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AIR DEFENSE ARTILLERY JULY-AUGUST 1991

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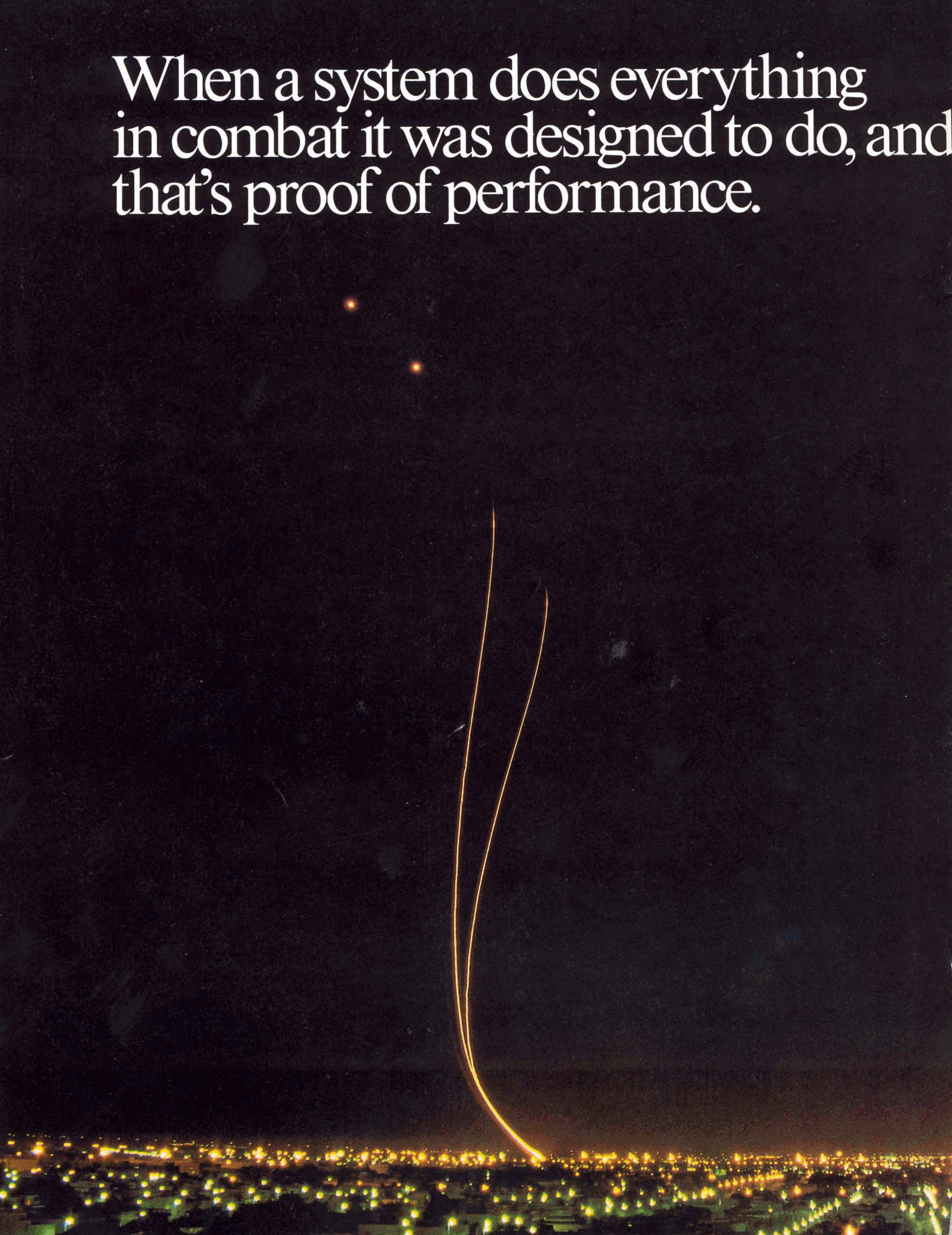

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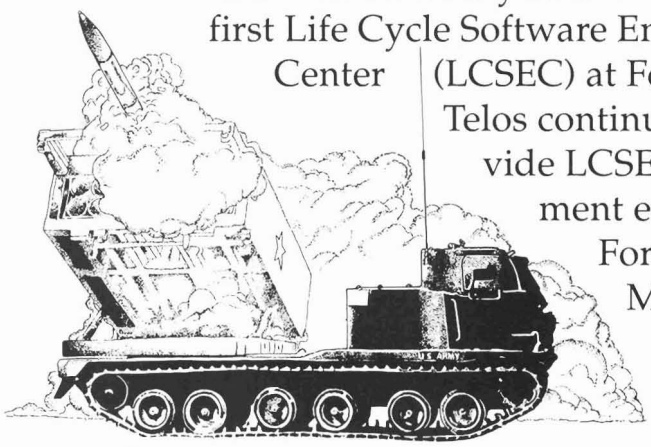

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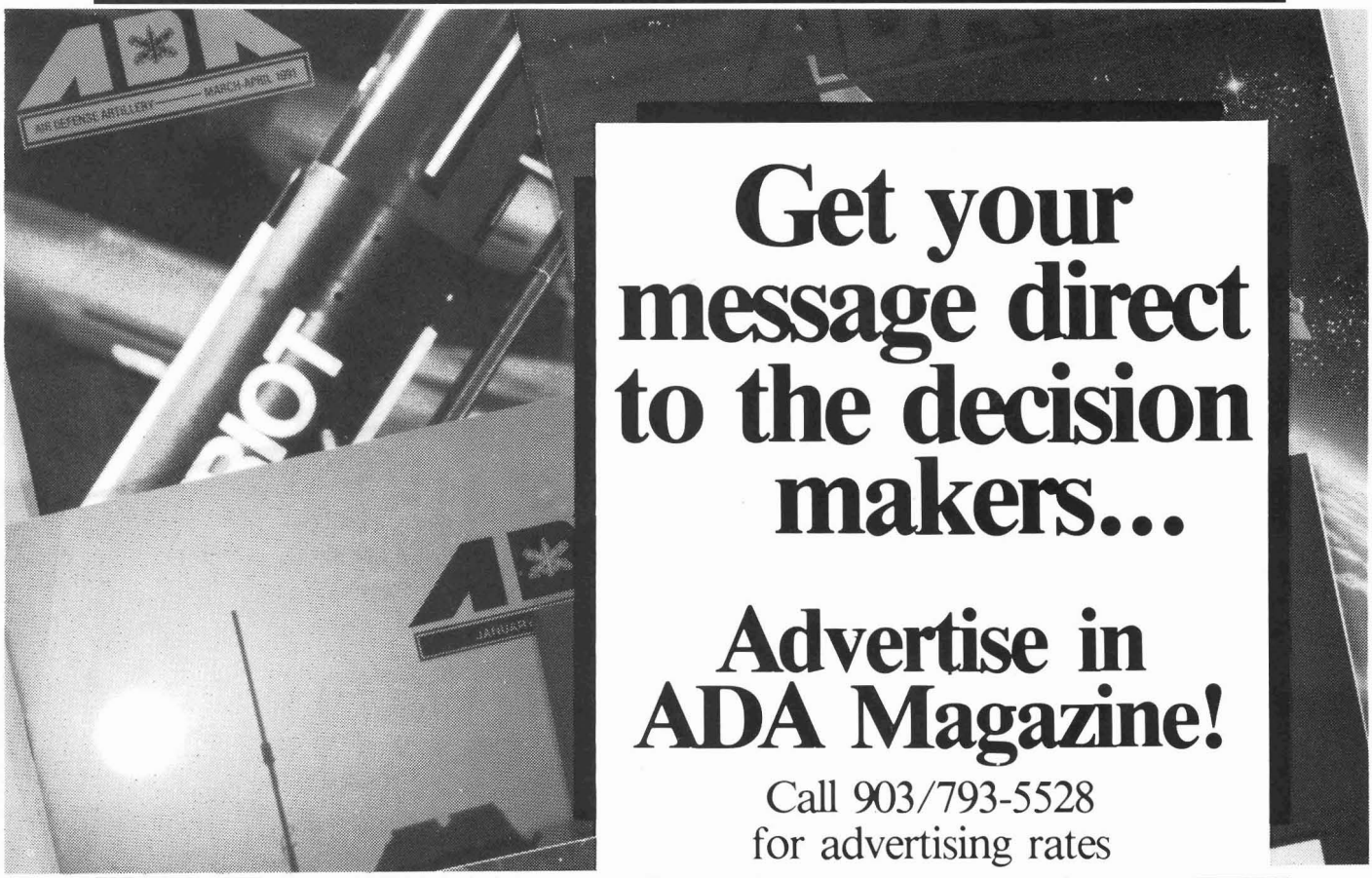

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INTERCEPT POINT

"I envy you your weapon systems, but more than your weapon systems, I envy you your soldiers."

—Lubos Drbovsky, Czech minister of defense, while visiting the U.S. Army Air Defense Artillery Center and Fort Bliss, Texas, following the Gulf War

During the past two years, the United States military restored democracy to Panama, liberated Kuwait, crushed Saddam Hussein's military machine and witnessed the collapse and formal dissolution of its arch-rival, the Warsaw Pact. These dramatic events, made possible by the presence of a strong and ready American military force, have re-established the United States as the world's preeminent military superpower. Now we face a new and unprecedented challenge. "Build down" is not just another Army "buzz word" or euphemism, for we must not simply reduce the force, and reduce it we must, we must "build down" the force. This means sensible, phased reductions over time with a continued adherence to our six fundamental imperatives: maintain a quality force; support with solid warfighting doctrine; retain the appropriate mix of armored, light and special operations forces required by national strategy; conduct tough, realistic training; continuously modernize to improve warfighting capabilities; and develop competent, confident leaders. It also means limiting the impact of involuntary release on soldiers, civilians and their families.

The Army that emerges from the build down will be a smaller but better Army — superior in weaponry, training and soldier quality to even the magnificent fighting force that, during the War in the Gulf, established new standards of excellence. It will also be an Army in which leadership opportunities and career satisfaction will, following a brief period of turbulence, quickly return to pre-build-down levels.

We will lose some good soldiers who helped make us what we are today: a virtually unchallenged military power. We intend to honor the Army's obligation to minimize the hardship of transition for those volunteer soldiers and their families who will be asked to leave the service. We must ensure they leave the Army with a sense of accomplishment, for the manner in which we handle these difficult transitions will be critical to the quality of the future force.

As leaders, now and in the future, our chief concern must be to keep quality soldiers — soldiers assured of making the cut, but who, discouraged by what they wrongly perceive as a long-term shrinkage of leadership and promotion opportunities, may decide to abandon the Army. We must encourage these quality soldiers to stay the course.

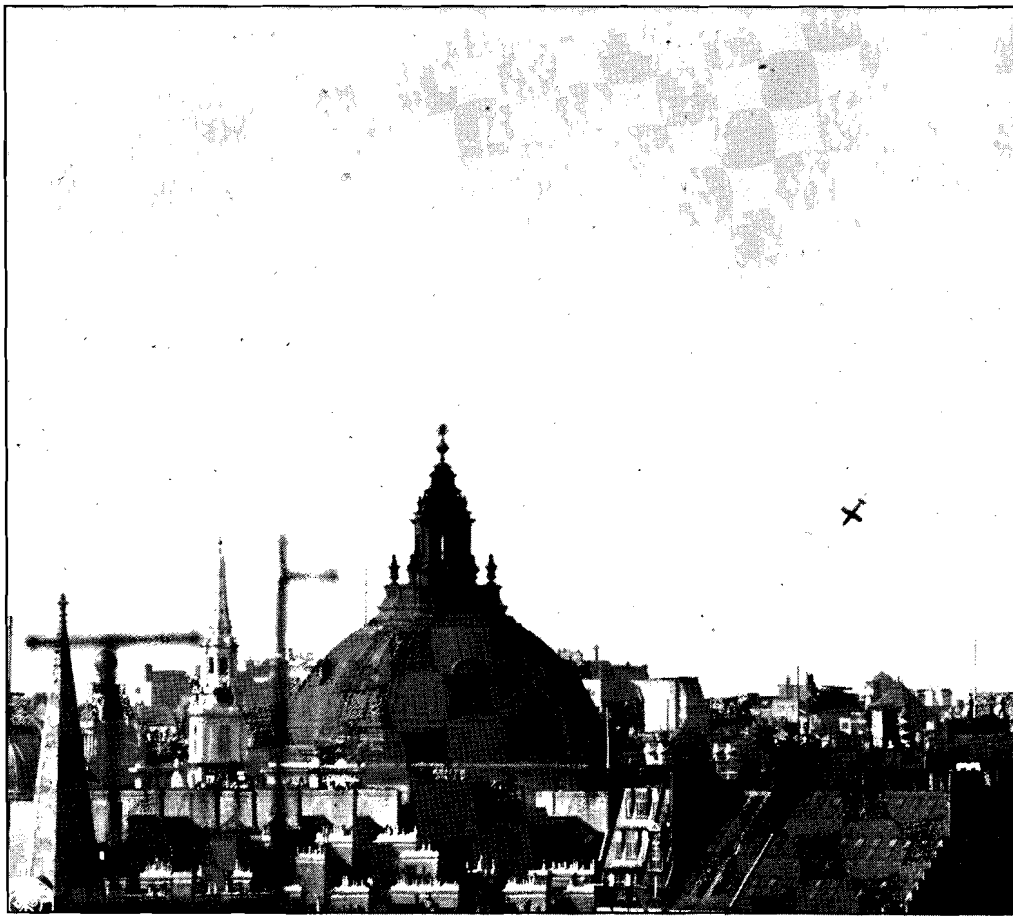
A battery commander, platoon leader, platoon sergeant or squad leader who served in Operation Desert Storm will write a lot of resumes before finding a job as challenging or as responsible as the one they performed in the Persian Gulf.

For example, for many National Guardsmen and Reservists, the unexpected tour of duty became a period of self-discovery, a watershed event that redefined their lives. Removed from less adventuresome tasks and thrust into a challenging environment, they adapted and thrived. They helped make history and,

(continued on page 25)

Winds of Change

London, June 1944-March 1945 — *On the night of June 13, 1944, seven days after the Normandy landing, the first V-1 flying bomb (forerunner of modern cruise missiles) drones across the English Channel to initiate a terror campaign that ends in March 1945 when the last V-2 rocket (predecessors of today's tactical and strategic ballistic missiles) smashes down in London. Air defenders, after a brief period of panic, learn they can cope with the V-1 that flies at speeds of 300 to 400 miles per hour, and soon antiaircraft gunners arrayed in belts between London and the coast are shooting down 80 percent of the "buzz bombs" targeted at the British capital. But no defense exists against the supersonic V-2, and Londoners discover that basement bomb shelters offer no protection. When the Allies overrun the V-2 launch sites in Holland and the research and development center at Peenemunde, the Germans are working on an improved V-2 capable of hitting New York.*



A V-1 buzz bomb plunges toward Picadilly in London. St. Paul's Cathedral is at left.

United States, Mid-1950s-Mid-1960s — *The United States scraps plans to station Safeguard air defense missile systems to defend its major population centers against Soviet intercontinental ballistic missiles when it becomes apparent that the era's anti-missile technology is too immature to stop these missiles. Across the United States, Americans, alarmed by heated Cold War rhetoric, go on a backyard bomb shelter-building binge.*

United States-Europe, 1970s-1980s — *NATO-Warsaw Pact treaties designed to stop the spread of strategic and tactical ballistic missiles (TBMs) also throttle emerging technology designed to detect missile launches and intercept them in flight. Third World countries unbound by the treaties continue to develop their TBM capabilities. The United States develops a limited tactical missile defense (TMD) capability for its Patriot air defense missile systems. The debate continues over where TMD, permissible under treaty guidelines, ends and strategic ballistic missile defense, strictly limited by treaty restraints, begins.*

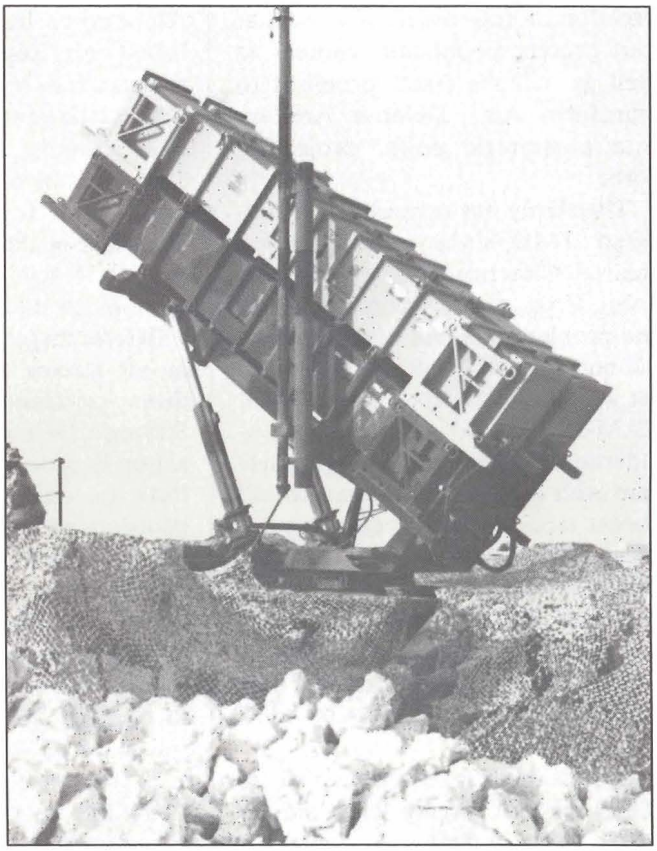
The Safeguard system was briefly deployed to counter ICBMs during the 1960s.

Tel Aviv, January-February 1991 — *Iraqi-modified Scuds strike residential areas as Hussein launches a terror campaign designed to draw Israel into the Gulf War and fracture the U.S.-led coalition. Israeli Patriot crews training in the United States rush home to mount a defense, soon to be joined by U.S. Patriot batteries deployed from the 32nd Army Air Defense Command in Germany. The Patriot fire units, although often deployed contrary to ADA warfighting doctrine, successfully engage Scuds entering their engagement envelope, but are unable to provide coverage the length and breadth of the urban sprawl along Israel's Mediterranean coast.*

Baghdad, January-February 1991 — *Tomahawk cruise missiles launched from U.S. warships strike military command, control, communications and intelligence (C^3I) centers inside the Iraqi capital with pinpoint accuracy. Fast and low-flying, the Tomahawks are virtually unbeatable. The high-tech barrage blinds and cripples the Iraqi command structure.*

Saudi Arabia, January-February 1991 — *Patriot units deployed to protect air and sea ports and lodgement areas perform superbly in their secondary role of providing defense against TBMs for specific military assets, but an Iraqi Scud leaks through the anti-missile defenses, strikes a barracks and inflicts the Gulf War's heaviest U.S. casualties. Scuds impacting in other areas accentuate the need to build a TMD that can defend military and civilian targets throughout entire theaters of operation.*

United States, January-February 1991 — *"The strategic defense debate ended about 3 a.m. last Friday [Jan. 18]," editorializes the* Wall Street Journal. *"That's when the now-famous Patriot missile slammed into a Scud missile, the first of many intercepts now occurring daily." The media doesn't comprehend the difference between strategic missile defense and TMD, but the editorial begins the national outcry for stronger missile defenses.*



Patriots successfully engaged Scuds during Desert Storm.

by Pete Olson

By dramatically reintroducing the threat of TBM and cruise missile attack, the Gulf War lent a new urgency to strategic missile defense and TMD programs once hindered by fiscal, technological and treaty restraints. Historians and military analysts may long argue over how effective Patriot was in executing an area population defense mission (for which it was not designed) against targets faster than those that figured in the system's design goals, but Patriot undeniably demonstrated that the technology exists to mount a successful TMD. The resulting national mandate for the creation of anti-missile systems that can protect population centers as well as military assets promises to transform Air Defense Artillery into a strategic power projection force.

The mandate for anti-missile systems that can protect population centers as well as military assets is transforming Air Defense Artillery into a strategic power projection force

The Army has reviewed and analyzed TMD since armies fielded their first tactical missiles (Honest John, Frog, etc.). For many years, the problem was one of technological constraints: Could you hit a bullet with a bullet? In the late 1960s, SAM-D (Patriot) developers considered equipping the emerging system with a nuclear warhead to kill threat tactical missiles carrying nuclear warheads. However, for austerity reasons, that program was terminated. In the mid-1970s, TMD missile requirements resurfaced, only to be dropped because of cost factors and doubts that the technology would work.

A firm tactical requirement for a TMD system finally emerged in 1982. The military developed a four-pillar TMD approach: attack operations (killing the missile and launcher on the ground prior to launch), active TMD (killing the missile in flight), passive TMD (preventing the enemy from determining the location of friendly units and hardening critical assets) and TMD C^3I (detecting threat missile launches and passing target data rapidly to the appropriate defense mechanism). Despite the four-pillar approach, TMD still rests on a shaky foundation.

Operation Desert Storm dramatically demonstrated that we cannot rely on attack operations to silence the tactical missile threat. Saddam Hussein's mobile Scud launchers proved difficult, elusive targets. The Air Force, having quickly established air superiority, dedicated thousands of sorties against the mobile missile launchers, but the Scuds kept coming. Gen. H. Norman Schwarzkopf authorized the insertion of a "fusion cell" of A-10 Thunderbolts and Delta Force and British Special Air Service commandos to paint mobile launchers with laser target designators and call in air strikes. But still the Scud threat persisted. As a result, the Strategic Defense Initiative Organization is coordinating tri-service efforts to establish a program for coordinated suppression of enemy missile launchers. The goal is to develop new sensors and employ fighter bombers and weapon systems to take out the launchers within five minutes of launch. It remains to be seen how well the program, still in its infancy, will work.

In the active TMD arena, the Army has developed Patriot to engage and kill tactical missiles in both self-defense and limited asset defense roles. Patriot fire units dramatically demonstrated these capabilities during Operation Desert Storm. However, Desert Storm also demonstrated Patriot's anti-missile limitations. Industry teams are working to develop new air defense systems that can provide broader area coverage and intercept incoming TBMs earlier in their trajectories.

The military has yet to produce any significant breakthrough in passive defense technology. Work continues on deception techniques designed to invite attack against low-value targets, communications security, hardening of equipment, rapid facility and runway repair and redundant systems.

