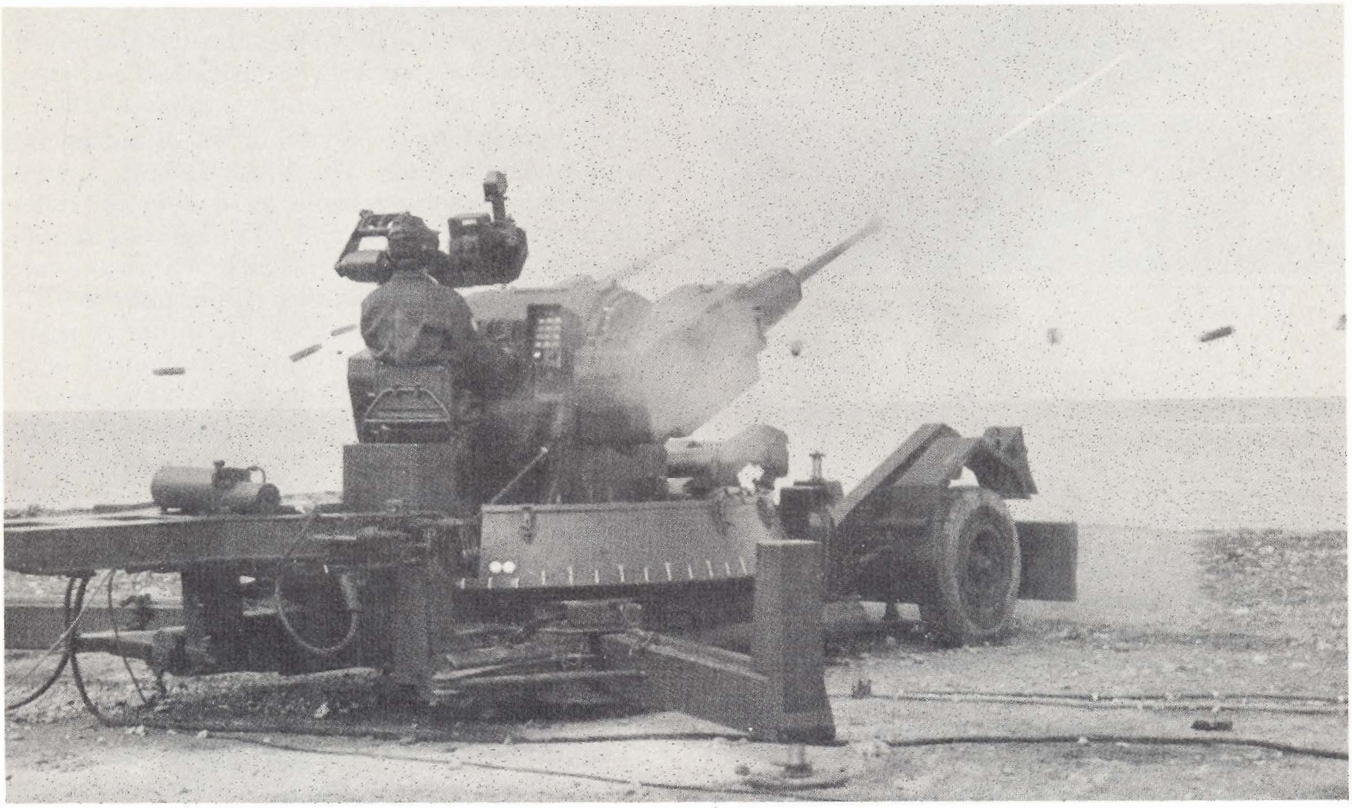
A new high-altitude airdrop resupply system is being distributed to Ranger and Special Forces units. The new system is more accurate, less subject to damage and can enable supplies to accompany paratroopers on drops behind enemy lines.

The high-altitude airdrop resupply system permits containerized unit loads weighing 300 to 2,000 pounds to be delivered from C-130 aircraft at speeds of 130 to 150 knots from a height of up to 25,000 feet above ground level. Higher speed and altitude make the aircraft and the load less vulnerable to enemy small arms and surface-to-air missile fire as compared to the standard Army high-velocity container delivery system.

The new two-stage system consists of a G-14 cargo parachute, an A-21 serial drop container, an automatic altitude sensor parachute staging unit, a test set, a newly developed 30-inch diameter pilot chute and a 70-inch shear suspension strap. The pilot chute gives the descending bundle a velocity slightly greater than an accompanying parachutist.

