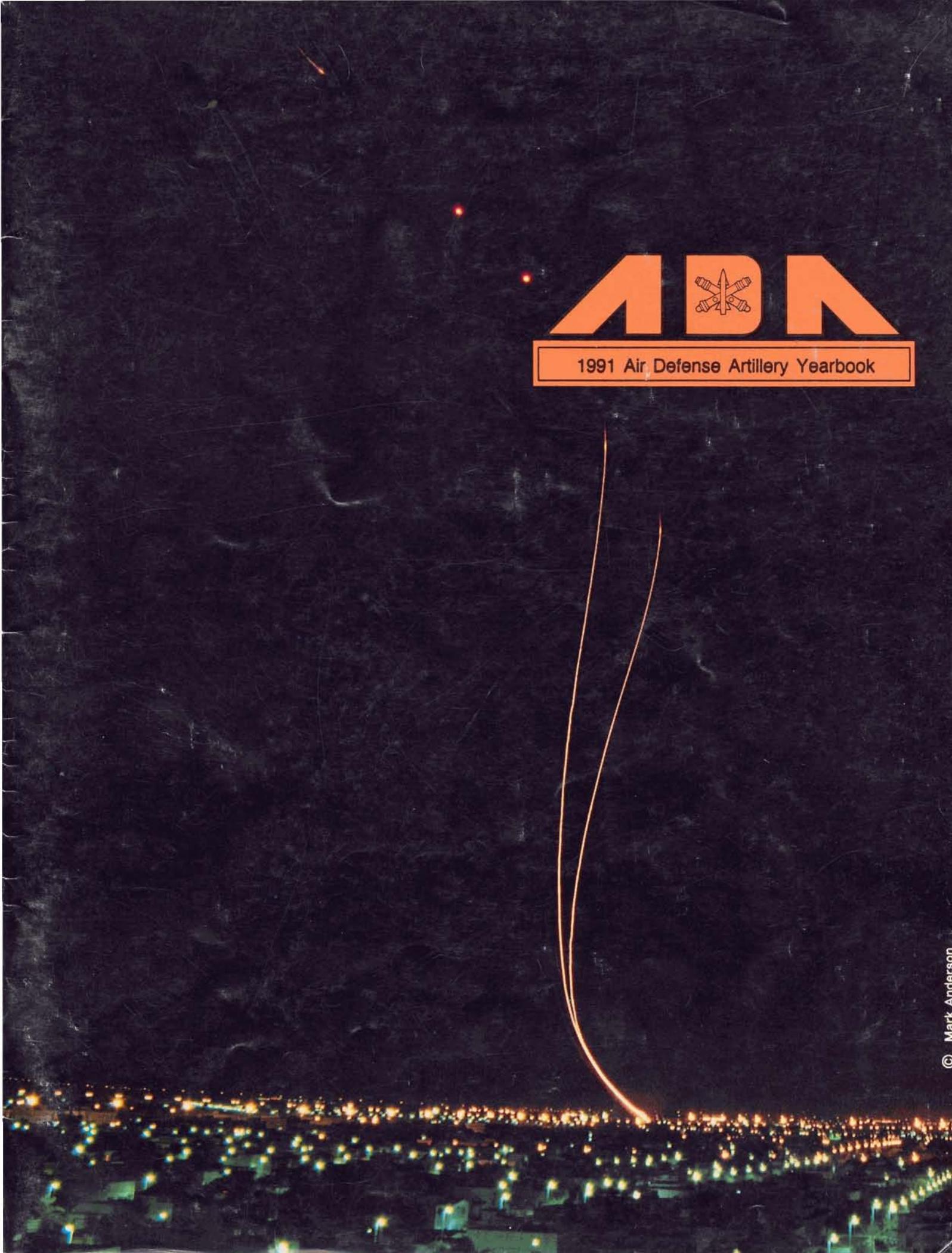