In an effort to improve C^3I, the services are exploiting national intelligence surveillance means, working to reduce communication relay times and developing additional tactical surveillance methods. The ability to identify missiles and launchers prior to, at and after launch is crucial to building an effective TMD.

The Changing World Threat

Operation Desert Storm demonstrated the geopolitical use of cruise missiles and TBMs. These missiles give Third World countries a deterrent against their neighbors and world powers that they did not possess in the past. Leaders of developing countries view tactical missiles as necessary counterbalances to preclude national blackmail, and they now appear to be as important to Third World arsenal builders as tanks and artillery. They provide even third- and fourth-rate powers with the perception of a strategic force: a perception likely to fuel the desires of other Third World countries to acquire both TBMs and the defensive weapons required to counter them. Having seen cruise missiles and TBMs used effectively in several wars, Third World coun-

Emerging Technology

Brig. Gen. J. Morgan Jellett, program manager for Joint Theater Missile Defense, told reporters recently that "It is Congress' intent to accelerate the tactical missile defense program as soon as it is technically and fiscally feasible . . . . In FY 92 we anticipate funding totaling $850 million for the tactical missile defense program requirements, up from approximately $400 million in FY 91. The Strategic Defense Initiative Office has been tapped to manage the program, and the Strategic Defense Command has been tasked to be the lead Army agency, consolidating the tactical missile defense efforts that were ongoing within the Army Missile Command and the Strategic Defense Command. The Army is structured now to do the tactical missile defense mission, and we are prepared to carry out DoD's directions."

The defense industry, meanwhile, is gearing up to provide tactical missile defense prototypes. Several new technologies, in various stages of maturation, are being explored under the tactical missile defense umbrella.

The Army has the lead in developing ground-based tactical missile defense technologies. The extroatmospheric reentry-vehicle interceptor system (ERIS) is designed to intercept ballistic missiles in space. The theater high-altitude area defense (THAAD) system would spread a tactical missile defense umbrella over an entire theater of operations. The extending range intercept technology (ERINT) missile would improve the tactical missile defense performance of existing systems such as Patriot or future systems such as Corps SAM.

On Jan. 19, an ERIS missile launched from Kwajalein Missile Range scored the system's first intercept of an ICBM in space. The ERIS program began in 1986 when the Army awarded Lockheed Missile and Space Company of Sunnyvale, Calif., a five-year, $428-million contract. The seven-foot long ERIS missile receives target information via a computer but largely relies on a super-cooled infrared system that detects heat generated by a missile warhead. As it nears the target, the ERIS unfolds a rigid, octagonal-shaped "parasol" that increases the probability of intercept. ERIS, now commonly referred to simply as the ground-based interceptor, is designed to intercept ICBMs at Mach 20 and at a distance of more than 100 miles.

During Operation Desert Storm, PAC-2 missiles and software rushed to the Persian Gulf allowed Patriot, designed primarily to destroy fixed-wing aircraft, to also intercept tactical ballistic missiles. But Patriot offers only limited asset defense against missile attacks.While Patriot performed superbly within its design parameters, providing "point defense" for military assets against tactical ballistic missiles, the results were mixed when the Iraqis employed Scud missiles against metropolitan areas. Patriot usually intercepted the Scuds, but the debris and warheads often fell into populated areas.

Operating in the theater strategic as well as tactical realms, THAAD interceptors would perform the mission that Patriot and Corps SAM (Hawk's eventual successor) are not designed to accomplish — provide protection from tactical ballistic missiles over an entire theater of operations.

THAAD requirements developed by the Air Defense Artillery School and U.S. Army Training and Doctrine Command specify a C-130 transportable system that can counter world power and Third World tactical ballistic missiles at high altitudes in mature and contingency theaters while meshing with Patriot and Corps Sam to provide a tiered tactical missile defense. The Army awarded $5 million-plus concept definition contracts to three industry teams (Lockheed, McDonnell Douglas and Sparta) for work between September 1990 and September 1991. The Army hopes to award a contract to one or two teams in December and begin early THAAD fielding in 1995.

(continued on page 8)

tries are either developing these systems on their own or procuring them from arms suppliers. Other countries that once depended on major world powers to supply them with these missiles have now developed or imported the technology necessary to become producers and suppliers themselves.

The military effectiveness of TBMs depends on several factors: target vulnerability, missile accuracy, weapons payload and target acquisition. While current Third World missiles are not very accurate against point targets, they are effective against area targets such as metropolitan areas. As Third World countries build or acquire more accurate missiles, their effectiveness against specific military targets will increase. Missiles with chemical, biological or nuclear warheads can make Third World countries that possess them a major force among their contemporaries. In developing TBMs, these countries are not constrained by treaties that restrict U.S. and Soviet TBMs to ranges of less than 500 kilometers.

Cruise missiles employed during Operation Desert Storm demonstrated the military use of weapons that can penetrate airspace at low altitudes and fly unhampered into fixed target areas. Although the technology to develop highly precise cruise missiles may not exist for several years in the Third World, the technology exists today to build less precise cruise missiles that can be targeted against cities and staging areas.

Iraq's Scud offensive reawakened the world to the tactical missile threat, but Third World countries used TBMs in conflicts prior to the Gulf War. In 1973, Egypt and Syria launched TBMs against Israel. Iraq and Iran exchanged missiles during their eight-year war. Libya launched a tactical missile attack against a U.S. Coast Guard installation on an Italian island in

1986, and Afghanistan continues to use Scuds against rebel forces.

We can be certain that the tactical missile threat will continue to grow. At least 24 nations may have TBMs by the turn of the century. Last year, CIA Director William Webster told a congressional hearing that at least six Third World countries will have missiles with ranges as great as 3,400 miles by the year 2000. At least 15 nations, he said, will have TBMs that can launch conventional, chemical, biological and, in some cases, nuclear warheads over lesser distances.

Fortunately, the Gulf War has provided us with many insights that will guide us in the development of a viable TMD.

Deployability is critical. Large air defense systems require multiple sorties of heavy lift aircraft. We must configure theater area missile defense systems to allow rapid worldwide force generation without significant demands on the heavy-lift air fleet. We need to consider moving secondary and reinforcing systems to the theater of operation aboard strategic and rapid sealifts.

Scuds aimed at Saudi Arabia and Israel contained conventional rather than chemical, biological or nuclear warheads that would have made a "near miss" as good as a "hit." We must develop interceptors that can destroy conventional, chemical and nuclear missiles and their warheads much earlier in their trajectories.

Intelligence is crucial. The exploitation of national intelligence resources was critical in Scud defense in Saudi Arabia and Israel. More timely and more accurate data, however, would have allowed us to furnish fire units with cueing as well as alerting information.

We must create flexible systems that can adjust to threat variants. The TBM threat in Operation Desert Storm did not behave as predicted. Patriot systems could not provide kill assessment data or produce real-time data recordings. Future systems must have built-in data recorders (similar to the ones in combat aircraft) with removeable data packs that will allow us to rapidly modify and verify software changes against an evolving and reactive threat. Recorded data would also help us train operators to recognize and respond to new situations.

We must increase the lethality of our anti-missile systems to kill tactical ballistic missile warheads as well as the missile booster

We must increase the lethality of our anti-missile systems to kill the warhead as well as the missile booster. A "mission kill" that nudges an incoming missile away from the defended military target may deflect the missile and its unexploded warhead into a populated area. The residual missile booster from a large TBM contains sufficient kinetic energy to cause significant damage to military or civilian targets. Scud warheads that survived Patriot engagements and missile boosters that fell to earth caused significant damage and casualties. Fortunately,

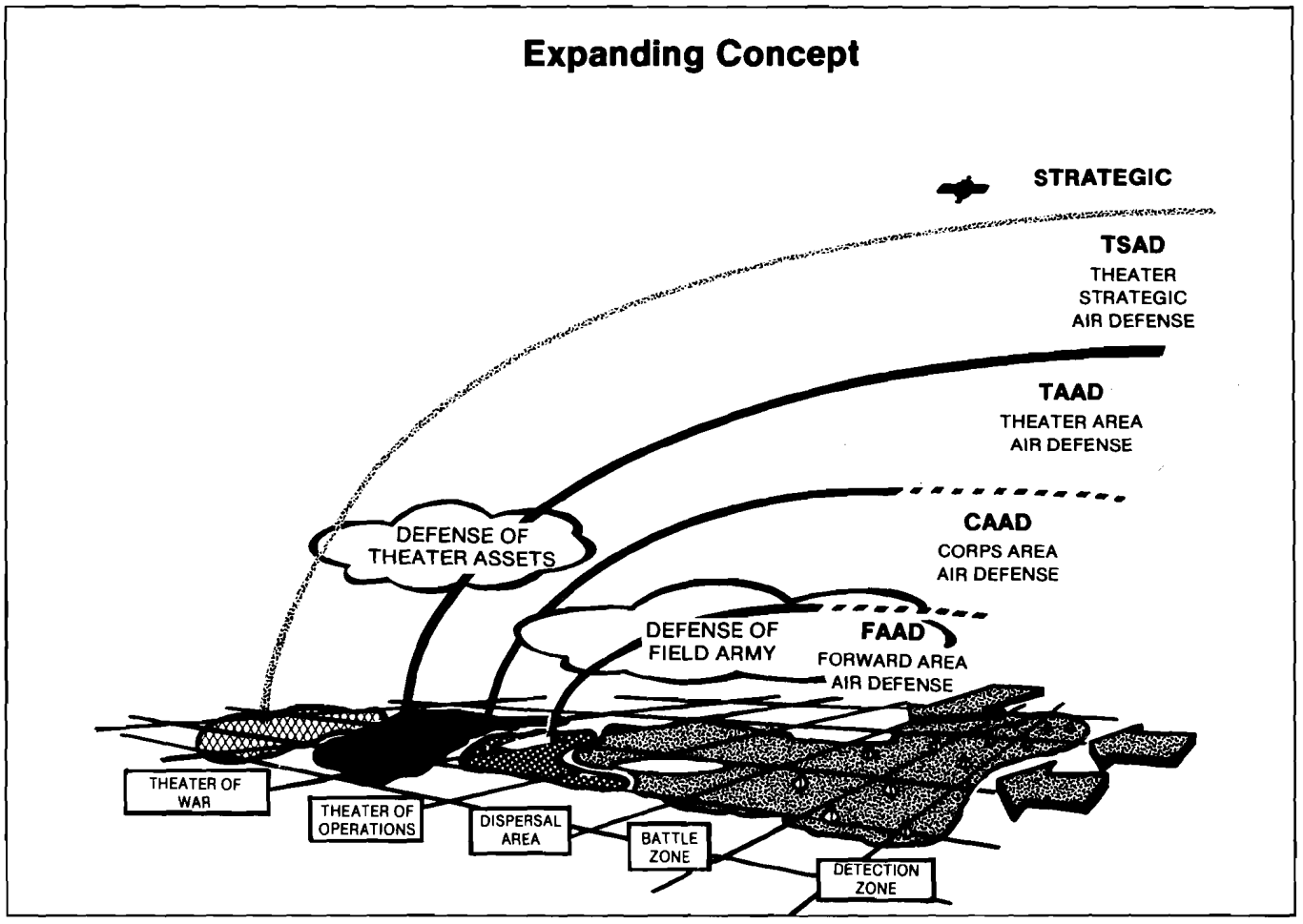
Interoperability is another problem. The distances between Patriot units in Saudi Arabia generated unique communications problems, including interfaces with joint and combined air defense networks. Future systems dedicated to a theater area defense mission must be capable of rapidly passing data information using standard military communications systems over local, theater and allied networks.

Desert Storm ADA units discovered that electrical power could be as precious and as scarce as water in the sun-scorched Arabian Desert. Desert Storm planners underestimated the availability of commercial and military power sources for sustained operations in a severe environment. Deployed systems must have highly reliable and sustainable power generation equipment that works in all types of weather and environmental conditions.

TMD Leadership

The United States reacted to Scud attacks on civilian targets by assigning Patriot batteries in Desert Storm a theater strategic defense mission, protecting civilian populations against TBMs. While this new mission is not fully documented or accepted by the Army, President George Bush was emphatic in his Jan. 29 State of the Union Address: "I have directed that the Strategic Defense Initiative program be refocused on providing protection from limited TBM strikes, whatever their source. Let us pursue an SDI [Strategic Defense Initiative] program that can deal with any future threat to the United States, to our forces overseas and to our friends and allies." The president's directive will transform Air Defense Artillery into a strategic power projection and protection force to defend our forces, our allies and host nations against tactical missile attacks during combined operations.

The ADA concept that existed prior to Desert Storm divided the air defense battlefield into three sections: division, corps and echelons above corps. Each of these areas' structure differed slightly, and units within them fought the air battle with different objectives, systems and methods of coordination with the air forces. With the advent of the theater strategic defense mission against tactical missiles, the ADA concept evolves. The revised



ADA concept now has four battlefield defense areas: forward area air defense (FAAD), corps area air defense (CAAD), theater area air defense (TAAD) and theater-strategic active defense (TSAD).

· *FAAD*. ADA units will defend divisions and lower echelons against aircraft and airbreathing targets transiting the divisional area. FAAD-class weapons could be employed for high-value point defense around critical corps assets.

· *CAAD*. ADA units will defend corps assets and provide divisional and corps elements with limited TMD while augmenting coverage against aircraft overflying divisional FAAD weapon systems.

· *TAAD*. ADA units will defend critical military forces, military assets and resources at echelons above corps while providing lower echelons with additional coverage against TBMs and aircraft. TAAD systems could be augmented with both CAAD and FAAD weapons for specific high-value defenses.

· *TSAD*. ADA units will provide missile defense of rear area military resources, civilian populations, industrial bases, utilities and government facilities of sufficient military worth to have dedicated point or limited area defense. ADA units will provide missile defense overlay to TAAD, CAAD and FAAD systems. TSAD systems' value warrant protection by aircraft and cruise missile defense systems.

Scud attacks on populated areas during Desert Storm have lent a new urgency to the quest for an air defense system capable of providing missile defense of U.S.-based military resources, civilian populations, industrial bases, utilities and government facilities. The defense of the continental United States, a clearly strategic mission previously executed by the Army Air Defense Command, has yet to be remissioned to Air Defense Artillery.

Air Defense Artillery 2000+

To execute its expanded mission, Air Defense Artillery must field an integrated family of weapons. A single ADA system cannot counter the full spectrum of threat aerospace systems. As more ADA systems enter the force, the differences in sensors, seekers, lethality and employment doctrine will create a diverse defense no single system can defeat or suppress. Each

(Emerging, continued from page 5)

The Lockheed team includes Lockheed-Sanders and Lockheed Missile and Space Corp. Players on the McDonnell Douglas team are Raytheon, Aerojet, Aerospatiale, BGT, Harris and SRS. The Sparta Team includes Hughes Aircraft, LTV, Diehl and Thomsom CSF. Sparta Inc. will serve as its team's "lead" contractor during the concept definition stage while Hughes will play the lead role during the demonstration and validation stage.

The Missiles Division of LTV Aerospace and Defense Company recently won a $104.6 million contract modification to develop and demonstrate a pre-prototype ERINT-1 missile and launch control system. The contract, awarded by U.S. Strategic Defense Command, is funded by the U.S. Army Strategic Defense Initiative Organization.

ERINT-1 is a small, highly agile, kinetic kill missile for defense

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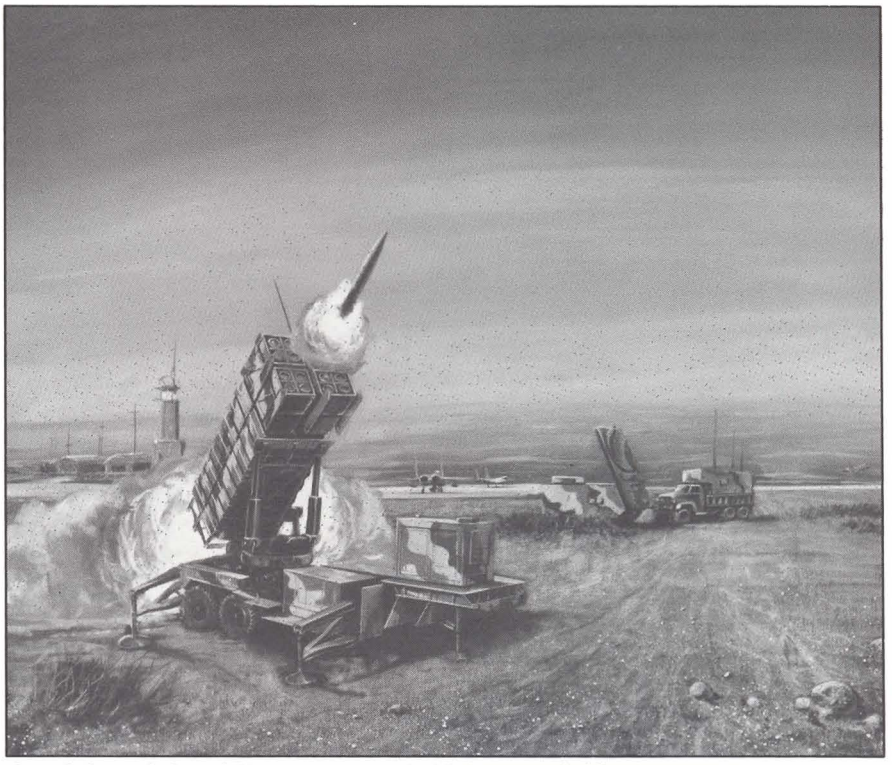


An artist's rendering of ERINT-1 integrated with the upgraded Patriot.

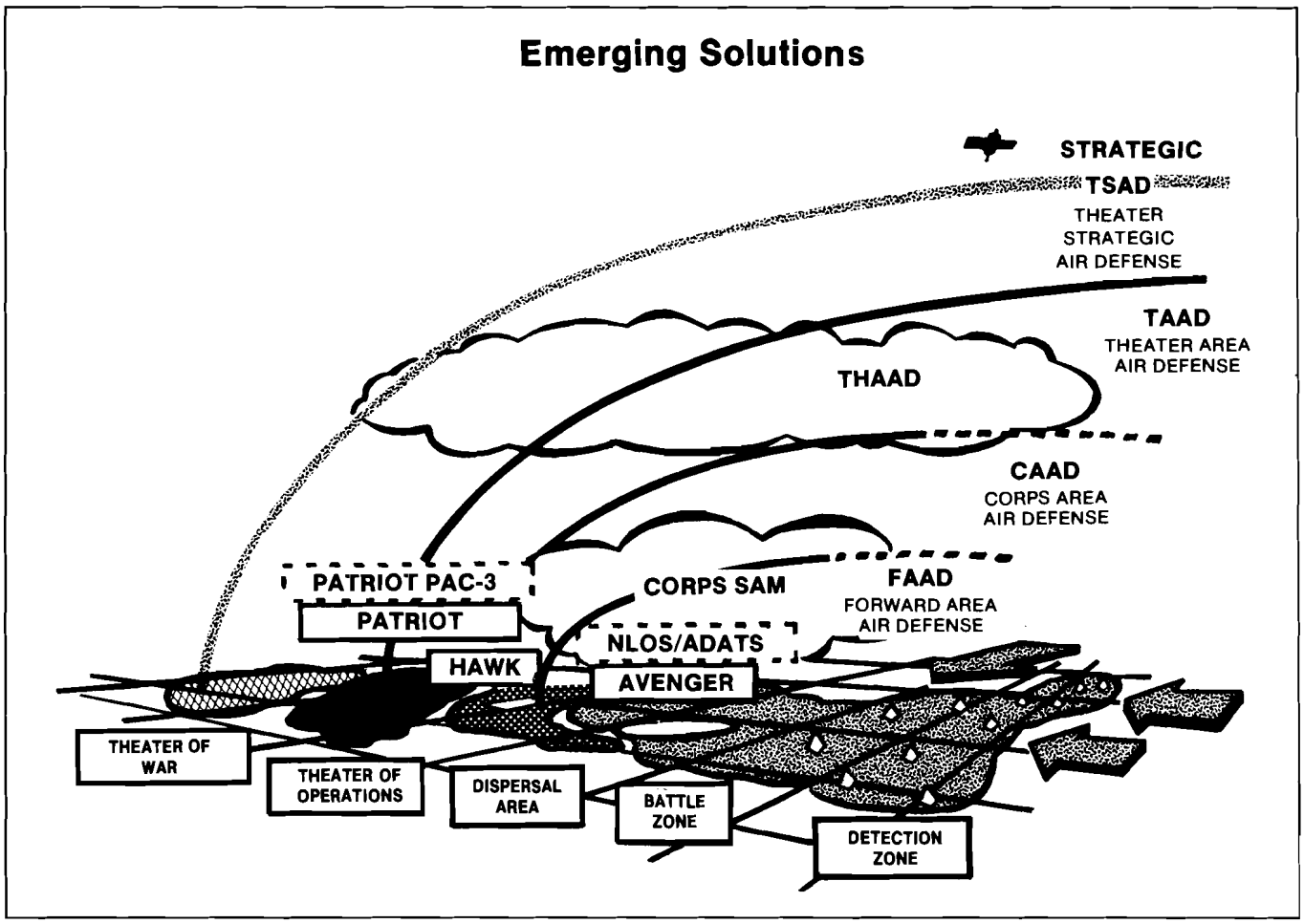
variation in defense multiplies the threat's suppression difficulties.

The development and fielding of effective TSAD and TMD capabilities will be a staged, phased-in process over many years paced by the threat, technology, affordability and national strategy. A TMD in-progress review was held in April to review U.S. Army Training and Doctrine Command (TRADOC) schools' and centers' progress on tasks assigned under the Tactical Missile Defense Management Plan. The plan provides a road map for TRADOC to ensure tasks outlined in the Joint Tactical Missile Defense Master Plan are accomplished. The master plan ensures that all master plan tasks are assigned to some TRADOC agency, and provides assistance in dealing with agencies outside the TRADOC community to prevent duplication of effort and wasting of budget dollars. The following paragraphs describe a balanced development and acquisition strategy. While this is not the only strategy, it does provide (for illustrative purposes) a baseline for the emerging TMD concept.