The high-altitude airdrop resupply system was developed by the U.S. Army Troop Support Command at its Natick Research and Development Center, Natick, Mass. *(Ranger)*

Greek Anti-aircraft System Creates Interest



The Greek anti-aircraft system, the Artemis 30, attracted some interest when it was displayed last summer at the Farnborough Show in Great Britain.

Armed forces representatives of the People's Republic of China, India and a number of Middle Eastern countries were among those showing interest in buying the system.

Greek sources claim that the Artemis 30 has a firing rate of approximately 900 rounds per minute. It uses inexpensive ammunition which is exclusively of Greek manufacture. A night and all-weather system, it supposedly can simultaneously engage (sic) 20 airborne targets with a short reaction time and can shoot down three aircraft in 8.5 seconds. It can also fire ground-to-air missiles. The Artemis 30 is equipped with a camera for monitoring enemy aircraft.

According to sources, it is easy to use, easy to maintain and can easily be transported. It is noted that the system's generator is located at some distance from the actual weapon so that enemy missiles attracted to it cannot strike at the weapon system and its operating personnel. *(Spotlight)*

Details of Soviet Mi-28 Published

Last fall, *International Defense Review* published a four-page article that gave details of the new Soviet combat helicopter, the Mi-28 Havoc. Included were sketches, but no photographs.

The article stated that the Mi-28 is at least the equal of, if not better than, the AH-64 Apache which is just entering service with the U.S. forces. It also claims that the Havoc's missile armament is better than the Apache's.

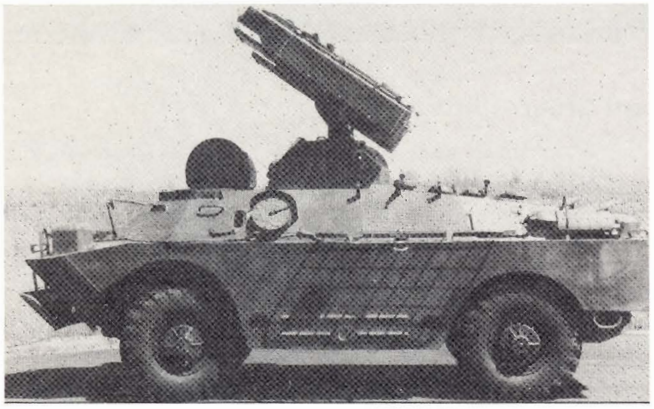
Expected to enter service in 1986 or 1987, the Havoc is designed for anti-tank and anti-helicopter operations and is more maneuverable, faster and smaller than the Mi-24 Hind deployed in Afghanistan, Eastern Europe and along the Sino-Soviet border.

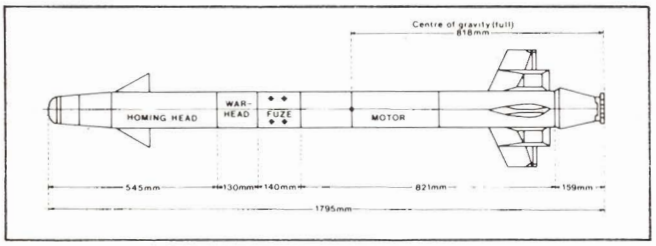
Abu Dhabi Extends Mirage Order

Abu Dhabi is negotiating with Dassault-Breguet for the purchase of up to 18 Mirage 2000 fighters to add to the 18 aircraft already on order.

The oil-producing country ordered the first batch of aircraft from the French manufacturer in 1983. The fighter formation is to form part of the United Arab Emirates' Western Command.

Analysts Look at Captured SA-9 System





A rare opportunity to analyze a Soviet missile system presented itself when South African forces operating in Angola captured an SA-9 Gaskin launcher vehicle with five missiles. According to reports, the sophistication of the standard anti-aircraft missile system of the Soviet ground forces surprised the analysts.

The vehicle is a modified BRDM-2 armored car. The chain-driven belly wheels on the sides of the standard vehicle were removed to make space for the fire-control turret. The vehicle is equipped with an inertial navigation device, similar to that on many other Soviet vehicles, that can guide it to within a hundred meters of a preprogrammed site. The launchers operate in platoons of four which deploy in a square pattern of 150 to 300 meters apart with each vehicle covering 90 degrees of airspace. Early warning is given by a network of visual observation posts or by a command post with a separate radar system, both of which are linked to the vehicles by radio or telephone. The SA-9 system can also be equipped with a passive detection system that gives an audio signal and rough azimuth of approaching aircraft.