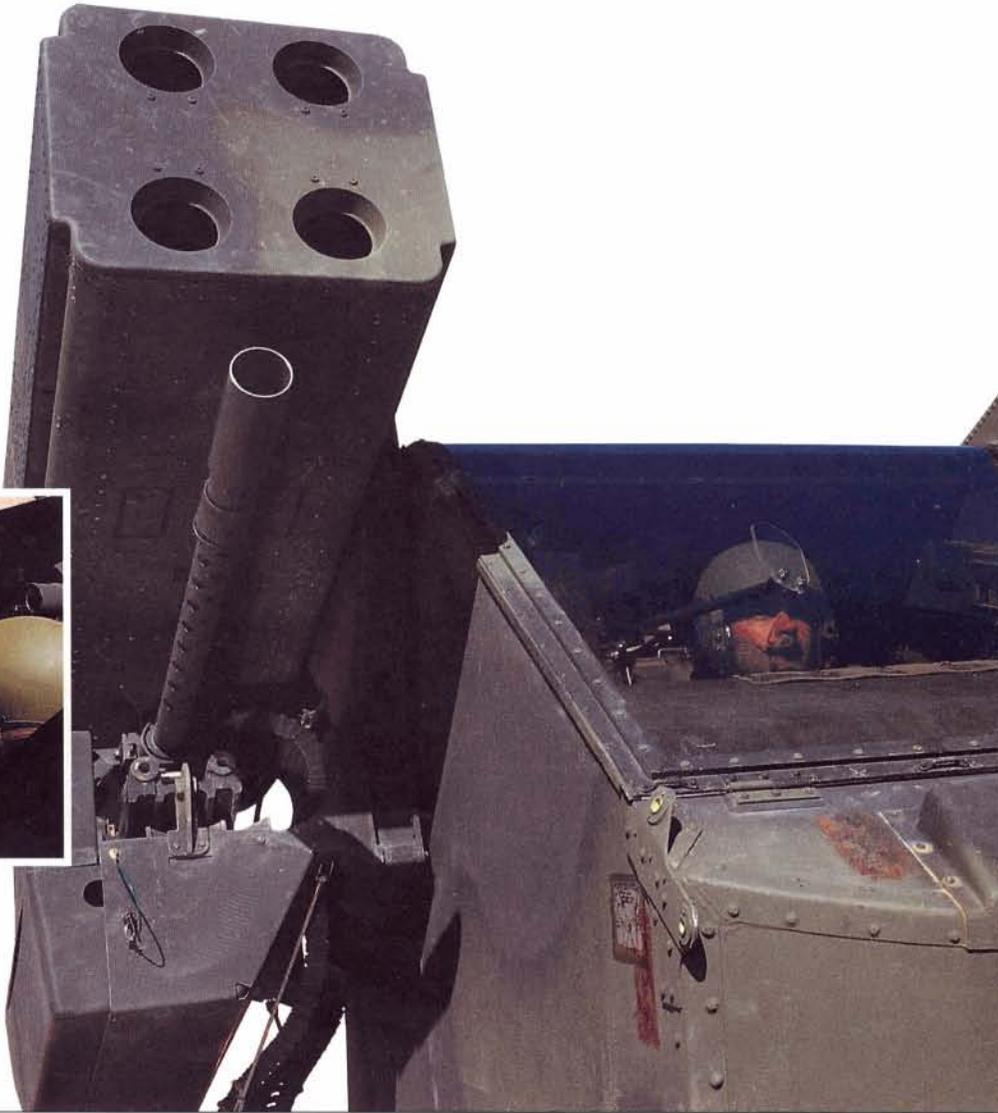