The balanced acquisition strategy makes the best of what we've got while developing new air defense systems to improve our TMD. We will continue to grow currently existing air systems to their cost-effective full capability, evolving them through major component and technology replacements into more capable systems. We will start new acquisition programs only after product improvements and major system evolutionary paths fail to provide necessary solutions. We will delay new starts if new technologies capable of evolving existing systems are in development and offer potential capabilities without requiring a new start. However, we would start to develop some new capabilities rather than wait for unproved technology. Paper systems have never won a war.

For example, in keeping with the balanced acquisition strategy, we will continue to product-improve Patriot to its cost-effective limit. The baseline is Patriot PAC-2 with quick reaction program improvements. We will leverage elasticity in Patriot's growth potential and increase functional capabilities in firepower, discrimination, lethality, coverage and TMD command, control and communications functions. Patriot will serve as the underlay for the emerging high-altitude area TMD.

Corps SAM will replace Hawk to become, along with Patriot, the lower tier of TBM and cruise missile defense. Corps SAM will provide forward area defense against cruise missiles and short-range Frog and SS-21 class ballistic missiles as well as conventional aircraft. Its mission will be to protect forward maneuver



forces. Corps SAM is a high-priority project, but its fielding is 10 to 15 years away.

Industry teams are working on a generic TMD weapon system that will serve as the theater high-altitude area defense (THAAD) baseline. THAAD is a system concept to engage conventional, chemical, biological and nuclear TBMs at high altitudes. The THAAD system will counter TBMs in mature and contingency theaters. Providing an overlay to product-improved Patriot and Corps SAM, it will serve as the second tier of TMD, protecting military assets, maneuver forces and population centers scattered throughout an entire theater of operation. The Army has developed high-altitude theater missile defense mission area requirements, issued a draft THAAD system request for proposal, and plans to release an official request for proposal late this summer. The Army hopes to award a contract in December, and THAAD system early fielding may get underway as early as 1995.

Expanding mission TMD requirements have many implications for Air Defense Artillery. For example, the fielding of new TMD systems is likely to create new operator and maintainer MOSs. The Army's ADA force structure may be increased to field a TSAD force. In a time of decreasing force requirements, Air Defense Artillery will assume new missions against a more capable threat. Air Defense Artillery's future is heavily linked to the advanced technological systems required to defeat the tactical missile threat and to the training of highly trained professional air defense soldiers who will operate them.

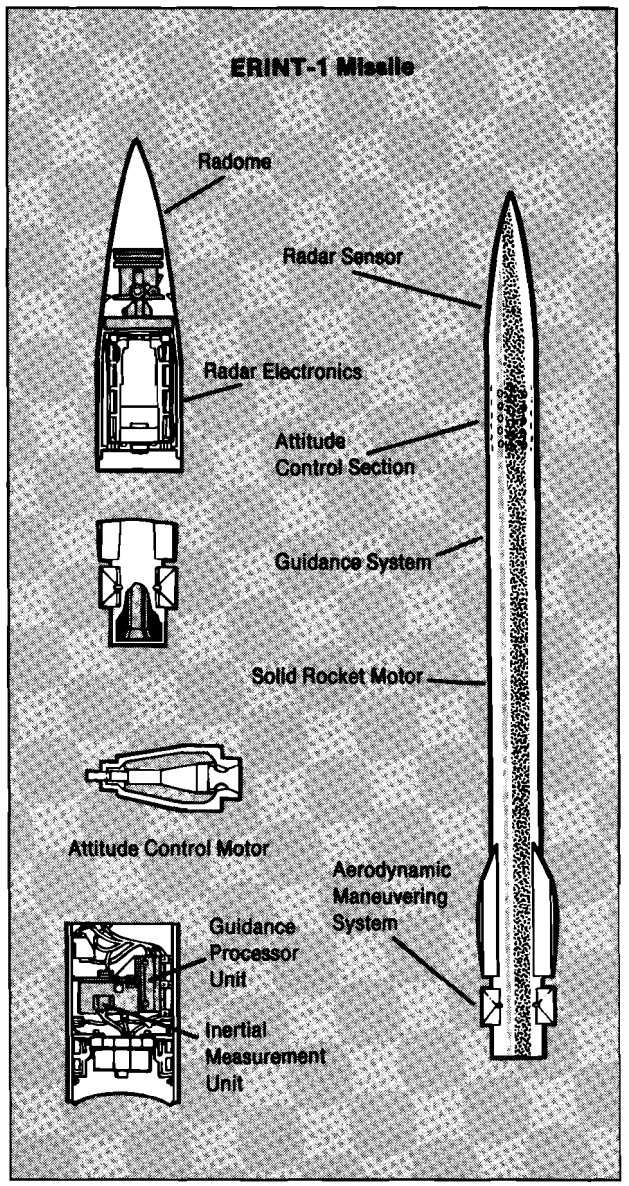
ADA Future

The battlefield decisive engagements have been and always will be won by the combat arms (Infantry, Armor and Field Artillery) whose mission it is to close with and destroy the enemy. However, this will be accomplished in year 2000+ because Air Defense Artillery will have provided them and their support elements with an impervious umbrella-like cover to protect them from hostile close air support, offensive air, TBMs and cruise missiles. The integrated family of ADA weapons (from Stinger to Patriot to high-altitude theater missile defense to anti-satellite air defense) pro-

(Emerging, continued from page 8)
against tactical ballistic missiles and air-breathing threats. ERINT technology is based on the proven flexible lightweight agile guided experiment (FLAGE) missile that successfully engaged a series of targets, including the complete destruction (warhead kill) of a Lance missile, during proof-of-principle tests in 1986 and 1987. FLAGE was a Strategic Defense Initiative program to develop hit-to-kill accuracy against small, high velocity targets. The ERINT-1 program will extend FLAGE's capability to higher altitudes, longer ranges and other threat vehicles.

The ERINT-1 contract was restructured in 1988 to develop a pre-prototype missile and launch control system for tactical missile defense while ensuring modular system compatibility with existing and planned fire control radars. The ERINT-1 is ground-launched and inertially guided by aerodynamic fins toward the predicted impact point. At the terminal flight phase, an onboard radar acquires the target and provides near real-time data to the guidance processor, which rapidly determines homing guidance commands. ERINT-1's rapid response comes from LTV-developed attitude control motors consisting of small, solid rocket thrusters mounted near the vehicle's nose. Guidance commands fire the thruster in flight and refine the agile missile's course to ensure a pinpoint hit on the target warhead. Flight tests scheduled for 1992 will validate maturing of the ERINT-1 design improvements and its ability to destroy tactical ballistic and cruise missiles as well as aircraft.

According to LTV, ERINT could be integrated with the upgraded Patriot to augment Patriot's tactical missile defense firepower. Under one LTV concept, 16 of the smaller ERINT missiles could be fitted on a launcher that can now hold only four Patriot missiles: a 4:1 firepower advantage. LTV claims ERINT's initial flyout speed and millimeter waver seeker would make it effective against saturation attacks. The system, according to LTV, would also provide a highly accurate seeker and responsive guidance for hard kill of tactical missile warheads while reducing personnel and equipment. Under a second LTV concept, ERINT-1 would be deployed as a small, lightweight, high- to medium-altitude weapon for contingency operations.



vides an interlaced, impenetrable shield that denies the enemy access to his reconnaissance, surveillance and target acquisition platforms and to his attacking airborne systems. The battlefield commander has confidence now that he can mass his forces without threat of observation and preserve the element of surprise as he maneuvers to the attack and engages and kills the enemy. The critical need for air defense on the AirLand Operations battlefield is more important now than it has ever been under previous warfighting concepts.

Emerging anti-missile technology will provide ADA soldiers the tools they need to counter the growing TBM and cruise missile threat. However, our success in meeting the challenges that await us will not depend on high-tech hardware and software alone, but also on highly skilled soldiers who possess the determination, adaptability, willingness to learn and devotion to duty required to meet the challenges of the 21st Century. As we develop and field advanced ADA systems, our paramount concern should be to ensure that we continue fielding ADA soldiers equal to the ones who served in Operation Desert Storm.

Pete Olson is the deputy TRADOC system manager for high- to medium-altitude air defense, Fort Bliss, Texas.

KE ASAT

by Maj. Russell Lange and Capt. Sean B. MacFarland

Southwest Asia, 2005 — *The commanding general frowned at the map. Intelligence satellite overflights had revealed a weakness in his opponent's dispositions that would allow him to counterattack and sever the enemy's lines of communication. That was the good news.*

The bad news was that the enemy owned several reconnaissance satellites of his own. Somehow, the general had to reposition his forces without telegraphing his intentions. This would have been an almost impossible task ten years ago, but today the answer to his problem is only a phone call away. Recently, the kinetic energy anti-satellite (KE ASAT) weapon system reached initial operational capability. Within a few hours of his conversation with the chairman of the joint chiefs of staff, KE ASAT missiles would be streaking into space to negate the enemy's satellites.

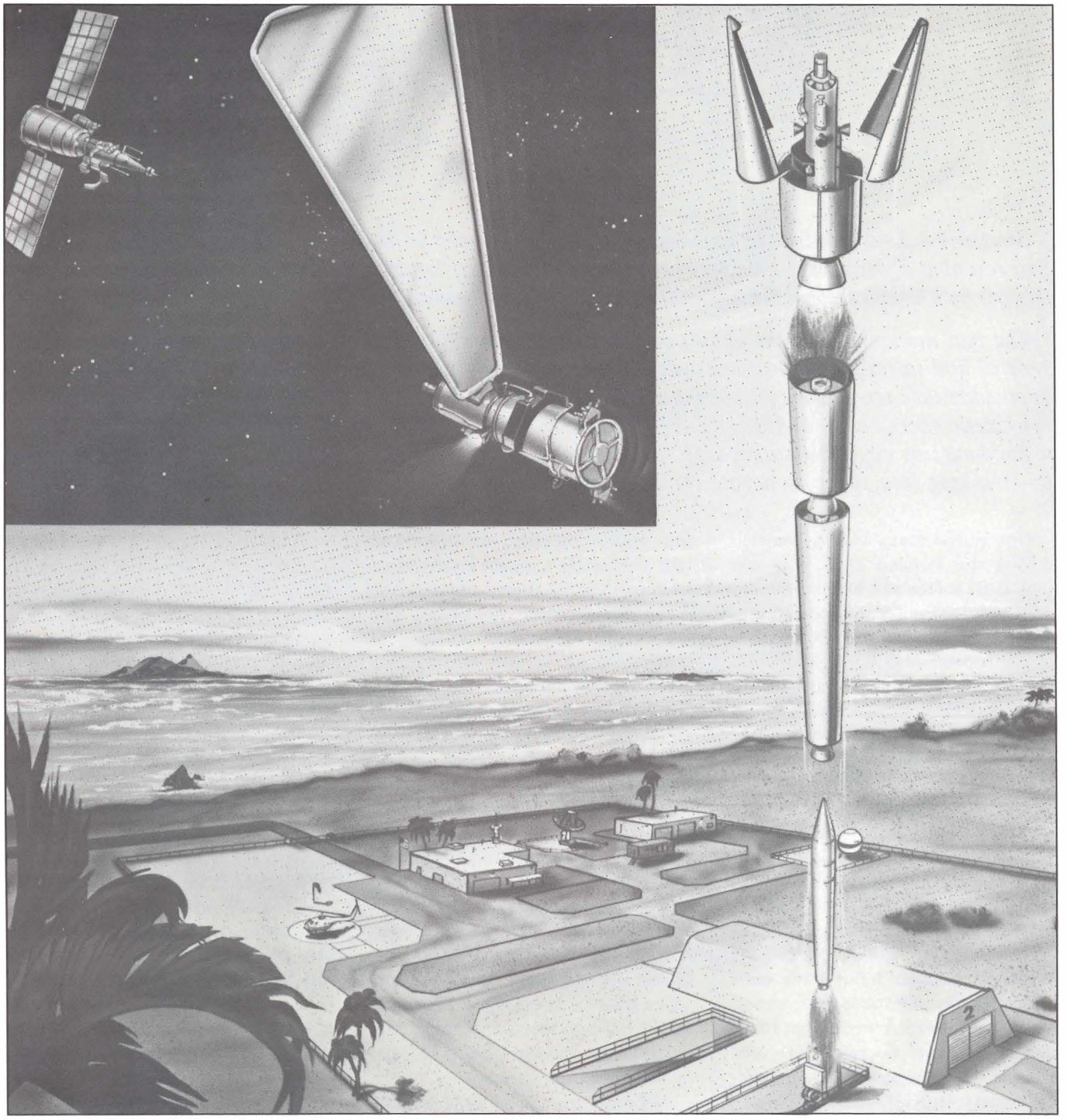
One of the many lessons learned during the Persian Gulf War was that U.S. forces are heavily dependent upon satellites. Space supremacy was as important to our victory as air supremacy. We relied upon satellites for both tactical and strategic communications. Single- and multi-channel tactical communications satellites were indispensable in providing constant, secure communications among widely dispersed maneuver units and headquarters. The featureless terrain of Saudi Arabia and southern Iraq made satellite-assisted navigation tremendously important, particularly at night. Without global positioning satellites, we could not have conducted the lightning-fast sweep around the Iraqi Army's right flank that led to our decisive 100-hour victory. Most importantly, air tasking orders and schemes of maneuver that proved so successful were based primarily upon intelligence gathered by our reconnaissance and surveillance satellites. Undoubtedly these space-based assets contributed heavily to our success.

The magnitude of our reliance on space during the war raises some important concerns. If the Iraqis had possessed a space-based communications capability, our air campaign against their command and control systems would have been far less successful. If they had had access to satellite intelligence, our initial buildup of forces, which progressed unmolested through several windows of vulnerability, would have been placed at far greater risk. Also, our "Hail Mary" play, which shifted the bulk of our forces to the west prior to the ground campaign, would have been a very dangerous move if Saddam Hussein had been able to observe the entire operation. Lastly, if the enemy had possessed the capability to attack our space-based assets, we certainly would have suffered a proportional degradation in our ability to see, move and communicate.

Although the Iraqis were neither able to use space nor deny its use by others, we may not always face such unsophisticated adversaries in the future. The answer to space-based threats in future conflicts can be found in the emerging Space Control Doctrine, in which the KE ASAT weapon system plays an important role. It provides the United States with a deterrent against attacks upon our own satellites by forming a credible threat to any low earth orbit satellite. As currently envisioned, the KE ASAT weapon system will consist of two major subsystems: the missile subsystem and the weapon control subsystem. Eventually, it may be complemented by a directed energy ASAT battery at White Sands Missile Range, N.M.

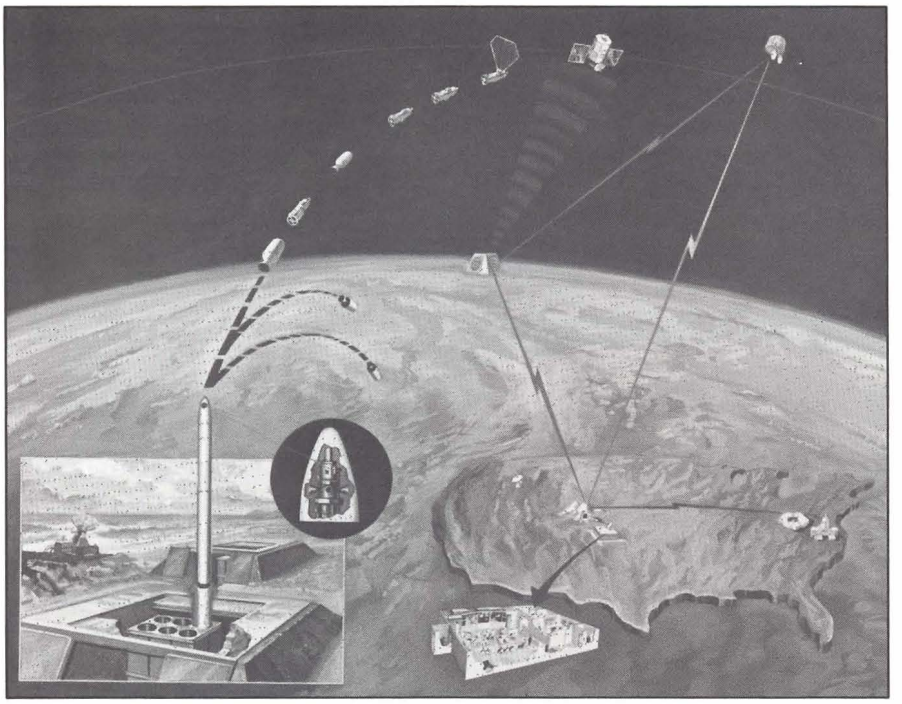
The missile subsystem will consist of a single firing battery at a fixed site, located on an island or the east or west coast to avoid overflight of any populated areas. Because the missile requires three booster stages to launch the kill vehicle into space at slightly less than orbital velocity, the impact locations of booster debris is a safety concern. The KE ASAT test site is Vandenburg Air Force Base, Calif. This may evolve into the operational site if the site selection evaluation board led by the user, Army Space Command, chooses it above 35 other candidate locations.

During an engagement, the missile will be launched to an approxi-



The KE ASAT missile subsystem will consist of a single firing battery located on an island or coast to avoid overflight of populated areas.

mate intercept point calculated by the weapon control subsystem. Once in space, the kill vehicle will orient itself, acquire the enemy satellite with its seeker and home in using small thrusters. As the kill vehicle approaches the target, it will deploy a kill device consisting of pellets embedded in a Mylar sheet. Just prior to impact, the kill vehicle will offset slightly to allow the kill device to destroy critical components of the satellite. The remains of the kill vehicle will then fall back to earth. This arrangement was devised to keep resulting space debris to an absolute minimum. Over 90 percent of the approximately 6,700



The KE ASAT kill device consists of pellets embedded in a Mylar sheet.

space objects currently being tracked by Space Defense Operations Center, Cheyenne Mountain, Colo., are pieces of "space junk." A much larger quantity of minute pieces of debris, too small to be seen by our space surveillance network, is also in low earth orbit. The U.S. space shuttle fleet has already had damaging encounters with these tiny objects. As a result, debris mitigation is an important consideration in the design of the system and in engagement planning.

The weapon control subsystem consists of three elements: a mission control element located at the Army Space Operations Center at Fort Carson, Colo., a battery control center (BCC) located at the firing battery and the communications network that links all elements of the KE ASAT weapon system.

The mission control element will perform readiness and engagement planning and will generate missile data loads. To perform these functions, it will interface with the Army Space Command side in Cheyenne Mountain. The mission control element will receive orders and data on target satellites and transmit system status and courses of action. It will also transmit missile data loads and commands to the BCC.

The BCC serves as the nerve center of the firing battery. It will receive missile pre-launch data, missile data loads and launch commands. The BCC will also monitor missile pre-flight health and status and keep the mission control element informed. Most importantly, the BCC serves as the "man-in-the-loop" for launch inhibit purposes.

Until this year the KE ASAT acquisition strategy was a relatively fast, streamlined program. In August 1990, Rockwell International was selected as the prime contractor for the demonstration/validation phase. However, in December 1990 the Army recommended deleting all funds for ASAT beginning in FY 92. Initial DoD and administration concurrence followed and program termination actions were begun.

It appeared at the time that the program was dead and, with it, our ability to conduct space control operations. Fortunately, limited funding was restored a month later (after congressional concern was expressed) and a restructured ASAT program emerged. "For a brief heartbeat in FY 91, it was gone," said Lt. Gen. Robert Hammond, commander of the Strategic Defense Command. "I received a call at my quarters one Saturday evening about midnight telling me to 'quick, apply CPR and bring ASAT back at the misery level.' I was tasked to keep the ASAT team together and make sure the contractor stayed involved. We barely managed to comply with that guidance. The funding this year is on the order of $70 million. We've gone to the Army acquisition executive with a new recommended baseline for ASAT that would require the Army to plus-up the funding in FY 92 and 93 and beyond so that we can have a meaningful program and not just stay in research. I'm optimistic that it will be approved."

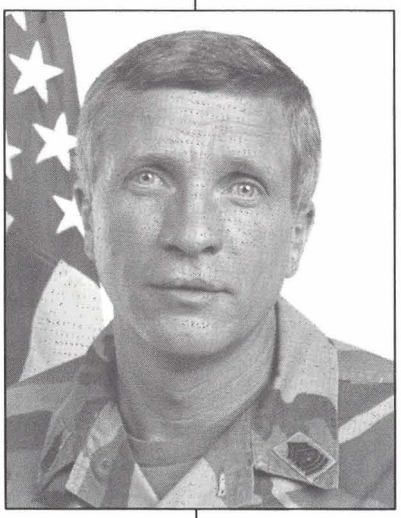
While the program has not appreciably changed in terms of either design or capability, the reduction in funding has eliminated portions of the test/evaluation program and has stretched the original milestone schedule. The KE ASAT weapon system is currently scheduled to enter full scale development in November 1993 and should reach initial operational capability near the turn of the century. The Air Defense Artillery School, in its capacity as user's representative, is currently involved in writing the operational requirements for the system.

Maj. Russell Lange and **Capt. Sean B. MacFarland** are members of the ASAT team, Directorate of Combat Developments, U.S. Army Air Defense Artillery School, Fort Bliss, Texas.

ADA FORUM

Congratulations to you air defenders who participated in Operation Desert Shield/Storm in Saudi Arabia, Iraq and Kuwait. Thanks for a job well done. Congratulations also to those soldiers who stayed behind in support roles. Deployed soldiers cannot exist in a vacuum; they can never completely be separated from their support bases. Nor can we forget the wonderful moral support from the wives and loved ones here at home.

But now that our troops have returned and are basking in the spotlight of what the media called a "stunning victory," it is time for reflection.



The key to our success in Operation Desert Storm was not just the technological superiority of our equipment, but equally the quality of the soldiers in Air Defense Artillery. "Some of the Army's best and brightest," said NBC's Tom Brokaw. ADA soldiers displayed a professional attitude from the beginning and throughout their deployment. It was a difficult time, but you have proven that you can get the job done, and done right.

We came together as a team out there in the desert, something that came from living together and experiencing the war as a team. Our job now is to keep that fine edge we acquired.

The job of training and motivating these veterans of the Gulf War will be a difficult one, one that will test the leadership ability of every NCO that supervises soldiers.

Let there be no doubt in your mind that if your platoon, squad or team is tasked with another combat mission tomorrow, you have trained them to the best of your ability to perform the mission. You must constantly train to build your units into disciplined, effective and cohesive fighting teams.