A three-man crew is composed of the commander who sits in the right-hand front seat, the driver, and the fire-control operator in the turret. Once the command to engage is received, the operator rotates the turret in which he's seated by moving his legs, which are strapped to a pair of control rods. The missile canisters are elevated by a set of joysticks located on the arms of his chair. Missiles can be selected manually or automatically. The fire-control operator then pushes a button to open the canister of the selected missile and aims the missile. Target acquisition is done by the boresight-on-target method. The system has no guidance capability of its own. After lock-on, the operator pushes another button to uncage the infrared seeker. He then superelevates the missile to provide a lead angle or to clear nearby obstructions. An electronic system fires them in order.

Four missiles are carried in the launcher and four in the vehicle. The SA-9 Gaskin, a heat-seeking supersonic missile, is 10 feet long, has a diameter of 4.8 inches and a launch weight of 66 pounds. It has four canard control vanes and four tailfins and does not rotate in flight like the SA-7. Maximum range is 4 miles; minimum range is 2,625 feet. Minimum elevation at launch is 20 degrees; maximum is 80 degrees. Maximum altitude is 20,000 feet. *(Jane's Defence Weekly and F.Y.E.O.)*

Rapier Defends U.S. Air Bases

British-built all-weather, low-level Rapier air defense missile systems are now protecting the U.S. Air Force air base at Lakenheath in Great Britian. The Royal Air Force 66th Squadron is the first of three to be formed which will eventually provide air defense to the seven air bases of the U.S. Third Air Force.

Rapier is the first weapon system the United States has bought off-the-shelf from a European country. As part of the purchase, the United States reached an agreement under which Royal Air Force forces would man the Rapiers around U.S. air bases in Great Britain. *(Defense Week)*

Japan May Get New Plane

Japan's National Defense Council is preparing a report, which will be presented before the end of next year, concerning the country's future defense. According to sources, the construction of a front-line combat plane having an operational range of more than 1,600 kilometers and incorporating advanced technology, such as stealth, will be recommended.

The aircraft's entry into service is expected in 1993, and about 150 units would be produced, joining the 150 to 175 F-15s built under license from McDonnell Douglas by Mitsubishi. The new plane, if produced, will replace another native product, the F-1, of which 76 are in service.

It is envisioned that the new aircraft will be capable of carrying double the load of the F-1, will have engines of British or U.S. construction and British ejectable seats. The electronic components and avionics, particularly advanced, will be of national production.

Books

WOMEN VETERANS. America's Forgotten Heroines
by June A. Willenz
The Continuum Publishing Co., New York, 1984. 252 pages. $19.50.

At last, here is a book that explores the trials and tribulations of women veterans. June A. Willenz opens her discourse with a historical overview that begins with the Revolutionary War and ends with the post-Vietnam era. She tells the untold story of whom she calls "America's Forgotten Heroines."

Part I recounts how women became integrated in the armed forces through the courage and dedication of pioneers who proved that women could do the jobs required of the military. It explains the sensitivity of the issue during the years of indecision by governmental and military heads.

Part II is unique. Here, Willenz chooses to let individual veterans speak for themselves. In "Who They Are," 26 women of World War II, Korean, Vietnam and post-Vietnam eras tell their background, military experiences and what impact their service had on their future careers and post-service lives.

The most informative part of the book is Chapter 6, "Veterans' Benefits for Women Veterans," where little-known facts are made available and should be of substantial value to veterans.

Women Veterans does have one flaw. As with many other works about women veterans, it fails to fully explore the status of women, other than nurses, who served in Vietnam. Although figures of Vietnam veterans are inaccurate and incomplete, the author failed to search out those veterans. But this is a minor criticism when compared with the effort Willenz made to present the story of America's forgotten heroines.

No one describes the book better than does U.S. Senator Alan Cranston in his forward: "*Women Veterans* will play an important role in stimulating [a] long-overdue progress by helping to educate and sensitize individuals . . . to the rich history of the participation of women in our armed forces, the neglect that they have faced after their service and their present legitimate needs based on their service and status as veterans."

This book should be read by all women veterans and by everyone interested in history and current affairs.

—*Claire B. Starnes*

WINGS OF WAR
Edited by Laddie Lucas
Macmillan Publishing Co., New York, 1984. 416 pages with index. $19.95.