1991 Air Defense Artillery Yearbook



With Avenger, he can beat a veteran pilot
at his own game.



Attack pilots hate Avenger.
Soldiers love it.
For good reasons.
U.S. Army soldiers helped
Boeing engineers design

Avenger. With even minimal
training, an Avenger gunner
can hit aerial targets with
Stingers—or any of several
air defense missile systems.

And they can do it from a
standstill, via remote control,
or shooting on the move. Day
or night. Rain or shine.
Avenger is effective,



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.

As one Avenger gunner said, "It doesn't matter where the bogey's coming from. We'll get him."

BOEING



Air Defense Artillery has left on the entire world.

This edition also marks the end of my term as the active head of your ADA Association. For the past few years I have had the privilege of being first your association president and now the executive director.

Your association has changed quite a bit over the last four years — mostly for the good. We have tried to serve the needs of our Air Defense Artillery soldiers and to support the efforts of Maj. Gen. Donald Infante and Maj. Gen. Donald Lionetti to build and maintain branch pride. We are today financially secure. We can point with pride at our gift shop operation and our many branch chapters.

But there is still much to do!

We must better serve our membership with programs that support pride in our branch and rewards for our soldiers.

We must build the new Air Defense Artillery Museum.

We must actively encourage membership, which over the past year has not grown in the manner it should. Si-

multaneously, our branch chapters must continue to grow and become more active.

We must adjust our internal organization to be in a position to better do all that must be done.

We must continue the memorialization project begun this year to recognize our historic past.

The ADA magazine must be made financially secure. Image/Southwest, the magazine's new publisher, took on the costs of publishing the magazine at a time when advertising sales were exceedingly slow. The association greatly appreciates their efforts to rebuild the magazine into a profitable venture.

So, my fellow air defenders, there is still much to do. But I am sure with your continued interest and the hard work of all, especially Edith and "Happy," we will continue to serve our membership and our soldiers.

V. J. TEDESCO JR.
Executive Director,
ADA Association

Fellow Air Defenders,

This edition of the *ADA Yearbook* celebrates both the end of Operation Desert Storm and ADA's triumphant performance during the Gulf War. This comprehensive, colorfully illustrated history of ADA's participation in the war vividly portrays the powerful impression of effective defense that

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Air Defense Systems Division

Col. V. J. Tedesco Jr.
Executive Director, ADA Association



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1991

Air Defense Artillery

Yearbook

Published by the Air Defense Artillery Association

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Triumphant in battle, the "First to Fire" branch prepares to meet the challenges that await it on battlefields of the future.
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Operation Desert Storm illuminates Air Defense Artillery's path into the AirLand Battle Future.
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New chapters and a substantial bank account highlight recent association growth.

Sponsored by the Air Defense Artillery Association and published by Image/Southwest, Texarkana, Texas, ADA is a professional journal devoted to the advancement of the art and science of Air Defense Artillery and of the U.S. Army. The 1991 ADA Yearbook supersedes the May-June issue of ADA and serves as the showplace publication published in conjunction with the ADA Commanders Conference. Articles appearing in the 1991 ADA Yearbook do not necessarily reflect the opinions of the officers or members of the Air Defense Artillery Association, and should not be interpreted as reflecting the official opinion of the Department of Defense. **RATES:** Memberships and subscriptions payable in advance. Lifetime, \$30; lifetime and one-year subscription to ADA (six issues), \$44. **POSTMASTER:** Send address changes to Image/Southwest, 517 Main, Texarkana, Texas 75501.

ON THE COVER: Two Patriot missiles race to intercept Iraqi Scuds targeted at Riyadh, Saudi Arabia. Cover photo by Mark Anderson, a physical therapist from the United States employed at the King Faisal Hospital in Riyadh.

A SLIGHTLY DIFFERENT SCENARIO



Riyadh, Saudi Arabia, Jan. 14 (Compiled from press reports) — Iraqi ground forces, supported by SU-25 fighters and HIND helicopters, launched a pre-emptive attack on a broad front against U.S. and allied units this morning. The strike came a full day before the U.N. deadline for Iraqi withdrawal from Kuwait. Forward area U.S. armor brigades, engaged in the first battle in the open desert since the days of Patton and Rommel, ..."