We must focus on the possibility that we might be called on to deploy to yet another battlefield in another part of the world. We just don't know what the future will bring but we must be ready.

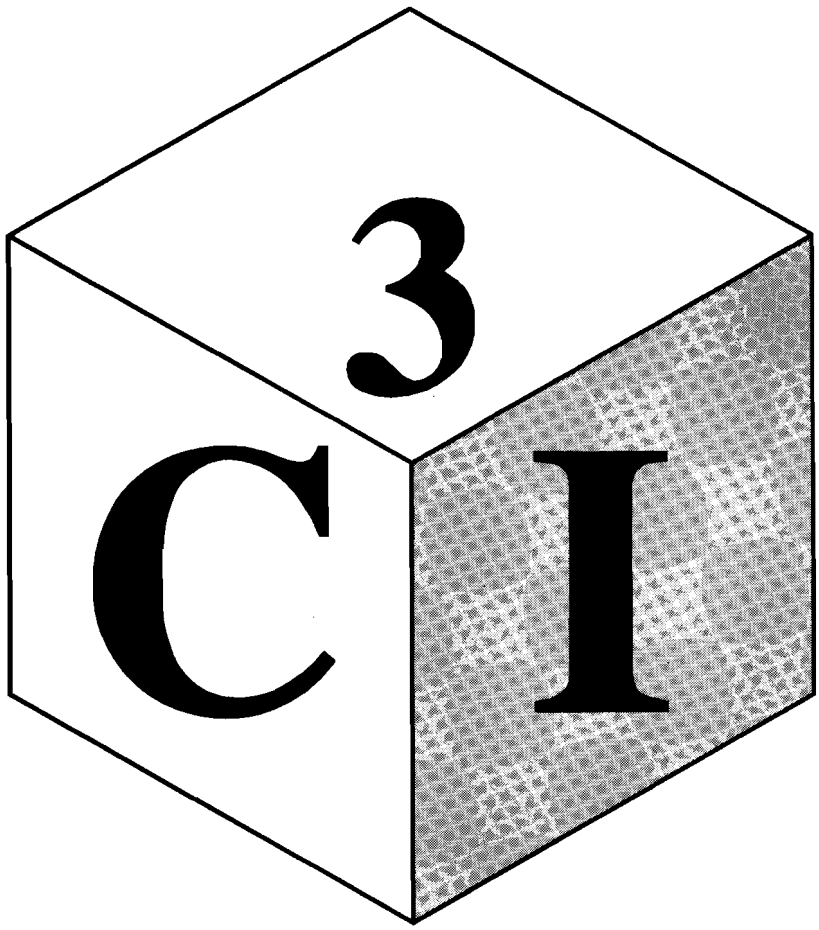
We have proven we can deploy and fight, now it is imperative we prove we can maintain that peak degree of edge. And that may well be the toughest challenge of all.

Fostering cohesion, *esprit de corps* and building morale are essentials for the fighting effectiveness of any unit. When thinking of sophisticated, innovative and creative programs to enhance unit morale, do not overlook the simple power of military ceremonies in this area. There is no ceremony too small and not one exists without significance. From "Reveille" to "Taps," each day there exists a condition that qualifies for excellence in a soldier's life. Appreciation of these events is demonstrated through performance of ceremonial recognition.

Underlying this is the positive impact that these ceremonies have on unit cohesion, pride and enhanced morale. Just the opposite effects are obtained if the first accomplishments of our young soldiers are not recognized as important.

Don't miss any opportunity to stop and recognize well-deserving soldiers, especially the opportunity to reward young soldiers receiving their first awards or advancements — a simple tradition in our Army, packed with a powerful stimulus for soldiers.

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



by Maj. Dennis Pate

Comprised of a bewildering network of unphotogentic prototypes in different stages of evolution and buried under an avalanche of unfamiliar acronyms, the revolutionary forward area air defense (FAAD) command, control, communications and intelligence (C^3I) system is the least publicized, least understood FAAD component. However, soldiers who work with FAAD C^3I prototypes are every bit as enthused as soldiers who crewed Avenger, ADATS and non-line-of-sight component prototypes. Field commanders who recognize FAAD C^3I's vast potential as a combat multiplier eagerly await its fielding. That moment draws ever closer.

The FAAD C^3I program passed an important milestone in May when a field experiment conducted at North McGregor Range, N.M., demonstrated that developmental FAAD C^3I software works as designed. "The experiment is the first step in the evolution of the C^3I software being developed by TRW, the prime software developer, for the early stages of fielding FAAD C^3I support to FAAD units," said Ramon Martinez, a project engineer with the Air Defense Artillery Test Directorate at Fort Bliss, Texas. "The purpose of the mini-demonstration and field experiment was to determine the ability of the TRW C^3I software approach to receive, process and disseminate air defense target track and operational data to end user units."

Conducted May 23 and 24, 1991, the FAAD C^3I experiment evaluated the integration of a battalion tactical operations center node and sensor C^3 node containing common hardware/software (CHS) transportable computer units with track sources, and provided resulting track data processed by the TRW V2 software.

"The software demonstration was highly successful," said Martinez. "It provides us with a 'proof of principle.' There were no major anomalies. All demonstration requirements were satisfied, and additional requirements were exercised."

The Air Defense Artillery Test Directorate conducted the field experiment using the FAAD integration test support system (FITSS). A collection of FAAD C^3I hardware, FITSS is a suite of FAAD C^3I subsystems instrumentation, communications equipment, processors, software and ancillary support equipment that facilitates the integration of the FAAD program. The FITSS experiments represent a combined effort involving the Air Defense Command and Control Systems Project Management Office, the Air Defense Artillery Test Directorate and the U.S. Army Air Defense Artillery School.

"FITSS is a building block approach to the total integration of the FAAD family of weapons. It allows us to test the FAAD C^3I concept before spending the money to test, evaluate, procure and field the complete array of objective FAAD C^3I hardware," explained test coordinator Lester Hess. "The experiment is one phase of an ongoing effort to identify critical developmental deficiencies early in the C^3I program so that we can correct them in a timely manner with minimum cost.

A 6th ADA Brigade Stinger gunner tracks a target drone during a FAAD command, control, communications and intelligence demonstration.

"The experiments are directed toward fielding a capability in time to support C^3I developmental tests and evaluations and operational tests," he continued. "These experiments will ensure that ADA gunners are provided with a timely and accurate air defense picture."

The May field experiment was preceded by a lab bench test conducted in late April at TRW's facilities in Domingues Hillls, Calif. The goal of the lab bench test was to ensure proper integration and interoperability of the subsystems in a clean laboratory environment. The bench test configuration consisted of an air defense sensor that provided data via a hard-wired enhanced position locating reporting system (EPLRS) and a tactical in-

formation distribution system hybrid interface link to a communications interface unit/tactical control unit emulating a sensor C^3 node.

Target tracking data was provided via an EPLRS net to a simulated Stinger fire unit equipped with CHS/enhanced hand-held terminal units. The sensor C^3 node included a CHS transportable computer unit with a TRW communications interface unit installed. Additional equipment in the lab bench test included the post-deployment real-time interactive simulator-driver system data recorder as well as interfaces to other FAAD C^3I node inputs.

The April lab bench test was followed by a mini-demonstration conducted May 1 at Hughes Aircraft Company, Fullerton, Calif. An air defense sensor, tracking targets of opportunity, provided track data via a hard-wired hybrid interface link to a standard integrated command post shelter emulating a sensor C^3 node. Track data was then transmitted via an EPLRS to a simulated Stinger fire unit equipped with CHS/enhanced hand-held terminal units. This highly successful mini-demonstration set the stage for the pivotal May 23 field experiment conducted amid the sand dunes and mesquite bushes of the North McGregor Range short-range air defense site.

The North McGregor Range demonstration was designed to integrate the FITSS testbed equipment with TRW software, tactical computer units, communications interface units, standard integrated command post shelter and EPLRS. A test directorate radar acting as a ground-based sensor surrogate provided three-dimensional track data to the sensor C^3 node, which passed the data via EPLRS to the enhanced hand-held terminal unit with the Stinger gunners.

A second standard integrated command post shelter, acting as a battalion tactical operations center also receiving track data from the sensor C^3 via EPLRS, was added for the field test portion of the experiment.

Stinger

A new technology, the soldier-portable air defense display system (SPADDS), now exists to provide timely electronic forward area air defense (FAAD) command, control and intelligence (C^2I) information to the manportable air defense system (MANPADS) Stinger gunner while the gunner is engaging targets. SPADDS will give MANPADS Stinger teams real-time target identification, alerting and cueing information and the capability to acquire and track hostile aircraft masked from the gunner's view.

Army airspace management involves air defense operations, combat operations, air traffic control operations and fire support coordination to execute AirLand Operations and accomplish the ground commander's mission. These tasks require an enormous amount of communications between the many air defense elements (Chaparral, Vulcan, Hawk, Stinger, etc.) and tactical operation centers on the battlefield.

The air defense FAAD C^2I system of the 1990s includes the enhanced position locating reporting system and the joint tactical information distribution system to assist data flow around the battlefield. SPADDS would acquire the appropriate C^2I information by subscribing to these services.

Currently, communications for MANPADS Stinger teams are standard formatted voice reports over different radio nets and manual plotting of early warning air track data from FAAD battalions' forward area alerting radar sections on terrain map overlays. SPADDS would eliminate many voice reports and manual plotting of air track data.

(continued on page 18)

The standard integrated command post shelter houses key communications equipment.

(SPADDS, continued from page 17)

SPADDS, conceived as a fully portable, lightweight, hands-free computer system, will give MANPADS Stinger gunners access to FAAD data link information. SPADDS will enhance command and control capabilities during the execution of AirLand Operations by providing real-time target identification, alerting, cueing and air track information to the Stinger gunner. With the addition of heading and inclination angle sensors on the missile tube, SPADDS could also allow gunners to acquire and track targets not observable using direct vision.

The pocket-sized SPADDS computer will consist of a fully ruggedized container into which lightweight modules can be inserted. A module card will contain a global positioning system receiver capable of accessing a fleet of 18 satellites, allowing users to determine their position within feet. Other modules will perform processing, memory, graphics, digital radio, battery and voice recognition functions.

An integral part of SPADDS will be a radio capable of transmitting voice and data. Networking software will permit access to FAAD data link information. The system will provide situation awareness information via symbolic representation of aircraft position, speed, heading and threat class (cueing) as well as information on the approach of distant air threats (alerting).

Critical to the air defense soldier will be the capability to interact with the computer. Primarily, the user must be able to select an air threat symbol for closer examination or engagement (hooking a symbol). The user may interact with the computer by voice recognition technology, a thumb-operated joystick on the Stinger tube, or a virtual environment display system that allows the operator to interact with a computer screen using a glove on one hand. Voice recognition technology currently seems to be the best approach (because it eliminates wires and hand-operated switches) if the number of interactive commands can be limited.

Another unique component of SPADDS is a miniature, low-power, ultra-lightweight, helmet-mounted computer display that would greatly simplify communications between different air defense elements and enhance FAAD

(continued on page 20)

New Mexico Air National Guard A-7 aircraft flew scripted flight profiles designed to challenge TRW's V2 software. The A-7 aircraft performed various maneuvers designed to trip the V2 software designations of friendly, hostile and unknown identifications.

Although the integrated system's ability to provide FAAD C^3I data through the EPLRS with an appropriate level of data integrity is still being evaluated through observation and data analysis, test observers immediately rated the system's performance a success.

This first step in fielding a FAAD C^3I system will be followed by a series of experiments that will integrate the joint tactical information distribution system, ADA sensors, C^3 nodes, battery and battalion tactical operations centers, single channel ground and airborne radio systems, airborne warning and control systems, Avenger and manportable air defense system units.

A series of FAAD C^3I interim steps leading from the present to the objective FAAD C^{3I} system follow two parallel paths: one path for sensor fielding and one path for automating C^3. As the currently fielded forward area alerting radars are removed from the field, short-range air defense units will employ an interim air defense early warning system called the manual early warning system. Soldiers who once

An EPLRS transmitted target track data.

Office

Maj. Gen. Donald M. Lionetti, chief of ADA, recently established a provisional U.S. Army Training and Doctrine Command (TRADOC) system management office for ADA command, control, communications and intelligence (C^3I) at Fort Bliss, Texas. Col. Charles G. Ronald was named as the TRADOC System Manager (TSM) of the new ADA C^3I office. The C^3I office will serve as the U.S. Army ADA School integrator for the ADA point of the SIGMA Star.

The SIGMA Star graphically represents an interoperability concept that links all points of the star through common elements, such as communications, hardware, software and shelter. Each of the five points (maneuver control, fire support control, intelligence and electronic warfare control, combat service support control and air defense control) are supported by a central point that combines Army Command and Control Systems (ACCS) and Army Tactical Command and Control Systems (ATCCS).

The six-man C^3I office will provide intensive management, oversight and direction for the integration and implementation of doctrine, tactics, training, testing and fielding of ADA C^3I support systems. The office will also ensure that ADA C^3I operational and materiel requirements documents are developed, coordinated, approved and funded; act as TRADOC's single point of contact to focus ADA C^3I issues; formulate requirements and solutions for the fielded force; and advocate ADA user requirements (technical, operational and programmatic) to the various individual system proponents, TRADOC and Headquarters, Department of the Army. The C^3I office staff will also oversee ATCCS interface implementations and ensure balanced, prioritized and operationally effective C^3I systems are developed and acquired to meet the needs of ADA weapons systems and organizations.

"We will assist and support the theater missile defense (TMD) efforts, the forward area air defense (FAAD) and high- to medium-altitude air defense (HIMAD) weapon systems TSMs in their C^3I integration activities and functions," said Ronald. "The lead role from the TSM perspective for ensuring C^3I integration with weapon systems remains firmly embedded with TSM-FAAD and TSM-HIMAD. TSM ADA C^3I will exercise a broad oversight of their C^3I efforts solely for the purpose of total system integration and coordination according to the operational and organizational plans.

"We will forge close working relationships with the TSMs and the Directorate of Combat Developments at Fort Bliss, the Air Defense Command and Control Systems Project Management Office at Redstone Arsenal and the combat development directorate at Fort Gordon," Ronald continued. "We will also serve as the primary Air Defense Artillery School's interface with program executive officers and their subordinate program management structures on matters regarding assigned systems and integration programs."

Systems TSM ADA C^3I will manage include –

- ADTOC (Air Defense Tactical Operations Center)
- FAAD C^3I/HIMAD C^3I
- GBS (Ground Based Sensor)
- LSDIS (Light and Special Division Interim Sensor)

TSM ADA C^3I will serve as the ADA point of contact for (not all-inclusive) –

- ACCS/ATCCS (Army Command and Control System/Army Tactical Command and Control System)
- SICPS (Standard Integrated Command Post Shelter)
- NATO ACCS (NATO Air Command and Control System)
- MSE (Multiple Subscriber Equipment)
- ADDS (Army Data Distribution System)
- Satellite Systems
- TIBS (Tactical Information Broadcast System)
- AWACS/Hawkeye (Airborne Warning and Control System)
- J-STARS (Joint Surveillance and Target Attack Radar System)
- PCPAS (Prototype Command Post Automation System)
- GPS (Global Positioning System)
- PAWS/RAIDES (Portable [All-Source Analysis System] Work Station/Rapid Air Defense Evaluation System)

operated forward area alerting radars will serve as early warning scouts, using voice radio nets to pass target data to air defense artillery command and control elements and fire units.

Air defense liaison officers will introduce target data into the manual early warning system from airborne warning and control system and high- to medium-altitude air defense sources. Light and special divisions are projected to begin receiving the light and special division interim sensor during FY92. Lockheed-Sanders' portable search and target acquisition radar (P-Star) recently won the light and special division interim sensor competition against Lear Astronics' UPS-3 tactical defense alerting radar, its sole competitor. The low-cost, lightweight, state-of-the-art pulse doppler P-Star weighs about 300 pounds and can detect helicopters based on the unique signature of their rotor blade returns. Forward area alerting radar operators will operate the light and special interim sensor once it is fielded.

The light and special division interim sensor will connect to the objective FAAD C^3I system at its projected FY93 fielding start date.

The objective FAAD C^3I system will eventually replace the single-

(SPADDS, continued from page 18)
C^2I capabilities. This display technology gives the soldier an unobtrusive, high-resolution presentation of digitized information in a hands-free manner. The miniature screen, positioned on the head gear close to the user's eye, provides the Stinger gunner with a symbolic representation of the air battle similar to the other air defense C^2I systems.

The helmet-mounted display could provide the soldier with any number of different full screen displays. For example, the SPADDS helmet-mounted display might provide early warning data, the friendly situation, fire control or message log data. The screens would present visual data on a designated subject directly to the air defense soldier on the battlefield through the SPADDS helmet-mounted display. The early warning screen could present data from the air defense data system and could include air track data on potential threat and friendly aircraft operating in the area.

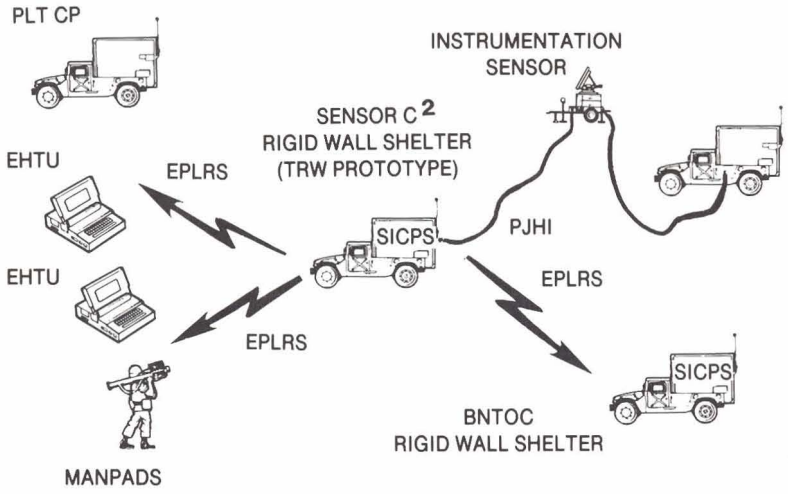
The friendly situation screen could show Stinger team location, section leader location, platoon leader location, battery command post location, forward area alerting radar location, location of supported maneuver units, and adjacent ADA unit fires on a map overlay.

The fire control screen could show all information pertinent to the air battle situation, including a 360-degree plan position indicator display with range rings, target track symbology (friend, hostile, unknown, location, range, speed, altitude, fixed- or rotary-wing and track identification number), weapons control status, fire control orders, air defense warning, team sector of responsibility, primary target line, missile tube orientation (aim point) and elevation.

The message log screen could contain information on security instructions, missile resupply, mission orders and movement orders.

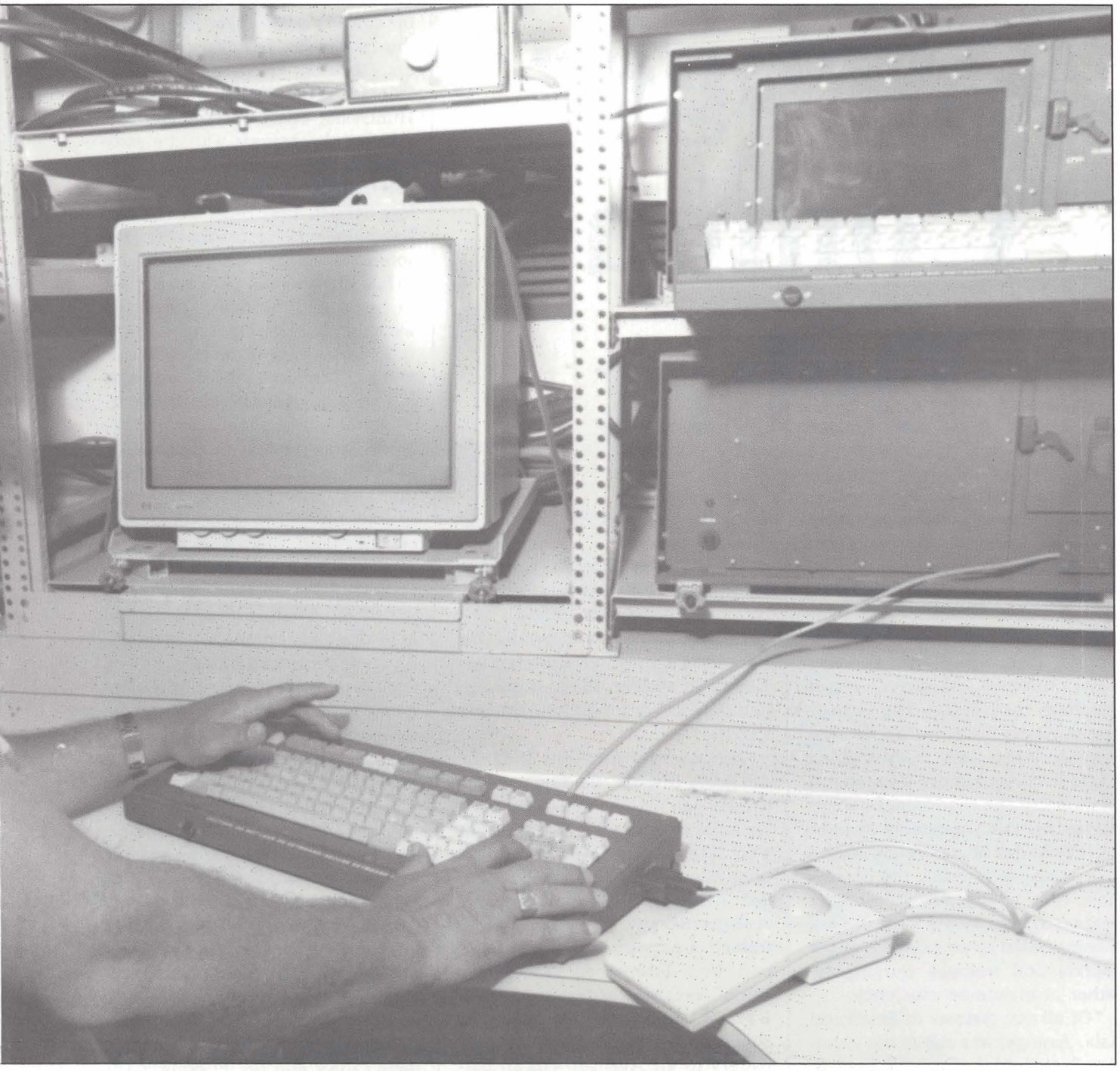
Although the SPADDS concept needs more definition, it offers one possible technology to aid the individual soldier in management of enormous amounts of complex air defense data, effectively fight the air battle, and allow the ground commander to accomplish the mission.