World War II British flying ace Laddie Lucas recounts the stories of those who participated in the great aerial campaigns of the war—on both the Allied and enemy sides. Contributors from Britain, Australia, New Zealand, Canada, the United States, South Africa, Germany, France, Italy, Poland, Czechoslovakia, Norway and Japan provide 200 accounts, arranged in chronological order. Illustrated with black-and-white photographs and fully indexed.

NUCLEAR WEAPONS. Fact Book
by Christopher Campbell
Presidio Press, Novato, Calif., 1984. 192 pages. $18.95.

Christopher Campbell, a past editor of Janes' famous books on aircraft and aerospace, has indeed done his homework. His book about nuclear weapons gives no argument, but presents a well-informed, authoritative analysis of facts. It explains the nuclear capabilities of the United States and Soviet Union, and explains the sophisticated technology behind such recent developments as the cruise missile and the Soviet Blackjack bomber—all in terms an ordinary person can understand.

Although the emphasis is on the superpower countries, Campbell includes a chapter on France, which he describes as a superpower in miniature. He wraps up his discussion with "Battle for the High Frontier."

The 24 color and 84 black-and-white photos and 44 diagrams, many of which were specially commissioned drawings, illustrate the weapon systems, strategies and defenses as well as the effect of nuclear war.

ELITE FIGHTING UNITS
by Lt. Col. David Eshel (IDF, Ret.)
Arco Publishing, Inc., New York, 1984. 208 pages. $19.95.

This book examines the record of major elite forces during World War II and explores the qualities required of soldiers handpicked to serve in those units around the globe today. The deeds of valor performed by these elite troops are described, some for the first time in such a compilation. Among the exploits and actions detailed are those of Israeli special units, Arab elite assault units, soldiers in the Falkland and Grenada campaigns, British commandos, German elite forces, the American special forces, Egyptian airborne troops and Soviet marines. A founding member of the Israeli Defense Forces' armored corps, Lt. Col. David Eshel has put together a book that should be an important acquisition for all military enthusiasts.

F-4 PHANTOM II
by Robert C. Stern
Stackpole Books, Harrisburg, Penn., 1984. 72 pages. $7.95.
WORLD FIGHTERS, 1945-85
by Michael J.H. Taylor
Stackpole Books, Harrisburg, Penn., 1984. 72 pages. $7.95.
USAF IN COLOUR TODAY
by Dana Bell
Stackpole Books, Harrisburg, Penn., 1984. 64 pages. $9.95.

These latest volumes in the *Warbirds Illustrated* series are packed with photos, many of them color. The text of each volume is uncomplicated and is more for amateur aviation buffs. *World Fighters, 1945-85*, especially, is merely an introduction to a few fighters of the world. The latest and newest fighters will not be found in this volume. *USAF in Colour Today* is just that—a series of 120 color photos through which the author attempts to tell the story of the U.S. Air Force.

CAVEAT. Realism, Reagan and Foreign Policy
by Alexander M. Haig Jr.
Macmillan Publishing Co., New York, 1984. 365 pages. $17.95.

"I am in control," will probably be the statement that Al Haig will have to live with for the rest of his life. In *Caveat*, he explains what he meant and why his statement, made during a national crisis, was distorted by the U.S. press.

"Certainly I was guilty of a poor choice of words, and optimistic if I imagined that I would be forgiven the imprecision out of respect for the tragedy of the occasion," writes Haig. "My remark that I was 'in control . . . pending the return of the vice president' was a statement of the fact that I was the senior Cabinet officer present. I was talking about the arrangements we had made in the situation room for the three- or four-hour period in which we awaited the return of the vice president from Texas."

Billed by Haig as "neither autobiography nor formal history, but rather a personal memoir" of his days as secretary of state, *Caveat* brings us accounts of such matters as Soviet diplomacy, Central America and nuclear arms.

Haig takes the reader inside power relationships at the highest level. The view is sometimes frightening, and the problems haven't all been solved. However, Haig gives President Reagan credit for a revival of American confidence and pride.

"Thanks to the president's fundamental good judgment and his many acts of political courage, the United States is stronger now than it was in 1980, its voice is more clearly heard and on the whole better understood, and if our friends have suffered shocks and surprises, they have also been reassured that America will no longer choose the sensibilities of its adversaries over the interests of its allies and itself."