It didn't happen like that. But if it had, those brigades would have welcomed the company of a mobile missile system able to engage sophisticated enemy helicopters and aircraft in an ECM and clutter environment. That's what ADATS is all about. Selected as the Line of Sight-Forward-Heavy element of the Army's Forward Area Air Defense System (FAADS), ADATS destroyed six of seven target aircraft at White Sands last year. At Fort Hunter-Liggett, with soldiers from the

2nd Battalion of the 6th ADA Brigade, ADATS successfully defended a maneuvering unit in force-on-force tests.

The Line of Sight-Forward-Heavy program is now in its RAM (Reliability-Availability-Maintainability) Maturation Phase, preparing for the Army's 1992 production decision. ADATS will be ready. Consequently, so will you.

ADATS will be ready. So will you.

MARTIN MARIETTA



THE WAY AHEAD

Maj. Gen. Donald M. Lionetti, chief of
ADA, charts the future of the
"First to Fire" branch





Rose Palmisano

The weekly arrival of commercial airliners laden with thousands of air defenders homeward bound from the War in the Gulf has made the Spring of 1991 a season of joy — a protracted homecoming celebration adorned with yellow balloons and emotionally buoyed by the warmth of family reunions. Throughout Operation Desert Storm, Army Central Command (CENT-COM) briefers continuously warned against euphoria, but it is now permissible to feel a little bit euphoric. Seldom, indeed, has there been greater justification for euphoria, and never has the “First to Fire” branch had greater cause to face the challenges of the future with such bright confidence.

The U.S. military performance in Operation Desert Shield and Desert Storm is the most impressive, most dramatic military victory, in my judgment, in the history of this nation and perhaps in all recorded history. It's a classic example of the application of massive and overwhelming military power focused at decisive locations and points in time to achieve total and complete victory in the satisfaction of clearly-defined national and military objectives. Brilliant in its inception and certainly magnificent in its execution, United Nations' forces achieved the goal of ejecting Iraqi forces from Kuwait and, in the process, defeated the fourth largest army in the world. Air Defense Artillery was a proud and significant contributor to this victory.

On a strategic plane, keys to the success of Desert Storm were the strength of our national commitment and the cohesiveness of the allied coalition. At the operational level, the air campaign followed by a brilliant operational maneuver in the land campaign broke the back of the Republican Guard and,

with it, Iraq's will to continue. In all phases, Air Defense Artillery played a prominent role.

Success of the counter-Scud campaign bolstered national will and coalition unity, and provided Israel a politically defensible rationale to refrain from retaliation. Without Patriot, generation of the enormous number of sorties allied air forces achieved would have been impossible from bases under continuous and unpredictable Scud attacks. Without Patriot, ports could not have processed the tonnages necessary to first build, and then sustain, our forces in Saudi Arabia. Without Patriot and Hawk forward defending massive troop movements over incredible distances to posture for the ground operation, vulnerable columns could have been lucrative targets. Finally, without divisional air defense artillery, our maneuver commanders

Avenger tremendously improves our ability to defend forward forces.