FAAD C^3I Demonstration



FAAD integrated test support system NCO

channel ground and airborne radio systems with the EPLRS, which will provide a quicker and more robust data distribution system. The final step in the light and special division upgrade will be the replacement of the light and special division interim



SFC Danny Hulsey works inside the standard integrated command post shelter.

sensor with the light FAAD C^3I ground-based sensor about 2000.

Heavy divisions should receive ground-based sensors integrated with the FAAD C^3I system during the first quarter of FY95. The ground-based sensor, in conjunction with FAAD C^3, will provide automatic targeting data to fire units and produce division air pictures for C^3I elments. Heavy ground-based sensor fielding is projected to run through 2000. The Army will announce its ground-based sensor selection based on a recently completed "sense off in October.

Maj. Dennis Pate is the chief of the Test Division, Air Defense Artillery Test Directorate, Fort Bliss, Texas.

Avenger Combat Debut

A Dallas television station's camera crew followed Avenger crews from the 4th Battalion, 5th Air Defense Artillery, Fort Hood, Texas, through new equipment training and the Operation Desert Storm ground campaign. The Avenger story, however, deserves bigger headlines than it got. The Army's first shoot-on-the-move air defense weapon system went from contract award to combat deployment in just 18 months. The road from Boeing's Huntsville, Ala., assembly lines to the Euphrates River Valley wasn't always easy but, today, the deployment of a totally new air defense weapon system to the Persian Gulf is being billed as an example of the military and industry working together at maximum efficiency.

"Of all our systems in Southwest Asia, Avenger was one of the standouts," said Maj. Gen. William S. Chen, commanding general of the U.S. Army Missile Command, as he presented a certificate of recognition to the 200 employees assigned to Boeing's Defense & Space Division's Huntsville, Ala., Avenger program headquarters. "Our troops were well trained and spares were provided in sufficient quantity to maintain exceptional readiness rates."

The Avenger program had been lavishly praised by Army procurement and acquisition officials as a virtually trouble-free program, but when Iraq's army overwhelmed tiny Kuwait in August 1990, the Army had only just begun to field the new system.

Two Avenger fire units from the 6th ADA Brigade, the first to reach the Persian Gulf, rolled onto C-5A Galaxies at Fort Bliss, Texas, along with 11th ADA Brigade Patriot fire units bound for Saudi Arabia. The 3rd Armored Cavalry Regiment's Avenger/Stinger platoon was trained, equipped and ready to depart Fort Bliss when the "Brave Rifles" received orders to deploy. But 4-5 ADA had just begun its conversion from a Vulcan/Stinger battery to an Avenger/Vulcan battery.

Accelerated Fielding

Boeing's support of the Gulf War began Aug. 17, 1990, with the first of three accelerated training courses conducted by Boeing personnel for the 4-5 ADA "Renegades." The first step was to speed up delivery of Avenger fire units to the 1st Cavalry Division air defenders. Boeing instructors traveled from the Avenger assembly plant at Huntsville, Ala., to Fort Hood to conduct the courses with the assistance of six Army instructors from the U.S. Army Air Defense Artillery School, Fort Bliss, Texas, and Boeing maintenance support personnel. Training courses scheduled to last three weeks were condensed to seven and 12 days. Class days were 12 to 14 hours long.

The Avenger Project Management Office kept pushing Avenger fire units down the pipeline. Avenger gunnery was scheduled and, to prove the system's capabilities, each crew fired two missiles from the static, moving and remote configurations. All systems fired successfully and destroyed their targets. The 1st Cavalry and III Corps commanders watched and even joined an Avenger crew in its foxhole during a remote engagement. As crews continued training, Boeing engineers corrected minor equipment malfunctions and kept the systems operational. A superbly trained maintenance section was provided additional equipment to support extended operations in an immature theater of operations.

"The training by Boeing instructors was superb," said 4-5 commander Lt. Col. Randall Harris. "Every fire unit destroyed all the targets they engaged The division had directed that all weapon system crews be qualified and fire their weapon systems prior to deployment. The Stinger Project Management Office and the Firepower Division, Deputy Chief of Staff for Operations, Headquarters, Department of the Army, allocated enough Stinger missiles to allow every Avenger to fire prior to deployment."

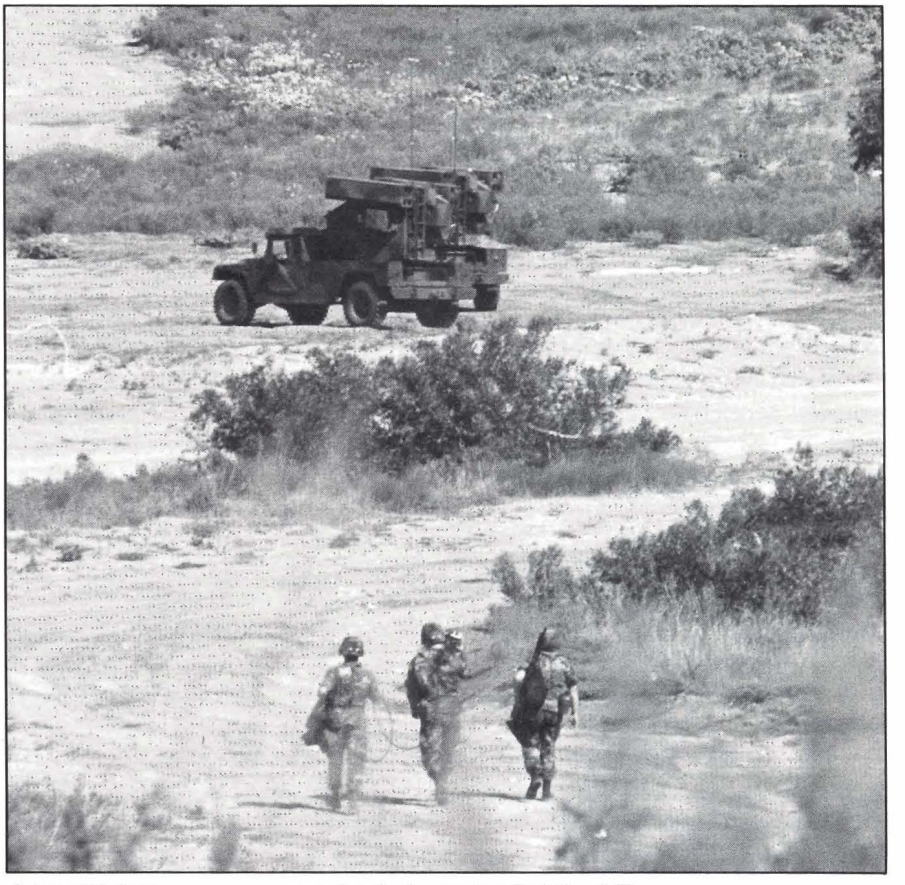
Boeing accelerated spare parts production, delivering 116 spares, including forward-looking infrared

(FLIR) systems, control display terminals, optical sight systems and other critical parts. The company also expedited repairs, requiring an average of only three to seven days to move through the repair pipeline.

Avenger turret air conditioning was an option the Army had decided not to exercise due to weight restrictions, but Avenger soldiers soon discovered that the turret's ventilation system was inadequate in Saudi Arabia's soaring heat. A MICOM official discovered a small Alabama company, Motivair, that specializes in air-conditioning systems for transfer trucks. After reviewing the Motivair air conditioner, Boeing and MICOM officials developed a set of air-conditioning unit specifications to quickly meet the Gulf War challenge.

The goal of the Boeing-MICOM team was to get the air conditioning units installed in the Avenger turrets before the beginning of the next hot season, a goal that wasn't met only because the allied coalition's 100-hour onslaught crushed the Iraqi army and ended the Gulf War before the hot season arrived.

Soldiers normally perform organizational level maintenance on the Avenger while Boeing maintenance workers perform maintenance work above the organizational level, but Avenger units deployed to Saudi Arabia needed to perform some on-the-spot above organizational level maintenance work that wasn't described in their technical manuals. In October 1990, the Army issued a contract modification to the Avenger engineering services contract that called for an addendum to the Avenger technical manual to support maintenance needed while soldiers were in the Persian Gulf. This addendum, titled the Desert Shield Technical Bulletin, furnished additional maintenance information soldiers needed to keep Avenger fire units operational in the harsh desert environment.



A 4-5 ADA Avenger crew prepares for deployment at Fort Hood, Texas.

Boeing delivered five 350-page bulletins in December 1990, a short three months after the contract modification was received.

Beyond the Call of Duty

The Army, of course, pays for contract modifications, but the Boeing employees, caught up in the tidal surge of patriotism that swept the nation, went "beyond the call of duty" by preparing care packages designed especially for Avenger soldiers. The first 62 care packages, containing such items as toothbrushes and toothpaste, Blistex and other general care items, books, games, candy and gum, were sent to Avenger soldiers in mid-October. Boeing employees added Christmas ornaments to a second batch of 65 care packages shipped in November and worked in small groups to send Christmas and Valentine's Day cards, Desert Storm pins and letters to remind Avenger soldiers they were being remembered by Avenger civilians. Deployed Avenger soldiers most appreciated blank Christmas cards, items understandably in short supply in Muslim countries. The soldiers used the blank cards to send Christmas greetings to their families and friends.

"On a personal level, I know I speak for all our Avenger employees when I say that those lives have become as important to us as they are to these fine soldiers' families and friends," said Avenger Program Manager Ross Dessert. "And, on a higher level, we as a program are genuinely concerned that, if and when Avenger is called upon, it will protect its country's interests with flying colors."

In the aftermath of Operation Desert Storm, the U.S. Army Air

Defense Artillery School is conducting an after-action review to determine ways to improve Avenger's performance and refine its warfighting doctrine. Despite minor problems, there's no doubt that Avenger's performance in the Gulf War will wind up with excellent reviews.

Combat Operations

The 4-5 ADA deployed a total of six combat-ready, technically and tactically proficient Avenger platoons. The first three 4-5 ADA Avenger platoons deployed with the battalion's Vulcan crews and Stinger teams in early October. The 2nd Armored Division's 2-5 ADA conducted training for the 4-5 ADA's remaining three Avenger platoons. These platoons reached Saudi Arabia in mid-January, just as the air war began.

The Avenger crews provided air defense for the lead elements of the 1st Cavalry Division during its 500-kilometer move to defensive positions north of King Khalid Military City. On Feb. 18, the division launched probing attacks designed to make Iraqi commanders believe the coalition's main attack would be a thrust up the Wadi al Batin, a historic invasion route. The Avenger platoons provided an effective day and night umbrella as the division engineers blew the first holes in the border berm. They accompanied multiple launch rocket systems and 155mm self-propelled howitzers forward to protect them as they delivered their withering fires and as they finally withdrew under counter-battery fire. As maneuver forces moved forward to probe Iraqi defenses, Avengers defended critical trains and command posts while providing air defense of the probing forces from overwatch positions on the Saudi side of the berm.

On G-Day, Avengers continued to support division deception operations as the 1st Cavalry Division's 2nd Brigade conducted a limited attack 40 kilometers into Iraq to fix the enemy forces in place and cement the deception plan. As the 1st Cavalry Division withdrew and shifted west through the breech opened by the 1st Infantry Division, the Avengers protected the division's maneuver elements as they moved 300 kilometers in 24 hours. They provided coverage for critical Class III and V logistics trains and logistics support trains as they moved forward to sustain the momentum of the attack and defend vital division command posts and brigade tactical operations centers.

When the cease-fire was announced, the 1st Cavalry Division was prepared to crash into Republican Guard units driven into the Basra pocket. As the Avenger crews prepared for redeployment, they had time to reflect on the system's overall performance.

"The system worked great, the soldiers loved it, leaders believed in it and it provided significant new capabilities to the division," said Harris. "Everyone agreed that Avenger is a winner. Thanks to outstanding maintenance personnel, trained crews, well stocked PLL and good test equipment, Avenger's operational readiness rate exceeded 94 percent."

Throughout Operation Desert Shield and Desert Storm, Avenger crews reported only minor problems with the equipment. "Though several voltage regulator problems were experienced with the Humvee [the high-mobility, multi-purpose wheeled vehicle], it proved a reliable and effective prime mover," said Harris. "Some minor hardware failures occurred, but most were easily corrected, and the more serious ones appear unique to early production models and have been corrected on newer versions."

The 4-5 ADA Avenger crews saw room for improvement. They recommended the addition of an air conditioner and machine gun for self defense. They also wanted something done about light escaping from the Avenger turret when they operated the FLIR at night. Storage space, with the crews carrying more equipment, water and food in combat than is needed in peacetime, was also a problem.

"Employment lessons learned all involved a more aggressive use of the system based on crews and leaders gaining confidence in the system's abilities," said Harris. "During many operations it appears that Avengers are capable of moving behind maneuver forces and providing overwatching fires in lieu of the normal Stinger teams in Humvees. Shoot-on-the-move and nighttime capabilities are a plus and survivability is about the same. We all realized that the Avenger had no place running with the lead task forces and in areas where Stinger under armor was the most survivable alternative.

"The FLIR is a reliable and effective sensor and can be used to support limited ground-surveillance missions," he continued. "However, the limited number of systems make it imperative that the primacy of the Avenger's air defense mission is enforced. Finally, the fatigue factor on an Avenger crew must be conquered. Due to the large number of critical assets that we defended, we did not have the luxury of placing Stinger teams and Avengers at the same asset. The Avengers provided 24-hour air defense coverage, which caused crews to quickly fatigue."

Some weapon systems have always proven more popular with soldiers than others, and air defense soldiers assigned to the system have always been "high" on Avenger. During Operation Desert Shield and Desert Storm, Avenger lived up to the expectations of soldiers who have been singing its praises since its initial fielding.

INTERCEPT POINT

(continued from page 1)
when the war was over, they didn't want to "go home again" to mundane civilian jobs. To the surprise of many, hundreds have applied to stay on active duty. Like those of us who from the beginning set out to make the military our life, they found the call of duty and the allure of Army life irresistible.

It is also my belief that the Army, despite the build down, will continue to offer opportunities for career satisfaction equal to, or greater than, anything outside the service. The future for Air Defense Artillery soldiers is a bright one. Gulf War lessons learned present us with strong arguments for a stronger, more integrated air defense. Saddam Hussein's tactical ballistic missile attacks have lent a new urgency to the fielding of a strong theater-high altitude defense (see "Winds of Change," page 2) and revived our anti-satellite initiative (see "KE ASAT," page 11). A recently released Pentagon white paper reveals that one of the Desert Storm commanders' greatest fears was that Iraq would launch an "Air Tet" similar, in its political consequences, to Vietnam's Tet '68 Offensive. These fears, and the sure knowledge that our potential enemies will, having seen the destruction wrought by coalition fighter-bombers and attack helicopters, give top priority to their air forces, guarantee that the "First to Fire" branch will continue to receive funding and force structure priorities.

So, if you love the Army but, despite glowing officer efficiency reports or gleaming enlisted efficiency ratings, are disillusioned by the prospects of force reductions and slower promotions . . . or if you're thinking with Operation Desert Storm concluded and the Cold War melted America doesn't really need you any more . . . my advice is simple: think again! If you love the Army, don't leave. The Army still has — and will always have — room at the top for leaders of excellence, and you won't have to abandon your dreams, the values you hold dear or the camaraderie you cherish. The truth is, America has never needed you more. The smaller Army of the 21st Century will be a perilously small land force for a superpower with worldwide responsibilities. America can afford a smaller Army, but it cannot afford an Army without quality leadership.

We can't afford to lose you just because the immediate future looks a little uncertain. The Army has developed a comprehensive plan for the future that reduces the size of the Army and limits some near-term modernization, but preserves the quality, readiness and warfighting capabilities of the total Army. Accessions will be reduced to levels required to sustain the end state force, retirements will be increased and voluntary loss programs will be emphasized. However, it appears involuntary loss actions — reductions in force and selective early retirement boards — will be needed to meet the end strength targets and properly shape the force.

Current plans envision building down from a five-corps, 28-division force to a four-corps, 20-division force by 1995. The Active Army will build down from its 1991 peak of approximately 745,000 to 535,000, while the Army National Guard will be reduced from its current level of 457,000 to 321,000 and the Army Reserve from 319,000 to 230,000.

During Operation Desert Storm, it became apparent that the quality of our soldiers, not the quality of our weapon systems, ensured our victory. Few professional observers would challenge the often-expressed contention that our soldiers manning Iraqi air defense systems, driving Iraqi tanks, serving Iraqi field artillery pieces and carrying AK-47s would have beaten Iraqi soldiers equipped with American weaponry. We will make the force reduction a drop in quantity, not quality, for quality soldiers are the strength of the Army and the final bastion of defense for the American people and our way of life.

The statistics sound grim, but the turbulence and the uncertainty won't last long. Leadership and promotional opportunities will quickly return to former levels. The smaller, more deployable, more versatile and more lethal Army that emerges from the build down will be an Army in which you will be proud to serve, an Army with room at the top. Give the future a chance. Don't give up on your first love — our Army — and don't give up on ADA and Army leadership. We certainly haven't given up on those of you who are, forever and always,

First to Fire!

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

IRR to Combat

by 2nd Lt. William Breazeale

2nd Lt. William Breazeale atop a destroyed

"Knock 'em dead," muttered Lt. Col. Jeff Babb, my past Professor of Military Science from Francis Marion College in Florence, S.C., as I was walking out the door for the Air Defense Officer Basic Course. Of course, I was heading for El Paso and the U.S. Army Air Defense Artillery School at Ft. Bliss, Texas, for four months of duck hunting. I thought I was going to experience the "real Army" for four months, then go home to my manager's job at the United Parcel Service. I found during the coming months that I could not have been more mistaken.

I reported to Fort Bliss Aug. 19, 1990. During the drive from South Carolina to El Paso, I listened to the situation in the Middle East on the radio, never dreaming it would become such a notable event. My training, more challenging and interesting than I had expected, was punctuated with increasingly grim briefings by Col. Eugene P. Semmens and others about the Middle East. My classmates and I were concerned yet unafraid — a strange feeling.

Although my OBC class suffered a lack of training equipment due to Operation Desert Shield, the training went very well. In the meantime, I was actually enjoying being in the Army, and realized that UPS could wait, but my country could not. I felt that getting to a unit in Saudi Arabia in time to help was more important than an overnight package getting to a customer in time to help them make a few extra dollars. I initiated the paperwork for the Commandant's List for selection to active duty.

Due to the impending war and certain qualification standards, I was the only Army Reservist or National Guardsman in my class allowed to apply for active duty. I faced a board manned by two majors and a lieutenant colonel. My OBC mentors, Capt. Stephen Richey and Capt. Brock Peterson, who are the best instructors a young lieutenant could possibly have, gave favorable recommendations on my behalf. Finally, my dream came true. I was ordered to active duty Dec. 20, 1990, one day after graduation from OBC.

I immediately chose the 24th Infantry Division (Mechanized) for two reasons: they were in Saudi Arabia and they are a heavy division with short-range air defense.

T-72 tank inside southern Iraq during Operation Desert Storm.

I went on leave and waited to see if President George Bush would stand behind the Jan. 15 deadline to Saddam Hussein. When he did, I reported to Fort Stewart, Ga., knowing it would take me approximately 20 days to get to Saudi, and 10 more to reach my unit.

I spent 10 days at Fort Stewart undergoing nuclear, biological and chemical training and weapons training. The rest of my time was spent in briefings about Saudi from an officer who repeatedly said, "If you all are not scared there is something wrong with you. I am scared and I'm not even going." When it was time to leave for Fort Benning, Ga., to the CONUS Replacement Center, two of the 30 soldiers I trained with refused to go and were arrested by the Military Police.

When I arrived at Fort Benning, I was told I would fly out in three days. My family made the six-hour drive from South Carolina for a last visit. We were issued our weapons (M-16A-1 rifles) and told to have our bags ready the next day. My parents arrived and I let them hold my M-16 and look over my equipment. Four hours later, standing on the stairs of a 747, I faced my parents' expressions of horror and fought to hold back tears. I later realized that I earned my combat patch more in those 15 seconds than in the whole war. It was a long flight to Saudi.

2nd Lt. William Breazeale crosses the Iraqi border during the early days of Desert Storm.

We landed Feb. 10, 1991, in Dhahran, Saudi Arabia. The next day we flew via C-130 to the XVIII Airborne Corps Replacement Detachment approximately 50 miles from the Iraqi border. That night, I saw my first blood: an Arab driving a Range Rover crashed into an Army tractor-trailer. I was the first on the scene. I stood there watching a fellow human bleeding and struggling for life, frustrated that neither I nor anyone else could help. A few minutes later, several Arabs came and took their comrade away.

Through a series of bus, 5-ton, and Hummer rides, I finally made it to 1st Platoon, B Battery, 1st Battalion, 5th Air Defense Artillery. The unit had just moved to a position five miles from the Iraqi border in support of Task Force 1-64 Armor. 1st Platoon was a self-propelled Vulcan platoon with three Vulcans, an M-113 armored personnel carrier, a high mobility multi-purpose wheeled vehicle (HMMWV) and a 5-ton truck. I was to be the assistant platoon leader. I met the present platoon leader, 2nd Lt. David Bell. He and the other platoon members looked "extremely adapted," and I thought to myself, "this can't be all that bad." It was a humbling experience seeing the men and equipment for which I would actually be responsible one day. I quickly discovered I did not know much about the daily operations of a platoon in a tactical environment.

I spent the next days getting to know the enlisted soldiers and adapting to the hard day-to-day life of living in the desert.

We finally received the order to cross the border on the offensive. Bell and I decided I would track aircraft with the manual short-range air defense control system from early warning inside the M-113. I would also be an extra M-16 laying lead downrange in the event we saw thousands of Iraqis charging our position. Simply stated, we were scared of an unknown Iraqi ground fighting force and the massive fixed-wing threat the Iraqi's still possessed.