But the caveat applies. "The impulse to view the presidency as a public relations opportunity and to regard government as a campaign for re-election (which of course, it is, but within limits) distorts balance, frustrates consistency and destroys credibility." *Caveat* is a warning to those in office, to those who aspire to office and to the public who must live with the decisions made by those in office.

It is worthy reading by all three.

—E.C. Starnes

AIRLIFT TO WARSAW. The Rising Of 1944
by Neil Orpen
University of Oklahoma Press, Norman, Okla., 1984. 192 pages. $14.95.

Airlift To Warsaw is a history of the little-known attempt by Allied forces to arm and supply the Warsaw nationalists during the rising of 1944. It is a well-researched history of the men, machines and politics of a time when the world was aflame with war.

Flying American Liberators and British Halifax bombers, Polish, British and South African air crews flew airlifts of arms, ammunition and food from their bases in Italy to this ill-fated city on the Vistula. The fliers belonged to Lt. Gen. Ira C. Eaker's multinational Mediterranean Allied Air Forces. Of the 21 flying nights available to them from Aug. 8 to Sept. 22, 1944, 186 sorties were flown with a loss of 31 aircraft or 16.8 percent. No other major air operation during World War II could compare with this incredible effort.

The author tells the story of the Warsaw airlift missions through the words of the men who flew those missions. Air Marshal John Slessor, deputy commander, and other surviving members of the air crews who flew the Warsaw run give an exciting touch. Also included are excerpts from official operations memoranda. Through these memoranda and first-person accounts, the author provides a living account of the airlift.

In addition to the oral history, a bigger picture is given, not only of the events leading up to, during and after the rising, but also of the political implications that weighted military decisions of the four countries involved—Poland, Great Britain, Russia and the United States.

The author, himself a veteran of the Allied North African campaign of World War II and a retired colonel of the South African army, has an impressive list of credentials including 12 other books relating to South African military history.

—Hubert L. Koker

AN ILLUSTRATED GUIDE TO MODERN ELITE FORCES
by Max Walmer
ARCO Publishing, Inc., New York, 1985. 160 pages. $9.95.

This compact, highly illustrated guide offers detailed descriptions of the weapons of more than 30 elite fighting forces which include U.S. Special Forces units, the French Foreign Legion, the British Special Air Services Regiment and Soviet Spetsnaz units. Information is given about how these forces train and fight, and what sets them apart from ordinary soldiers. Illustrations include action photographs and artwork, with emphasis on uniforms and weapons.

F-5E & F Tiger II
by Bert Kinzey
Aero Publishers, Inc., Fallbrook, Calif., 1984. 72 pages. $6.95.

This is Volume 5 in the "Detail and Scale" series. In this book, the Tiger II, a U.S. Air Force and Navy aggressor aircraft, is presented in detail. Charts and tables provide extensive amounts of technical data. Details are illustrated in the form of close-up photography and line drawings, supplemented with scale drawings that show five full views. A brief historical summary is also given. For scale modelers, a complete section is provided that reviews all the presently available scale model kits of the Tiger II and covers the decals available for these kits.

AN ILLUSTRATED GUIDE TO FUTURE FIGHTERS AND COMBAT AIRCRAFT
by Bill Gunston
ARCO Publishing, Inc., New York, 1985. 160 pages. $9.95.

This book examines in detail the designs being developed to replace current military aircraft. It talks about new materials that are making forward-swept wings feasible, stealth technology and possibilities for more vertical take-off aircraft. It also tells of modifications to existing combat aircraft, such as the F-16XL and the new Harrier AV-89.

Opinion

A Better Air Base Defense

by Capt. John M. Friedson

Col. Domenic P. Rocco Jr.'s article "Air Base Defense," which appeared in the Spring 1984 issue of *Air Defense Artillery,* is the closest thing to written doctrine air defenders have to guide them in constructing an effective air base defense. The article at last offers a systematic approach to one of short-range air defense (SHORAD) artillery's most important missions, the protection of deep strike assets which are destined to play a pivotal role in the air-land battle. Having served in Col. Rocco's command as a member of the 108th Brigade, 6th Battalion, 56th Air Defense Artillery, while many of the procedures outlined in his article were improvised and tested, I read "Air Base Defense" with particular interest. I am convinced Col. Rocco's plan makes the best possible use of assets currently allotted non-divisional SHORAD battalions for air base defense. I would like, however, to suggest that a better defense could be devised that requires reduced logistical and training support and no additional personnel.