We rode for hours, day and night, steadily progressing to our objective, the Jalabah Airfield. We processed enemy prisoners of war (EPW) along the way, so 1-64 Armor could move more quickly to the objective. We used our Vulcans to pull fuelers out of the mud, a vital task because the M-1 Abrams tanks were running out of fuel fast.

The next morning we were awakened by screams from our radiotelephone operator that we had incoming artillery. Self-propelled howitzers had pulled up behind us overnight and were prepping Jalabah Airfield for the assault. It was an awesome display of firepower. After a four-hour assault on Jalabah, we consolidated and drove on toward Basra. There was destruction the whole way.

1st Platoon was put in charge of more EPW camps, holding Republican Guard prisoners, as we moved into the Euphrates River Valley. Some of the prisoners were hardcore, but most of them were far from it.

After 10 more days in Iraq, we were given orders to withdraw to Saudi Arabia. During this move I received my most serious injury of the war. I was closing a hatch on our armored personnel carrier when it hit a can of brake-free and squirted in my eyes and mouth. I do not think this is purple heart material, but it was an injury. How embarrassing!

The rest of the redeployment was simple compared to combat. After many laborious hours of cleaning vehicles and equipment, it was time to go home. We flew home on a PanAm 747, via Rome, Italy and New York. I was never so glad to get off a plane in my life.

We had a great welcome home ceremony at Fort Stewart. We marched across our huge parade field while Lee Greenwood's song, "God Bless the U.S.A.," played.

Today, I am the platoon leader of the same Vulcan platoon with which I served in the war. I realize now that war is a series of catastrophes that results in victory. I have a new feeling about the Army. I once thought the Army was just like the Boy Scouts, except that the Boy Scouts had adult supervision. Now I know that serving in the Army is the most honorable and important thing a mortal can do.

2nd Lt. William Breazeale is a Vulcan platoon leader with Bravo Battery, 1st Battalion, 5th Air Defense Artillery, Fort Stewart, Ga.

VAPOR TRAILS

E-44 ADA

During activation ceremonies on Feb. 22, 1991, Echo Battery, 44th Air Defense Artillery, became part of the 199th Mechanized Infantry Brigade, Fort Lewis, Wash. Echo Battery is the first separate ADA battery assigned to a separate brigade. At present, ADA platoons furnish air defense for separate brigades. With the fielding of the forward area air defense systems, an ADA battery will become part of each separate brigade.

Patriot Remote Launch

The U.S. Army Strategic Defense Command (USASDC) and the Patriot Project Office, in a cooperative effort, successfully proved the technical feasibility of the Patriot remote launch concept in a recent test at White Sands Missile Range, N.M.

The mission demonstrated that equipment currently fielded with the Patriot air defense system can, with minor modifications, be reconfigured to permit interception of tactical ballistic missiles by Patriot missiles fired from remotely positioned launchers.

During the experiment, the Patriot launchers were displaced several kilometers downrange from their usual collocation with the Patriot radar. A surrogate tactical ballistic missile was launched on a south-to-north trajectory. The Patriot radar acquired, classified and tracked the target. Extended-range communications allowed a Patriot missile launched from the remote site to successfully intercept the surrogate tactical ballistic missile. It was the first time that a Patriot missile has been remotely launched in such a manner.

The experiment was conducted as an outgrowth of a response to a board agency announcement issued by USASDC in 1987. USASDC was interested in proposals, from U.S. and allied organizations, that could provide a more effective interim theater missile defense capability against the evolving tactical ballistic missile threat. Raytheon Company of Wayland, Mass., was awarded the contract in June 1990 with funding provided by the Strategic Defense Initiative Organization.

Test results will be analyzed to quantify the potential capability enhancements to the Patriot air defense system.

— Missile Ranger

Chaparral "Top Gun"

Although the 1st Battalion, 2nd Air Defense Artillery, did not deploy for Operation Desert Storm, Col. Frank D. Miller, acting chief of staff, avers the unit proved a valuable asset to the support mission at Fort Stewart, Ga., and when it comes to training, they have not missed a beat. Recently, the soldiers of 1-2 ADA took part in a "Top Gun" competition that included a live-fire exercise of the Chaparral missile system.

According to Capt. Michael W. Wooley, battalion adjutant, 33 squads competed in this year's contest. The squads were judged in crew drill evaluation, visual aircraft recognition, missile upload, system replacement, target engagement and identification of friendly or unidentified aircraft.

1st Platoon's 2nd Squad (SSgt. Jeffery P. Ross, squad leader; Sgt. Patrick Thomas, senior gunner; PFC Mark A. Pritchard, driver; and PFC Jason Buckout, gunner) proved to be the "Top Gun" crew after maintaining a score of 100 percent across the board.

Firing the Chaparral at the live-fire is the last competition the soldiers go through. "We normally do two shoots per year. This is our first one this year, and only our second at Fort Stewart," commented

Wooley. "We have only been at Fort Stewart since March of 1989, so we are still a relatively new battalion here.

"The actual live-fire is one of the most important exercises," continued Wooley. "It gives the senior gunner a chance to actually pull the trigger, launching an actual Chaparral into the air. It is something that they really enjoy doing, that is why there is such intense competition during Top Gun."

At the live-fire, a ballistic aerial target (BAT) is used to simulate an aircraft and to provide a heat source for the Chaparral missile.

"After the BAT is fired you will hear a 'missile tone,' " said Ross, Top Gun squad leader. "At the tone, when the missile locks on to the aircraft or to the heat source of the BAT, you know you are pretty much guaranteed a hit."

Two types of hits count during the live-fire: a direct hit, when the missile actually hits the target, and a tactical hit, when the missile is within 32 feet of the target.

"Because of the size of the BAT, if it were an actual aircraft it would have been a sure hit," said Ross.

"This live fire went pretty good," said Wooley. "We got three direct hits, five tactical kills and one miss."

Because the live-fire only takes place twice a year, the soldiers reinforce their training with normal field training exercises, common task training and training with mobile integrated laser equipment.

"We can use the Chaparral system to track as well," said Wooley. "We can take it to any airfield and use the system to track airplanes coming in. That gives the senior gunner the experience he needs in tracking. The soldiers can emplace and hit targets with the system within five minutes," Wooley added. "We have a bunch of superbly trained and highly motivated soldiers."

– Tiffany McAchran

Lane Training Challenges Crews

As part of their annual training, Chaparral crews of the New Mexico National Guard's 11th Air Defense Artillery Brigade are participating in a demanding field exercise known as "lane training." Commanders say lane training dramatically increases training realism.

Lane training challenges crews of the Chaparral, a short-range, low-altitude, ground-to-air defense missile system, to go through a multiple number of stations in which certain tasks must be performed. The soldiers are evaluated in a training context by members of the ADA Training Activity (ADATA), a New Mexico National Guard unit based at Fort Bliss, Texas, as the task is taking place.

"Lane training was developed to make training more realistic," Lt. Col. Jamie Fletcher, brigade chemical officer, of Las Cruces said. "The troops have to know individual soldier tasks to be able to do their collective tasks."

111th ADA Brigade soldiers from the New Mexico Army National Guard upload and arm Chaparral training missiles during timed lane training exercises.

"The training prepares the battery commander to maintain effective, timely command and control of the platoons," added Capt. James Adair of ADATA.

An example of how individual soldier tasks are tested during lane training is seen when Chaparral crews are required to decontaminate the tracked vehicle as it passes through a simulated radiologically contaminated area. Before a crew can even begin to think about their collective responsibilities, each soldier must master the individual skills needed to survive and work in such an environment. The soldiers must be proficient in using their protective gear and clothing before they can begin the area crossing or decontamination.

"We've developed lane training by the numbers," Fletcher said. "That allows the people a chance to practice the collective tasks in an environment without extra variables."

"Before training begins, we give each unit a checklist of wartime tasks to be proficient in," said 2nd Lt. Rick Giron, assistant officer in charge. "They can run through a rehearsal before they are graded."

"The beauty of this structured, dynamic training," Adair said, "is that the majority of tasks can be practiced at the home station during drill weekends."

The second stage of lane training is controlled by ADATA evaluators. The process takes place over a 22-hour period in a stressful simulated combat environment.

"After the crews finish the first phase," Fletcher said, "they have to integrate the tasks into a more realistic combat situation."

"The New Mexico units have come a long way since the exercise started," said Sgt. Joe Maestas, an evaluator for ADATA who has seen the New Mexico guard units improve.

One of the most demanding tasks the crews must perform involves uploading and arming four missiles onto the Chaparral while being timed by an evaluator. The task is made more difficult by the unforgiving climate of the southern New Mexico desert.

– Spec. William Mayhall

Lest We Forget

A monument to "The Brigade" was erected at Deming, N.M., on April 19, 1991. The solid granite stone weighing 10 tons and standing 10 feet tall depicts two soldiers helping each other. The theme of the monument is "LEST WE FORGET," and the monument is dedicated to the brave man and women who served in Bataan and Corregidor during World War II.

Fifty years ago, 1,800 New Mexicans were sent to defend the Philippine Islands; 900 of these survived the awful Battle for Bataan, the horrors and atrocities of the "Bataan Death March," and the privation and deep humiliation of 40 months spent in prisoner of war camps. The 200th Coast Artillery (AA) and its "child," the 515th, better known as "The Brigade," will always be remembered for the bravery

Monument to "The Brigade" at Deming, N.M.

and devotion to duty of its members. These proud men brought home three distinguished unit citations and the Philippine Presidential Unit Citation.

In paying tribute to the 200th in December 1945, General Wainwright said, "On Dec. 8, 1941, when the Japanese unexpectedly attacked the Philippine Islands, the first point bombed was Fort Stotsenberg. Assigned to defend this fort, the 200th was the first unit in the Philippines, under General of the Army Douglas MacArthur, to go into action and fire at the enemy, also the first one to go into action defending our flag in the Pacific."

– Col. Ezequiel L. Ortiz

Gulf War Raised Fears of Air "Tet"

The Department of Defense recently released a Gulf War lessons learned document that affirms coalition leaders never took the Iraqi air threat lightly. The document, a condensation of a longer, classified version, reveals that coalition commanders worried that the Iraqi air force "might be able to launch one massive strike against coalition bases and create the effect of an 'Air Tet' — similar to the Vietnam War's Tet Offensive of 1968 which achieved limited military success but embarrassed the United States and caused an erosion of public support for the war."

A New Legacy?

Desert Storm reinforces the legacy established by World War II air defenders

by Maj. Frank J. Caravella

Operation Desert Storm has brought Air Defense Artillery significant recognition. Our ADA battalions deployed to the Persian Gulf proved that well-trained soldiers working with the best air defense equipment in the world *can* accomplish the most challenging of missions and, in the process, exceed all reasonable expectations. Has the Gulf War performance of ADA soldiers and their sophisticated equipment provided the branch with a new legacy — a legacy of tough, intelligent, well-trained soldiers and superb weaponry? History proves that Desert Storm merely reinforces a legacy established five decades earlier by tough, intelligent, well-trained soldiers who, like the Patriot crews who battled Iraqi Scuds over Riyadh and Tel Aviv, crewed technologically advanced weapon systems.

In researching this question, I was pleasantly surprised to find that air defense soldiers have always been highly trained combat soldiers with higher than average intelligence. These soldiers operated and maintained the most sophisticated air defense equipment of their time. Our air defense predecessors performed their duties well, but with little recognition.

The 93rd Anti-Aircraft Artillery (AAA) Gun Battalion, one of the best-trained AAA battalions in World War II, provides a shining example. Although its accomplishments have gone relatively unnoticed and unappreciated, its combat record reflects an outstanding example of efficiency and effectiveness.

The 93rd AAA, when activated on the main island of Hawaii in 1943, was neither known nor distinguished. In fact, it had no real military history of any consequence. The anti-aircraft artillerymen, however, were warmly welcomed. The Battle of Midway had already turned the tide in the Pacific, but fears that Japanese Zeros, bombers and torpedo planes might stage a return visit to Pearl Harbor were still very real. Military leaders were determined to train the new AAA battalion to the highest standards and arm it with the latest in air defense weaponry.

The battalion's mainstay weapon was the most recent version of the extremely effective 90mm cannon, a weapon that had been upgraded three times. Gunners hand-rammed ammunition into the earliest version, but the second version incorporated a spring-operated mechanical loader. The third upgrade increased the rate of fire by replacing the mechanical loader with an automatic electric rammer and fuze setter. The 90mm cannon was truly on the cutting edge of 1940s technology. With an effective range of 33,000 feet, it was, by a wide margin, World War II's most lethal antiaircraft gun, surpassing even the vaunted German 88mm antiaircraft gun.

Gun support equipment was even more impressive. All four guns in the battery were controlled by a computer that provided an electronic target solution. A newly developed radar sent azimuth and range data to the computer while the weapons officer manually entered average wind speed and direction, weight of projectile (light, medium or heavy) and temperature every four hours. Drive motors automatically raised and turned the guns to elevation and azimuth, eliminating the need for a gunner to sight or lead the target. The crew, normally 12 individuals, could generate a rate of fire of 15 to 20 rounds per minute. Despite all the modern gadgetry, the crews were still required to boresight the weapons at least daily.

The latest in radar technology, a new "Identification, Friend or Foe" radar, or IFF, was used extensively by the 93rd AAA and other theater AAA units and reliance on it became commonplace. Friendly air casualties did occur in the theater, but the IFF radar significantly reduced their number.

Technical advances in ammunition were also formidable. For most

of World War II, AAA gun units used time fuzes with mixed results. The 93rd AAA, however, was also equipped with the new proximity-fuzed round known as POSIT. The proximity fuze worked like a crude radar, eminating signals that caused the warhead to explode as it neared the metal target. Since the supply of POSIT rounds available was limited, the 93rd AAA generally fired six time-fuzed rounds followed by six rounds of POSIT. Soldiers gave rave reviews of the POSIT ammo!

However, we all know sophisticated weapons systems are only as good as the soldiers who crew and maintain them. Before entering combat in 1945, the 93rd AAA's personnel could also claim training of the highest order.

When the battalion activated in 1943, it absorbed the original 93rd AAA unit (a separate battery trained at Camp Davis, N.C.) and Batteries 713 and 721 from the Hawaiian Anti-Aircraft Command. This provided the new unit with a core of experienced senior noncommissioned officers, many of them combat veterans of the Gilbert and Marshall Island Campaigns. The 93rd AAA's first commander, Lt. Col. Caleb Osborne, a veteran Coast Artilleryman, knew the technical aspects of his duty well and relied heavily on his NCOs to conduct training. These noncoms proved to be relentless trainers, demanding that soldiers of the 93rd AAA meet the highest standards in every aspect of soldiering.

In 1944, the Hawaiian Anti-Aircraft Command was tasked to provide one gun battalion for each deploying ground division. Some ground divisions maintained an organic automatic weapons battalion in their force structure, but possessed no other weapons for protection against high-altitude bombing. With Osborne nearing his 50th birthday, the command was transferred to a younger officer, one who could better face the rigors of combat command. The officer chosen to lead the 93rd AAA in combat was Lt. Col. William H. Vail Jr. At 28 years of age, he certainly had youth working for him, but he also brought experience and training. A 1938 graduate of West Point, Vail had already commanded soldiers at battery and battalion level in the Pearl Harbor defense. Battery command slots were subsequently filled by capable ROTC officers who had graduated between 1939 and 1942.

Vail was a tough but unassuming individual who expected much from his subordinates. He never raised his voice in anger or denigrated any junior leader or soldier. He recognized that his battalion was already a solid organization and that he needed to train and inspire the younger leadership to battle readiness. His efforts would help the battalion post an enviable combat record in the battles that awaited them across the Pacific.

Vail groomed an outstanding staff that won a reputation for overall individual excellence. Of particular note were his S-3, who eventually became a U.S Air Force brigadier general, and his S-2, who became vice president of Eastman Kodak Company following the war. These men brought energy and ingenuity to the battalion. Cannon devised and constructed a target plotting system for the batteries, while King incorporated the latest training techniques associated with the new weaponry. Their contributions were key elements in the unit's battle readiness.

The 93rd AAA was alerted to deploy on short order with Tenth Army. Early in 1945, the 93rd AAA shipped out of Hawaii for action in the Philippines, but circumstances in that campaign pre-

U.S. World War II antiaircraft weapons were "high-tech" for their era.

Tragedy's Witness

Lt. Col. William H. Vail Jr., along with his S-3 and S-2, landed on Ie Shima at D plus two hours to conduct a ground reconnaissance to verify earlier map and photo reconnaissance. Vail considered the ground reconnaissance necessary because the Japanese had altered terrain for local defense and laid mines and boobytraps throughout the island. He had no way of knowing the reconnaissance would make him an eyewitness to one of World War II's most tragic incidents — the death of Ernie Pyle, the legendary Scripps-Howard war correspondent whose front-line dispatches had made him a national hero.

During the initial landing the enemy did not heavily defend the beach, but sporadic machine gun fire and snipers were active. When Vail arrived on the beach, he noticed Pyle joking with soldiers in the area. After being briefed by the local security officer, Vail and his group mounted a jeep for their reconnaissance. Pyle and several soldiers had departed seconds earlier in another jeep. Ernie Pyle's jeep took about a 100-meter lead moving off the beach. About two minutes after their departure, wild machine-gun fire rang out. Occupants of both jeeps immediately dove for a trench near the side of the road. The sporadic machine-gun fire seemed to have no particular central target, and the entrenched members of the vehicles were well protected.

However, in a moment of curiosity, Pyle stuck his head above the embankment to survey the action. At that particular moment, a bullet from a machine gun hit Ernie Pyle in the temple, instantly killing him. Shortly thereafter the machine-gun fire stopped as the enemy soldiers moved to another position. In a matter of a few short minutes, the U.S. Army had lost a good friend. The area was deemed clear by the infantry and Vail continued his reconnaissance — shaken but in control. The reconnaissance party completed their mission. The 93rd AAA would soon disembark to well-reconnoitered positions that proved to be successful in the upcoming engagements.

vented all of the unit from landing and taking an active role. However, the 93rd AAA was fully employed during the attack on the island of Okinawa.

Once captured, Okinawa would become a key logistical center and air base for carrying the war to the Japanese mainland. The battle for Okinawa began on Easter Sunday, April 1, 1945, with a huge amphibious assault. The initial assault was successful, but follow-on and supporting operations were necessary to ensure the conquest of the island.

One of the supporting campaigns required the capture of the island of Ie Shima, which lies about three-and-a-half miles off the western tip of Motobu Peninsula and 20 miles north of the Hagushi Beaches on Okinawa. Ie Shima is oval in shape, about five miles long and two miles wide, with the longer axis running east and west. The Tenth Army commander ordered the 77th Division to take the island on April 16, 1945, with the 93rd AAA attached to the division for the operation. Once Ie Shima was taken, the island air strips could be used to support operations on Okinawa and flights against the Japanese mainland. This plan, based on intelligence of Japanese positions, worked relatively well.

Because of the slow initial advance from the beach on D-day, no guns of the 93rd AAA landed. However, personnel from the battalion landed and assisted the infantry in mine-clearing operations. One 93rd AAA soldier was killed and another injured during this operation. They might have suffered many more casualties had it not rained heavily for seven days prior to D-day. The rains unearthed mines, making it easier for them to be disarmed and removed. Many of the mines were boobytrapped, some with bombs as large as 300 pounds.

Unloading of the AAA equipment progressed slowly during the next two days because the beach area remained under intermittent sniper fire. Reconnaissance and occupation of positions was difficult because the reconnaissance teams were limited to roads that had been cleared of mines. But by April 19, all AAA assault elements were in position and operational.

The principal AAA operations of the entire Ryukyus campaign took place on the islands of Okinawa and Ie Shima. The first AAA action on Ie Shima occurred on April 26. Three single-plane flights flew over the island headed for Okinawa. They were engaged by radar-controlled gunfire, but with no evidence of destruction. On the night of April 27 and into the morning of April 28, the Japanese attacked Ie Shima itself. At 2200 one plane was engaged at 1700 feet and shot down. Then at 0015 and again at 0330 Japanese planes attacked. One plane was destroyed and two damaged by gunfire using POSIT rounds.

On May 4 the Japanese launched a large air attack on Okinawa, with 14 enemy planes attacking Ie Shima. Planes came from all directions at altitudes ranging from 2000 to 8000 feet. Radar-controlled gunfire destroyed one (perhaps two) and damaged two. Although small raids occurred almost daily through May 22, the period was classified as "quiet."

On May 24 the moon was full and the weather cleared, providing outstanding bombing conditions. Between 2000 and 2400, Okinawa and Ie Shima simultaneously experienced the most intense enemy ae-

rial activity of the entire campaign. The enemy made a desperate attempt to destroy airfields and supporting installations on Okinawa. Bombing runs were pressed through heavy AAA fire. Every AAA gun that could be brought to bear was in action. Of the 16 planes in the attack, 10 were destroyed.

The enemy attack on Ie Shima consisted of 20 raids, mostly single-plane attacks. Several planes hit the airstrips and fuel dumps, using chaff extensively, but damage to installations was slight. The attack continued into the early morning hours with 12 additional raids over the gun-defended area. During all this activity, the AAA on Ie Shima destroyed 18 planes and damaged seven. The 93rd AAA was credited for 15 and a third of those destroyed: a one-night record for a AAA battalion in the Pacific Theater and perhaps for World War II.

Enemy aircraft attacked Ie Shima with decreasing frequency from June through August, but the effectiveness of the AAA remained at a high level. Two separate incidents caused great pain and loss to the 93rd AAA. The first incident, on May 25, could be defined as a freak accident. To fully understand the incident we must review the topography of the island. The airfield on Ie Shima was on a level plateau in the center of the island. On the north and south sides the ground beyond the plateau extended to the water line. On this lower level and just opposite the end of one of the runways was the camp of Headquarters Battery, 93rd AAA. Vail selected this position because there were nearby caves that could be used to secure men and equipment during an airstrike, and it provided a natural revetment against the bombs dropped against the airfield. Unfortunately, at 1130 on May 25, a P-47N "Thunderbolt" taking off from this runway failed to become airborne and crashed into the middle of Headquarters Battery, immediately bursting into flames. Two men were killed and five severely burned. A great deal of equipment was destroyed, as were the permanent records of more than 400 officers and enlisted men.

The second incident occurred during the night of June 24, when the enemy inflicted heavy damage to Delta Battery. Fifteen Japanese Naval 60-kilogram bombs landed in and near the battery. One of the bombs fell on one of the gun positions, killing the entire crew of 12. Fires and explosions from stored ammunition continued for several hours before the fire was brought under control. Even with this loss, within seven hours they had cleared the debris, repaired the damaged fire control equipment and regained operational status (less one gun).

The death of his 12 buddies had a profound effect on PFC Arthur Snow of Delta Battery. Snow, the thirteenth man on duty, equivalent to a supernumerary for guard duty, was available if called upon by his noncom. When the bombing commenced on the evening of June 24, Snow decided that the safest place for him was the revetted gun pit. As he reached the outside of the revetment, a 60-kilogram bomb hit dead center on the crew. The revetment protected him from the blast. A few more seconds and he would have been the thirteenth victim.

During the Okinawa campaign the 93rd AAA destroyed 50 aircraft with five probables and 28 damaged. This was a remarkable testimony to the training and maintenance of the unit as it used only 120 rounds for each plane destroyed. To put this record in historical perspective, the British and French in World War I used thousands of rounds for each enemy aircraft kill, while the U.S. AAA performed slightly better. Given the historical inaccuracy of AAA in world wars, the efficiency and effectiveness of the 93rd AAA in World War II is extraordinary.

The key to the 93rd AAA's success was, of course, the competent leadership at all levels who demanded high training standards on the most sophisticated air defense equipment in the world. Disciplinary problems were rare in the 93rd AAA. Everyone in the unit understood their role and accepted it. Each member performed his individual duties, and all were well trained in unit collective tasks. Teamwork and unselfish dedication to mission accomplishment were the cornerstones to unit success during its tough encounters with the enemy. Other AAA units in World War II may claim more battle experience, but none can claim better effectiveness and efficiency.

During the exhilaration at the end of World War II, the 93rd AAA was quickly inactivated on Okinawa with little fanfare. Their accomplishments in battle remained little recognized. Their legacy as a highly trained unit manning the most sophisticated air defense equipment in the world passed unnoticed by most of the AAA community. All of us who respect professionalism commend and remember the men of the 93rd AAA Gun Battalion with respect and thanks for their sacrifices and for what they accomplished as individuals and as an organization.

Former members of the 93rd AAA will check into Cincinnati's Clarion Hotel on Oct. 3 for their seventh reunion. They should know that today's air defenders have not forgotten them or what they accomplished in World War II. Theirs is a unit that will live on as a shining example for all future ADA soldiers to follow.

Maj. Frank J. Caravella is a professor in the Department of Geography, U.S. Military Academy, West Point, N.Y.

CAREER NEWS

Acquisition Accession Board Convenes

The FY92 U.S. Army Personnel Command (PERSCOM) Army Acquisition Accession Board will tentatively convene Oct. 15, 1991, to consider eligible officers and civilians for accession into the Acquisition Corps. For the military, the primary year group is 1984; however, other year groups may apply depending on validated requirements. The Office of the Secretary of the Army (Research, Development and Acquisition) is currently defining the requirements that will drive the specific number of branch/functional area officers (by year group) required for accession by the board.

To be eligible, officers must —

· *possess functional area 51 (research, development and acquisition), 53 (system automation), 97 (contracting and industrial management), or branch code 15/35 (aviation/intelligence).* There are no exceptions to this rule. Officers who do not currently possess functional area 51, 53, 97, or branch code 15/35 may still apply for accession, but will be redesignated into one of the prescribed functional areas to meet accession requirements. If accessed, single track officers will also become aligned with a branch and functional area.

· *have a baccalaureate or master's degree in business, management, science, engineering, or a technical discipline and be academically qualified to compete for GRE/GMAT entrance requirements to advanced civil schooling.* The board will pay close attention to GRE/GMAT scores. For older year groups, civilian education level 2 is a desired goal. The board will recognize that older year groups may not have attended fully funded advanced civil schooling. There is ample time remaining for these officers to pursue an advanced degree on their own time.

· *be branch qualified at the company grade level.* For dual track officers in year groups 76 and earlier, the board requires a successful tour in a branch coded position at the grade of major.

· *be a graduate from the branch Officer Advanced Course and have completed Combined Arms and Service Staff School.* For officers in year groups 76 and earlier, officers must possess military education level 4.

Officers should forward consideration requests and an official copy of their university transcripts (if one is not currently on file) through their basic branches. To be accepted for processing, consideration requests must arrive at PERSCOM before Sept. 30, 1991.

The board will accept individual letters of communication that include only those matters deemed important in consideration of the officer's record. Letters should be addressed to: President, FY92 PERSCOM Army Acquisition Board; ATTN: TAPC-OBD-D; 200 Stovall Street; Alexandria, VA 22332-0411. Letters must arrive no later than the convene date of the board. Letters, to include enclosures, are for accession purposes only and will not be filed in the official military personnel folder (OMPF).

The board *will not* consider communications from other parties on behalf of officers being considered or communications containing criticism or reflection upon the character, conduct or motives of any officer. Hard copy photographs and complete evaluation reports (code 21) are not required for this board.

Officers wishing to be considered should review their OMPF and officer record brief prior to the convene date of the board. Officers may obtain copies at no cost by writing to Commander, PERSCOM; ATTN: TAPC-MSR-S; 200 Stovall Street; Alexandria, VA 22332-0444. Officers must include their social security number and current mailing address (home address preferred) with the request.

Officers should forward corrections and additions to the OMPF and ORB through the personnel office to PERSCOM without delay.

The PERSCOM point of contact for this board is Capt. Azemar, AV 221-6354.

USMA Officer Search

The department of social sciences at the United States Military Academy is looking for highly qualified company-grade ROTC or OCS officers from basic year groups 1984 to 1991 who have an immediate or future interest in civilian graduate study followed by a teaching assignment at West Point. The department of social sciences educates cadets in the academic disciplines of political science (american and international), economics and management.

The department's selection process is exceptionally competitive and requires early application — it is never too early to begin the application process. Under consideration now are the applications of officers who might be available to start graduate study in the summer of 1993 or later. Applications for officers in the 1992 group must be complete, including reported GRE or GMAT scores, not later than March 1, 1992.

Interested officers must be branch qualified by the time they intend to begin graduate school, demonstrate strong long-term military potential and have undergraduate records that indicate they can gain admission to and successfully complete graduate study at a top American university.

For more information please write: Department of Social Sciences; United States Military Academy; ATTN: Maj. Joseph Nunez; West Point, NY 10996.

Are You Prepared?

A review of the 1990 Sergeant First Class Promotion Board analysis indicates that ADA soldiers continue to make the same mistakes in preparing for promotion boards.

First and foremost, do not assume that your records are maintained and updated regularly and that the board will get an accurate "look" without your help. "Stuff" happens. We are in the high tech computer age: information that should be on your microfiche somehow gets left out, and Article 15s and bad NCOERs belonging to someone else wind up in your records.

I do not intend to give you the impression that the board members won't notice the difference in the names and social security numbers — they most assuredly will, and this derogatory information will probably be removed from your records without your even knowing it was there. What I am trying to impress upon you is that when the board members see this derogatory information in *your* file, they get the impression that you didn't care enough about getting promoted to check your fiche. Well, if you don't care about *your* promotion, you certainly can't expect the board members to be overly concerned about it either. The bottom line is that it is your responsibility to check everything the board is going to see to ensure it is complete and accurate.

Photographs continue to be a major problem area. A current photo definitely benefits the soldier. Problems normally begin with ill-fitting or sloppy looking uniforms, awards/decorations incorrectly placed on the uniform or left off completely, or chevrons sewn on by hand and not properly placed on the sleeve. An example of this is a soldier wearing a numeral 3 on his overseas service ribbon, yet his records reflect completion of only two overseas tours.

If the height and weight data entered on your NCOER gives the impression you are a slim and trim NCO, yet your photo gives the impression you are load-testing the seams of your uniform, the board might make a call to your unit to confirm your height and weight. The data entered on some NCOERs reflect as much as a five-inch growth from the previous year: this really pushes the limits of believability. If the data on the NCOER proves to be incorrect, board members will question your credibility and integrity.

Also, if you normally wear a mustache and sideburns, don't shave them off just prior to taking your new photo. The lighter skin where you shaved shows up in the photo and presents a false picture to the board.

Commanders and supervisors continue to submit NCOERs with numerous errors on them. As mentioned above, height and weight data that obviously conflicts with the photo will have an adverse impact

on your rating. An excellent rating with supporting bullet comments that barely justify a satisfactory rating always will bring the credibility of the author into question. In some cases, the bullets fully justify a better rating than was given. A bullet comment that the soldier, a squad leader in a Vulcan platoon, had the highest rating in the battalion as the unit retention NCO doesn't make much sense or carry much weight unless *Unit Retention NCO* is listed as an additional duty on the front of the NCOER.

Individual soldiers must ensure their promotion packets are accurate and current. However, the commanders and immediate supervisors also play a major role. Commanders and supervisors must keep up with the regulation, and all changes to the regulation, governing the preparation of NCOER. Supervisors should ensure that their soldiers being considered for promotion request a copy of their official fiche in time to review and submit any changes or corrections necessary. When the fiche arrives, the supervisor should review it with the soldier and provide guidance on needed improvements and how to submit changes or corrections. Commanders should conduct classes to educate soldiers on the centralized promotion process. Soldiers eligible for promotion consideration would be ideal instructors for these classes.

Air Defense Artillery must start doing a better job of educating our supervisors and soldiers on the centralized promotion process. Considering the current budget situation, promotions will become increasingly competitive. Let's help our soldiers out in this process.

– MSgt. Lanny Bales
Office, Chief of Air Defense Artillery

FAAR Removal Impacts on Personnel

The removal of the forward area alerting radar from the Army inventory will have several personnel and table of organization and equipment (TOE) impacts. The need for a replacement, the most immediate impact, will be met in the future by the ground-based sensor (GBS). However, until GBS is fielded, the need for a sensor will be met through the use of manual short-range air defense control systems (MSCS) and an interim sensor system.

A proposal to create MOS 14J, *Early Warning Systems Operator*, has been approved by the Office of the Deputy Chief of Staff for Personnel. The memorandum of approved change (MOAC) announcing the establishment of MOS 14J will be published during the fourth quarter of FY 91. The MOAC will provide guidance and instructions for personnel and position reclassification and documentation time lines.

When the FAAR is removed from each unit, MOS 16J soldiers will remain in the units, train on MSCS duties and subsequently perform as MSCS operators. Those personnel holding MOS 16J will train on the MSCS duties via exportable training packages and then reclassify into MOS 14J as outlined in the personnel reclassification guidance provided in the MOAC. All positions in documents coded MOS 16J will be recoded to MOS 14J according to the position reclassification guidance contained in the MOAC. The Directorate of Training Development, U.S. Army Air Defense Artillery School, has already prepared the exportable training packages and sent them to all affected units.

In the light and special divisions, position authorizations coded MOS 24M with additional skill identifier (ASI) X7 will remain coded for MOS 24M, but will have the ASI deleted. Personnel holding those positions will remain in the unit and perform Vulcan Mechanic duties until the light and special division interim sensor (LSDIS) is fielded, at which time they will assume the responsibility for unit-level maintenance of the LSDIS.

In the heavy divisions, gun/Stinger units, and corps and echelons above corps Chaparral units, those positions (*not* personnel) coded with ASI X7 will be recoded to MOS 14J. Personnel with ASI X7 will lose the ASI but will remain in the unit performing as Vulcan or Chaparral mechanics until their normal rotation.

Ordnance plans to use as many MOS 27N personnel as possible in MOS 35Y. Those MOS 27N soldiers not used in MOS 35Y will first be used in other Ordnance MOSs, than as appropriate to fill the needs of the Army.

Changes to personnel and equipment documents will be accomplished via basis of issue plan inputs to the objective TOE as each interim change takes

place. Commanders should submit requests for changes to their MTOE, based on the above guidance, in time to ensure the proper personnel and equipment are on hand at the time the LSDIS is fielded and through to the final fielding of the GBS.

For more information on personnel impacts resulting from the removal of FAAR from the inventory, contact MSgt. Lanny Bales, Office, Chief of Air Defense Artillery, AV 978-5011.

New Post-Graduate Program

The U.S. Military Academy has established the Dwight David Eisenhower Program of Graduate Studies in Leader Development, a post-graduate academic program designed to prepare Army officers for service as company tactical officers at the academy. The program has a professional rather than research emphasis, because it prepares officers for professional practice as leader developers, not just at the academy but also during their later service as leaders in the field Army.

Only carefully selected officers who have completed the first phase of an Army career, including significant leadership positions at platoon and company level in regular Army units, will qualify for acceptance into the program. Officers from all Army sources of commission and from any branch may apply. The commandant of cadets will select officers for the program, basing his selections on a "whole person assessment," which includes military *and* academic criteria. Students must have outstanding records of military service that demonstrate high potential for leadership and command at higher levels of the Army. They must also show academic potential based on the GRE and their undergraduate records. On the average, students should have minimum GRE scores of 1,200 and a minimum undergraduate cumulative grade point average of 3.0.

For more information on the fellowship, write to: United States Military Academy; ATTN: Dwight David Eisenhower Program; West Point, NY 10996.

ACAP

Today, the Army has the best quality soldiers and civilians in its history — people who volunteered to join the Army and make it their career. Regrettably, some of these same soldiers will seaprate as the Army is downsized.

The Army Career and Alumni Program (ACAP) provides a caring, comprehensive system to assist personnel leaving the Army in a disciplined and organized manner. The Army will place a strong emphasis on retaining quality.

ACAP actually synchronizes current transition services. ACAP Transition Assistance Offices provide total quality management to the transition process and a personalized transition plan for separating personnel. ACAP Job Assistance Centers provide standardized training in job-search skills, one-stop job hunting activities, and referral to external agencies. Although ACAP is not a job placement program, referrals to outside organizations and corporations number among its services.

ACAP underwrites a concern for people, engenders goodwill for the institution as individuals leave the service and reenter civilian life, and generates more readily tangible yields in the form of reduced employment compensation costs to the Army. Ultimately, ACAP promotes the ability both to recruit and retain a quiality force in the years ahead by proving that the Army "takes care of its own."

For more information on this program, contact the ACAP office; PERSCOM; TAPC-PDC; 2461 Eisenhower Avenue; Alexandria, VA 22331-0479 or call AV 221-3590.

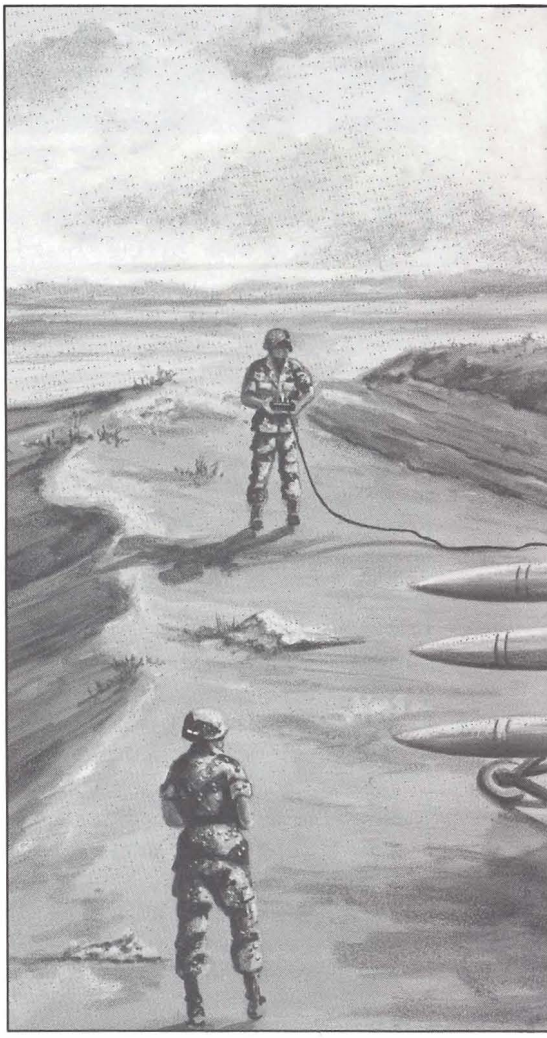
Separation Pay

U.S. forces worldwide are now eligible to receive separation pay. The Defense Department announced the provision is part of a package of transition benefits available to soldiers whose jobs fall victim to the military drawdown. The package includes separation pay, extension of some privileges normally reserved for active duty soldiers and additional educational opportunities.

Separation pay, equal to 10 percent of a soldier's base pay at the time of separation multiplied by the number of years the soldier served on active duty, will be paid to eligible enlisted personnel and officers who are being involuntarily separated after at least six years.

ADA Robotics

by Capt. Reed F. Young



The Hawk Multi-Purpose Transporter will

Many people throughout the Department of Defense (DoD) and the ADA community have realized the potential robotics has to increase the combat effectiveness of weapons systems. In fact, the 1990 Air Defense Modernization Plan states that "Robotics can provide significant enhancement to Air Defense by reducing manpower requirements, increasing crew survivability and providing the means for remote launch operations." However, simply knowing that robotics is a valuable technology is not enough. We must also identify specific areas to implement robotic technologies within Air Defense. Pursuant to this, the Directorate of Combat Developments at the Air Defense Artillery School, Fort Bliss, Texas, has established the Robotics Integration Program. This article is an overview of what robotics actually is, some robotics programs present within DoD and the research the Robotics Integration Program is currently performing.

When we think of a robot, we typically envision "The Terminator" (from the movie) or the character "Commander Data" on *Star Trek - The Next Generation*. While these do fall under the premise of robotics, they are far beyond the capabilities of current technology. More realistically, a robot is "A machine or device that works automatically or by remote control" or "a mechanical device that . . . is capable of performing human tasks or behaving in a human manner." Thus, a robot could be a child's radio-controlled airplane or a futuristic android. The most common examples are the painting or welding robotic arms seen at automotive assembly plants, or perhaps the mobile robot that police departments use to view and disarm explosive devices. These examples illustrate some of the common uses of robotics — performing repetitive or mundane processes, increasing speed and accuracy, or removing humans from hazardous situations. In other words, we use robotics to enhance human capabilities or simply to do the things we don't want to do. Sorry, robotics can't pay taxes just yet! Robotics also encompasses the realm of remotely piloted or self-directing vehicle control — a built-in or mounted computer can operate the vehicle given external commands from a human operator, or perhaps even generate its own path and work taskings. An example would be the robotic sentries many companies use. These sentries patrol hallways when offices are

automate Hawk missile loading and perform a variety of other tasks.

closed. If a sentry detects motion, heat or smoke, it alerts a security guard who can then take appropriate measures. There is even a robotic lawn mower that can cut your grass!

To illustrate the general military applications of robotics, let's explore some of the extensive work that DoD has done in two broad arenas: research and hardware development. DoD's research has dealt with overcoming some basic problems with technologies including communications (data transfer via a radio link), vehicle navigation algorithms (path planning and collision avoidance schemes) and the man-machine interface.

DoD's hardware development consists of several very interesting projects. The Air Force is developing a robotic vehicle to perform "rapid runway repair." An enemy bombing raid on an airfield leaves numerous bomb craters that incapacitate the runway. This robot would automatically find the craters, backfill the hole with gravel and dirt, and level it off with a quick hardening polymer. According to estimates, this machine will return an airfield to operation within hours, compared to the days it may take a human crew.

The Joint Program Office for Unmanned Ground Vehicles is developing a remotely piloted high mobility, multi-purpose wheeled vehicle (HMMWV) as a target designation and nuclear, biological and chemical detection system. Their current prototype uses television cameras, hydraulic and electric actuators, and a fiber-optic link to control the vehicle from a remote operator's van. The system can patrol the battlefield remotely, searching for targets and sampling the environment for nuclear, biological and chemical hazards. After identifying a target, it can use a laser target designation system to "light up" the target for a separate Hellfire missile system.

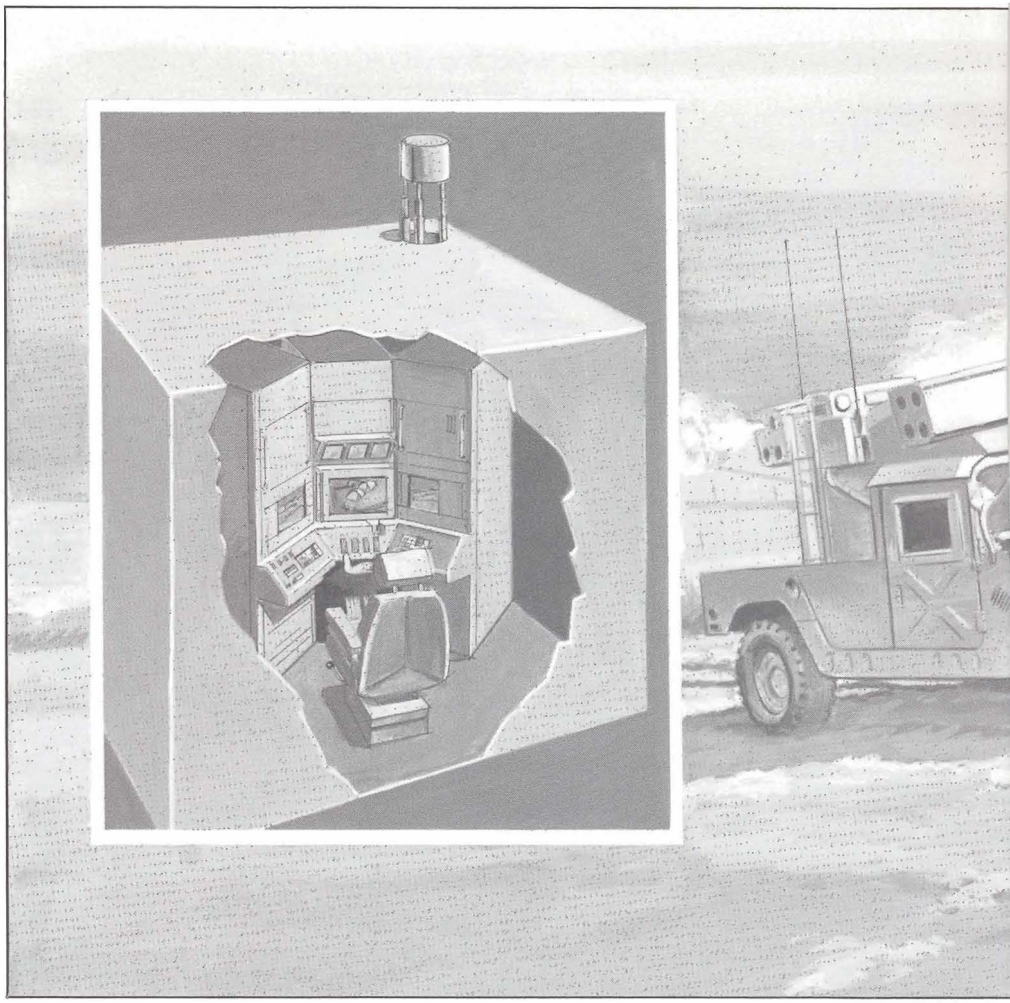
The Army is currently fielding the Security Explosive Ordnance Disposal Robot to Explosive Ordnance Disposal detachments. This robot consists of a single robotic arm mounted on a small tracked carrier. There are two telescoping cameras, illuminating lights and a variety of tools including a gripper and a shotgun. It is remotely operated and can work on (look at, shoot) the explosive device without exposing personnel to hazards.