The premise of this claim is that eight Chaparrals and 16 Stinger crews would prove more effective at the task of air base defense than the eight Chaparrals and eight Vulcans now authorized. As Col. Rocco points out in his article, air bases are relatively large and easy to find. The need for early engagement to reduce the effectiveness of standoff ordnance delivery is critical. Vulcans, with their limited range, inadequate 20mm ammunition and low probability of hits must be employed near the air base to provide a reasonable degree of coverage, thus limiting their engagements to "revenge shots" and exposing them to the effect of ordnance launched at the air base proper. Substituting two two-man Stinger crews for each four-man Vulcan squad in Col. Rocco's schematic (Fig. 1) would allow a commander to form an additional ring of defense (Fig. 2) around the air base outside the coverage provided by the Chaparrals.

The Chaparral/Stinger defense portrayed in Figure 2 positions Stinger crews far out enough in front of the Chaparrals to increase the chances that aircraft engaged by Stinger will be struck prior to their being fired on by Chaparrals. This deployment reduces the chance of wasting a missile in an unnecessary second engagement. The 16 Stinger crews provide mutual support along the most likely avenues of approach while providing overlapping fires in other areas. During periods of limited visibility, the Stinger crews might withdraw to the Chaparral positions and help Chaparral crews man their weapon systems on a 24-hour basis. Incorporating the Stinger crews into the ground defense would enhance the security provided by the air base security police, particulary if each Stinger crew were armed with an M-60 machine gun or the new M-249 squad automatic weapon.

Aside from the dramatic increase in air defense effectiveness, a unit using the Chaparral/Stinger mix would benefit from reduced training and logistical requirements. The Chaparral/Stinger battery would be able to cross-train Stinger personnel into Chaparral, the MOS into which they must progress in any case. This would eliminate the need to train operators on two unrelated weapon systems, as well as the requirement to send European-based Vulcan squads on expensive bi-annual trips to the Baltic Sea for firing practice. The need for Vulcan spare parts and Vulcan maintenance personnel would be eliminated at both the battery and direct-support level. The Stinger requires no maintenance support at the battery or direct support level except for additional target alert data display sets, which are already standard equipment for SHORAD batteries.

The increased capabilities of Improved Chaparral and the advent of Stinger have made the Chaparral/Vulcan mix obsolete. A Chaparral/Stinger mix offers increased effectiveness at reduced cost. Shouldn't we begin making the change now?

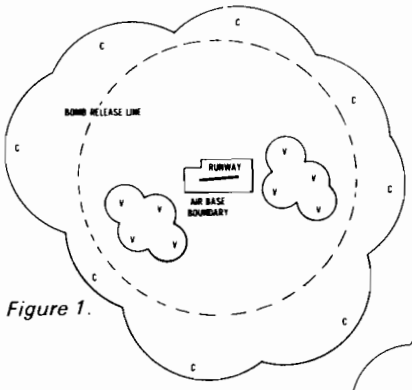


Figure 1.

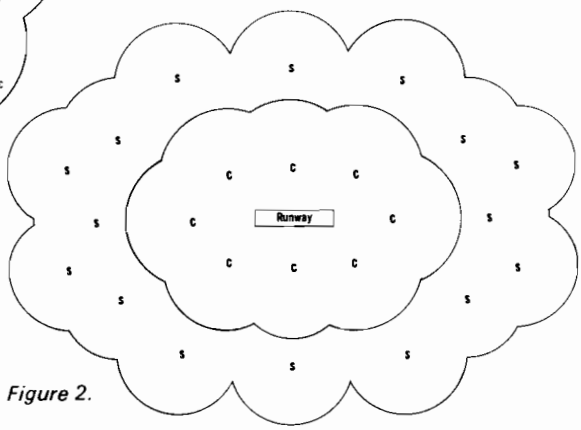


Figure 2.

Not To Scale

c = Chaparral v = Vulcan

s = Stinger

Capt. John M. Friedson *is the S-4 of the Sergeant York Training Battalion, The School Brigade, U.S. Army Air Defense Artillery School, Fort Bliss, Texas. He has served as a platoon leader, maintenance officer and executive officer with the 6th Battalion, 56th Air Defense Artillery, Spangdahlem Air Force Base, West Germany, and as S-4 of the 1st Battalion (Patriot), 43rd Air Defense Artillery.*

Coming in the Spring Issue . . . Battling 'Demons' at the NTC