The Robotics Integration Program has been actively pursuing the Hawk Multi-Purpose Transporter (HMPT) and the Remotely-Piloted Avenger (RPA).

The HMPT is not only designed to replace the current Hawk loader-transporter, it will also provide a quantum leap in capability. The design consists of a five degree-of-freedom (meaning five movements: rotation of the base, two arm joints and two boom extensions) crane mounted just behind the cab of a five-ton flatbed truck. The bed, replaced by an improved structure and missile rack, would simply bolt onto the truck's frame. This new structure provides the extra strength needed for the crane. A hydraulic pump connected to the five-ton's power take-off will supply the power, and a missile rack set on the structure will hold three missiles.

The operational concept is being developed in three phases. Phase One has the operator controlling the crane via a remote control unit or by the control levers on the structure. The remote would simply be a 50-meter cable connected to the crane's hydraulic valves at the truck, and a small box with controls at the user end. The operator would use the controls (levers and switches) to guide the crane. With this setup, the truck driver positions the truck adjacent to the launcher and parks. The operator then moves the crane into position, picks up a missile, moves it over to the launcher and loads it onto the launcher, repeating the process until all needed missiles are reloaded. Estimates show that the first missile can be loaded in four or five minutes with the second and third missiles being loaded in three minutes each — an 11 minute complete reload time.

Phase One realizes some immediate advantages. The necessary number of vehicles would decrease since the current five-ton/loader/transporter/combination would be replaced one-to-one or even one-to-two with the HMPT. There would be a personnel savings since the HMPT can operate with three soldiers *vs*. the five now required to perform reloading. The canning/decanning function would be simplified since the crane would be better able to "manipulate" the missile. HMPT is more suitable for convoying since it is integrated on the five-ton — there are no ramps or tiedowns and only minimum preparation for configuring to road march. The crane can perform a multitude of miscellaneous functions, such as changing engines or tires. With attachments, you could use hydraulic tools, a forklift or a clamshell digger. With a simple sling, you could pick up, transport and set down everything from generator sets to pallets of MREs!



Avenger crewmen could operate the remotely piloted Avenger from the safety of a bunker.

Phase Two adds elementary computer control to the crane. This computer control gives the operator two capabilities: teach mode and articulated movement. The teach mode allows the computer to mimic a set of pre-taught movements, effectively saving the operator time and effort. To teach the movement, the operator engages the teach mode. He then manually moves the robot through a set of motions with the computer "remembering" the motions. When the desired motion is complete, he disengages the teach mode and stores it in the computer's memory. Thus, whenever he wants the robot to move through those motions, he calls up the appropriate function and selects "run." This is especially useful for repetitive tasks such as moving from the "home" (stowed) position to just above missile "A."

Articulated movement simply means that the computer translates the operator's desired motion (such as move the missile "down") into the complex, individual arm movements needed to accomplish the motion.

Imagine a simple two-link robot where Arm 1 rotates about Joint 1 and Arm 2 (attached to the end of Arm 1) rotates about Joint 2. If the operator was trying to move the missile gripper straight down (for example, to load missiles onto launchers), he would attempt to coordinate the movement of each

arm simultaneously by controlling Arms 1 and 2 at the same time or even by moving Arm 1 a little bit, then Arm 2, and back and forth — a difficult task for even a well-trained, practiced operator. With articulated movement, the operator simply presses one "down" button and the computer calculates the coordinated motion of the arms so that the gripper of the robot moves down in a straight line. Thus, the operator loads missiles by simply pressing a button *vs*. mentally calculating what each joint has to do.

Let's illustrate a Phase Two operation. A soldier positions a truck adjacent to the launcher. He then executes a teach mode function that moves the crane from home to missile "A." The operator takes control, picks up the missile, moves it to where it hovers over the launcher, and lowers it onto the launcher with simple articulated movements. The operator then uses a second teach mode function to move the crane back to the home position.

Phase Three is a longer term goal that adds a more intelligent computer and robotic sensors to the control system. This system could identify obstacles and determine the launcher location relative to the HMPT. It could then generate the complex reloading motions, even in a dynamic environment. Here, a truck is driven up to the launcher site and parked. The computer then interrogates (defines obstacles and the absolute position and orientation of the launcher) its environment via the sensors. The crane then automatically picks up a missile, moves it to the launcher and loads it. Conceivably, the operator wouldn't even have to get out of the truck! The operator, of course, would always be needed for the strict Class V supervision.

Phases Two and Three illustrate some distinct advantages and increases in capability. They would greatly increase the speed with which the HMPT could reload missiles through the simplification of complex motions and the inherent adaptability of the robot to changing conditions and requirements. This simplification also causes a greatly reduced training time for the operator. Finally, with the machine augmenting the operator's work, there would be a reduced manpower requirement — one man and a robot could perform the work of two or three men.

The HMPT also realizes a great potential due to the inherent flexibility and versatility of robotic systems. If a new missile system were introduced into the inventory, the computer could simply be reprogrammed to the physical characteristics and dimensions of the new missile and launcher. The same equipment fielded with Hawk today could be given to Corps SAM tomorrow with only minor, inexpensive changes. HMPT could be used for forward area air defense system's resupply by delivering pallets of missiles to Avenger, NLOS or ADATS. An infinite number of teach functions could be programmed as new applications arise.

RPA research is a more long-term goal that mirrors some of the Joint Program Office for Unmanned Ground Vehicles work, with the concentration being on using the Avenger weapon system. This particular scheme requires some doctrinal changes but provides some genuine merit for capability enhancements. Remember though, the technology exists today to accomplish much of the following concept.

The Avenger is a highly mobile, short-range, fire-and-forget aircraft killer. It consists of a HMMWV, eight Stinger missiles, a .50-caliber machine gun and a rotating turret in the truck's bed to launch the missiles and fire the machine gun. The operator can either sit in the turret and launch via a heads-up combining glass (visually) or via a forward looking infrared targeting system. He can also launch remotely (up to 50 meters) via a remote control unit and umbilical cable using the forward-looking infrared. The remote control unit may not need the umbilical cable since it is conceivable that the information could be passed through a radio frequency link.

The RPA concept combines the Avenger/radio frequency remote control unit with the remote driving capability of the HMMWV mentioned earlier. Given this, the driver and gunner could be located in a relatively safe command vehicle or bunker and operate the Avenger by radio control. For that matter, they

could command several Avengers provided only one was moving at a time or that the RPA was directed to move itself. The latter would be possible if a navigation system was added, enabling the RPA to do road following, path planning and collision avoidance, and perhaps even calculate a path given only a grid coordinate. Unbelievable? Not really. The Carnegie Mellon University has developed a prototype navigation system, self-contained in a van, that can drive around the streets of Pittsburg given only its present location and goal location.

RPA has several operational scenarios where it would be particularly useful. If the mission was to guard rear-area assets, RPA would be deployed around the asset's perimeter in a security posture. An RPA control center, manned by a few operators, monitors the TVs of the various RPAs. When a hostile target is detected, operators engage via the RPA with the highest probability of kill while they remain protected in the command center. This same scenario applies to RPA in a forward area air defense role. The only difference is that the drivers move the vehicles along with the maneuver forces and respond to the orders of the maneuver commander.

In convoy operations, a single operator could provide air defense from front to rear via his control of several RPAs. RPAs can be programmed to follow the vehicle in front of it by maintaining a minimum distance and identical speed. This is accomplished using sensors. The operator then monitors the several systems from a single location. He engages hostiles from any orientation and any location and, moreover, from his choice of RPA.

Each of these scenarios illustrate several very interesting advantages of the remotely-piloted weapon scheme. First is an increase in the system's effectiveness. This increase is a product of several factors, including increased morale, increased alertness, better operator environment, operator's protection from the hazardous battlefield and a vast reduction in the "fear factor." All of these occur because the operator is removed from the "front lines" and placed in a relatively safe operator's van or bunker. The locations would be situated well behind the hostilities and would be comfortable (perhaps even climate-controlled) and reinforced for protection against nuclear, biological and chemical hazards and small arms fire. All weapon systems' effectiveness is a function of the operator's "fear factor," the apprehension and life preservation response that every soldier experiences when faced with a dire situation. It causes jitters, increased excitement levels and, possibly, a decrease in ability to perform skilled tasks. Any combat soldier can remember flinching when hearing bullets flying overhead. The remote operation allows the soldier to do his job fearless of the elements and with less anxiety about losing his life from returning fires. Other advantages include a reduction in manpower. This is a result of a few operators being able to run several RPAs as in the rear-area asset protection scenario. Also, the weapon system would have an increased survivability. Studies show that a remotely operated vehicle will run eight times longer than an on-board operated vehicle when both are subjected to small arms fire. In other words, the human is by far the most vulnerable element on the machine.

What does the far future hold for robotics in Air Defense? The technology is advancing every day. Commercial vehicles are being developed that can drive themselves, with no external control, given only a destination coordinate. They plan the route, avoid any obstacles in the road, obey traffic laws and never drink and drive! This same technology could be adapted to an Avenger. The weapon could be completely self-guiding and roam the battlefield, looking for and engaging targets. Soldiers would never have to leave the relative safety of the command bunkers. Maybe a missile resupply vehicle would be developed that could be dispatched from an ammunition transfer point. Given the grid coordinates of the fire unit, it would drive itself to the launcher, reload the missiles and drive back to the ammunition transfer point for another load of missiles and redispatch. The possibilities are restricted only by the applications we can dream up.

The true problem is overcoming our reluctance to accept new and unknown technologies and to allow that technology to perform human functions. Gen. George S. Patton said that "Man is the only war machine." This will always be true: the emotion and decision-making ability of human intelligence will probably never be truly emulated in a machine. However, robotic technologies can provide substantial benefits: a force multiplier (one soldier operating several weapons), increased survivability (the soldier removed from the battlefield and the inherent hardiness of a humanless weapon), increased effectiveness (the better working environment and removal of the fear factor thus increasing human ability) and, finally, an increased combat capability (the grand sum of all realized benefits). Through the demonstration of practical applications, perhaps this reluctance can be overcome and the systems of tomorrow will be allowed to mature.

Capt. Reed F. Young heads the Robotics Integration Program for the Materiel Requirements Division, Directorate of Combat Developments, U.S. Army Air Defense Artillery School, Fort Bliss, Texas.

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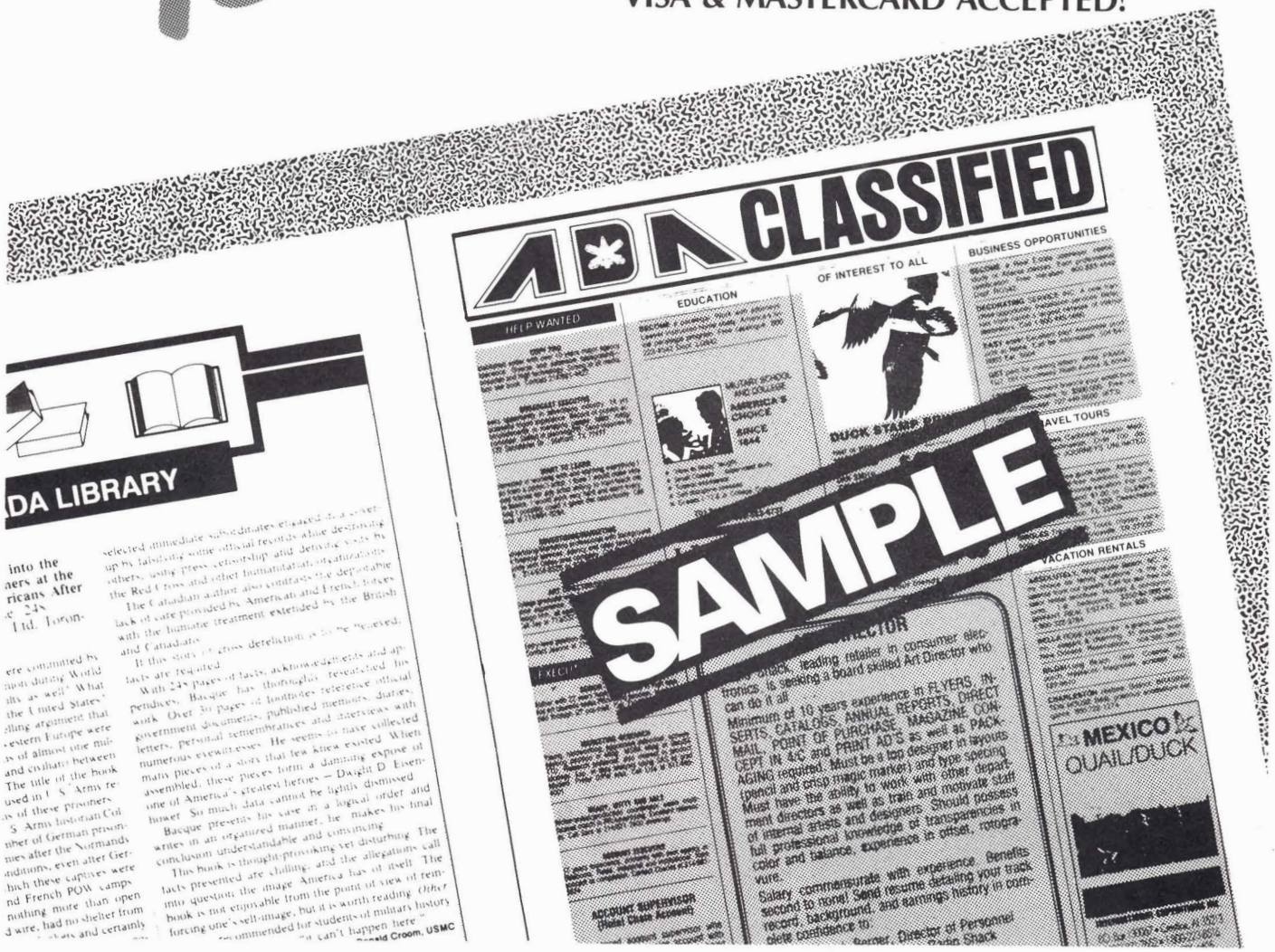

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Air Defenders,

As a matter of introduction, I was elected to succeed recently retired Col. Vicent J. Tedesco Jr. as executive director of the Air Defense Artillery Association during the recent June 1991 membership meeting at Fort Bliss, Texas. I thank you all for this privilege and pledge my total commitment to the service of our association and our great soldiers.

A special thanks is appropriately due to Colonel Tedesco for his commitment and dedicated efforts which have been so vital to our association — "Thank you, Vinnie."

Our Air Defense Artillery Association is indeed a healthy organization! The entire membership is congratulated for their hard work and contributions. Increased membership, improved chapter award programs for soldiers and profitable gift shop operations represent significant successes, but as Colonel Tedesco charged us in his last message — "There is still much to do!"

Continuing to build our association membership and striving to promote the association as a source of branch pride in support of soldiers are ongoing efforts that require everyone's support. Likewise, the initiatives underway to build a new Air Defense Artillery Museum to replace the inadequate and aging structure that currently serves as the repository of Air Defense Artillery's heritage and to continue the memorialization project are initiatives that merit and require continued support.

Today, Air Defense Artillery soldiers are buoyed by the warm outpouring of public acclaim for their performance during Operation Desert Shield and Desert Storm, but we face a difficult period of transition as the Army builds down to smaller troop levels. The Air Defense Artillery Association, with its commitment to branch pride, heritage and soldier support, can play an important role during this transitory period.

As the newly elected executive director, I solicit your ideas and comments on ways and means to serve the membership. Air Defenders deserve the very best; let's continue to work together to ensure that **the best** receive it!

Milton A. Whitley Jr.

MILTON A. WHITLEY JR.
Executive Director
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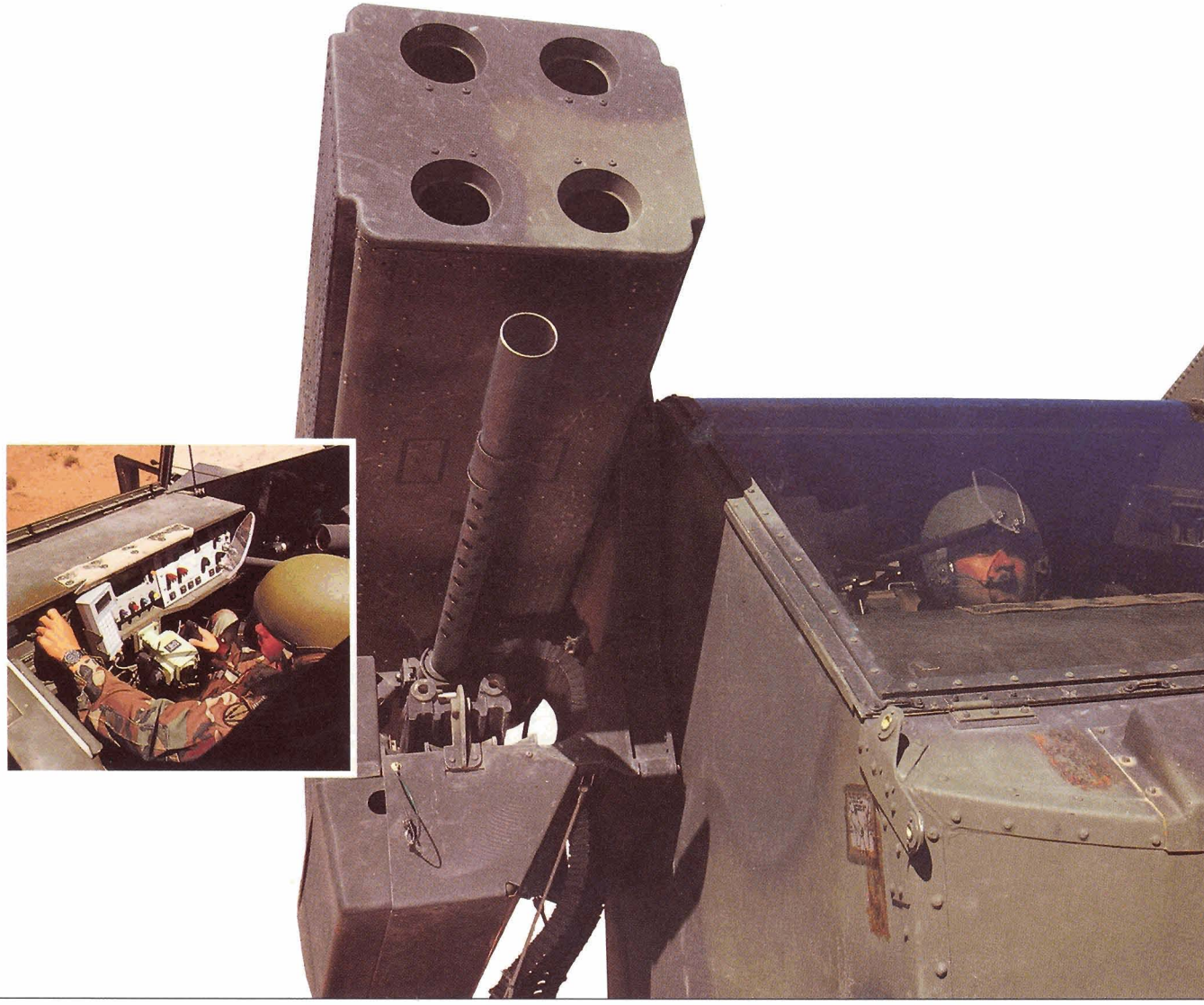

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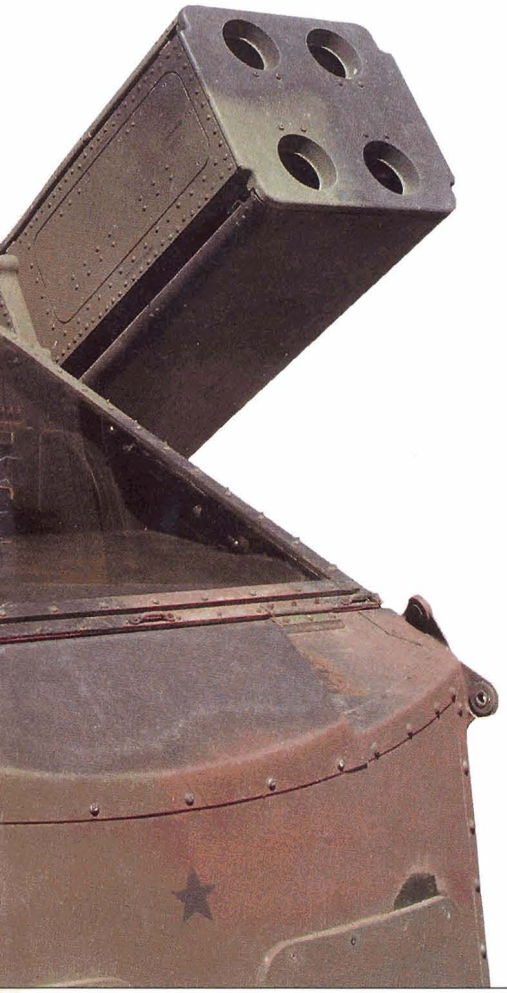

highly operable, maintainable, and affordable. It has passed rigorous testing, been fielded with the U.S.Army against multiple aggressor targets, and passed all tests with flying colors. Avenger is now in full-scale production for the Army's Forward Area Air Defense system.

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