Boeing Defense & Space Group

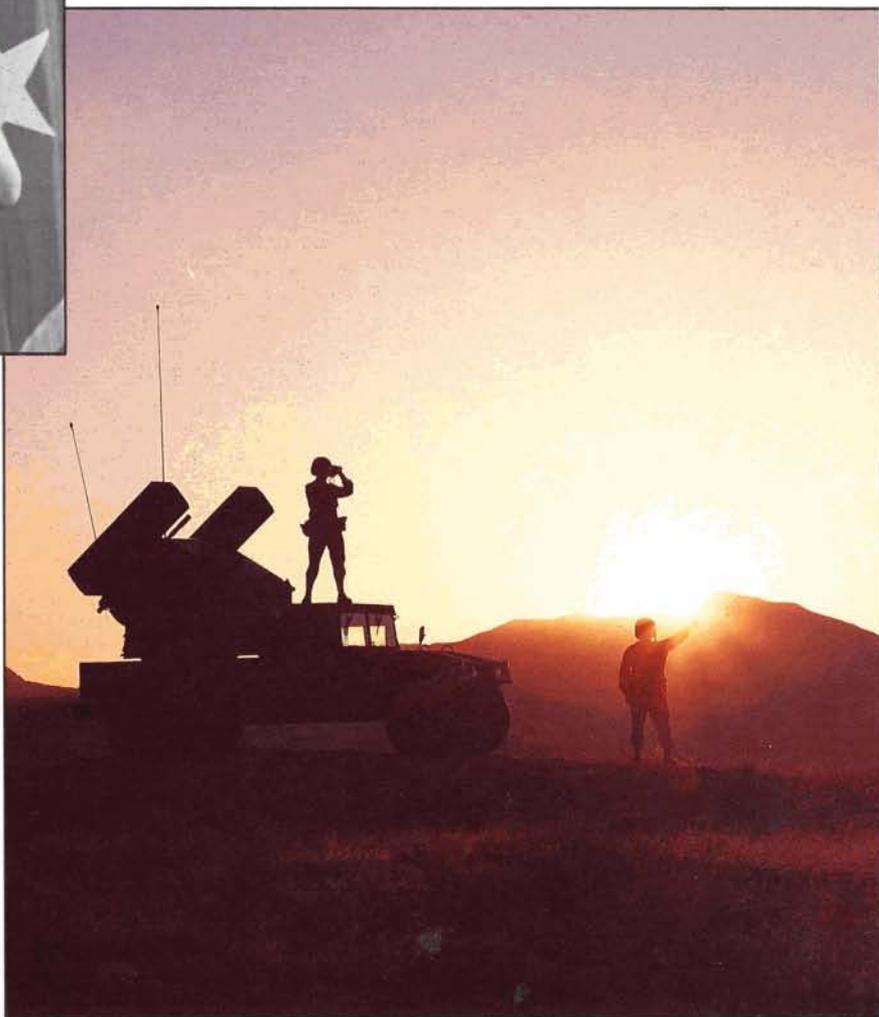
could not have been as bold in penetrating with deep thrusts to the heart of the Iraqi military. Re-

member, at the start of the land campaign, 80 percent of Iraqi air still lived — and Scud and Frog launchers still weren't neutralized despite over 110,000 sorties.

Desert Storm Doctrinal Implications

The Gulf War experience represents a tremendously rich repository of empirical data awaiting analysis to help us tune our doctrine, tactics, techniques and procedures and, as well, to help us focus appropriately our energies for materiel development.

Saddam Hussein's surprise Aug. 2 attack into Kuwait closely followed our recent declaration of victory in the Cold War with the collapse of the Warsaw Pact. We were in the process of



reaping our "peace dividend," planning for the downsizing of the U.S. Army and reassessing our warfighting doctrine to align with a smaller (yet deployable, versatile and lethal) Army. Our focus was just evolving from forward defense to power projection.

To support the U.S. Army as a strategic force in the future, the U.S. Army Training and Doctrine Command (TRADOC) embarked upon a massive effort to rewrite and refine FM 100-5, *Operations*, (see Brig. Gen. John Little's article, "Into the 21st Century," page 48). Underway for nearly a year when the war broke out, emerging concepts developed by Gen. John W. Foss, TRADOC commander, and all service school commandants in a series of general officer workshops, could, suddenly, be measured against a real-world contingency operation. Operation Desert Shield and Desert Storm have, therefore, become a laboratory within which we can derive great truths for the future. Within the ADA community, we must capture from those who participated, divisional and nondivisional, each and every lesson applicable to the future.

First, let me make some general observations and some micro-level conclusions about the Gulf War.

We validated the doctrine contained in FM 44-100 regarding ADA support of contingency theater operations. Air Defense Artillery must be deployed strategically, early in the operation, to defend the beachhead or airhead during the very vulnerable build-up period. In Operation Desert Shield, elements of the 11th ADA Brigade were alerted within hours of the Iraqi invasion and deployed within days of the first U.S. troops departing the United States. The first firing batteries of Patriot ADA equipment arrived in theater just behind the ready brigade of 82nd Airborne Division, the first-in military unit.

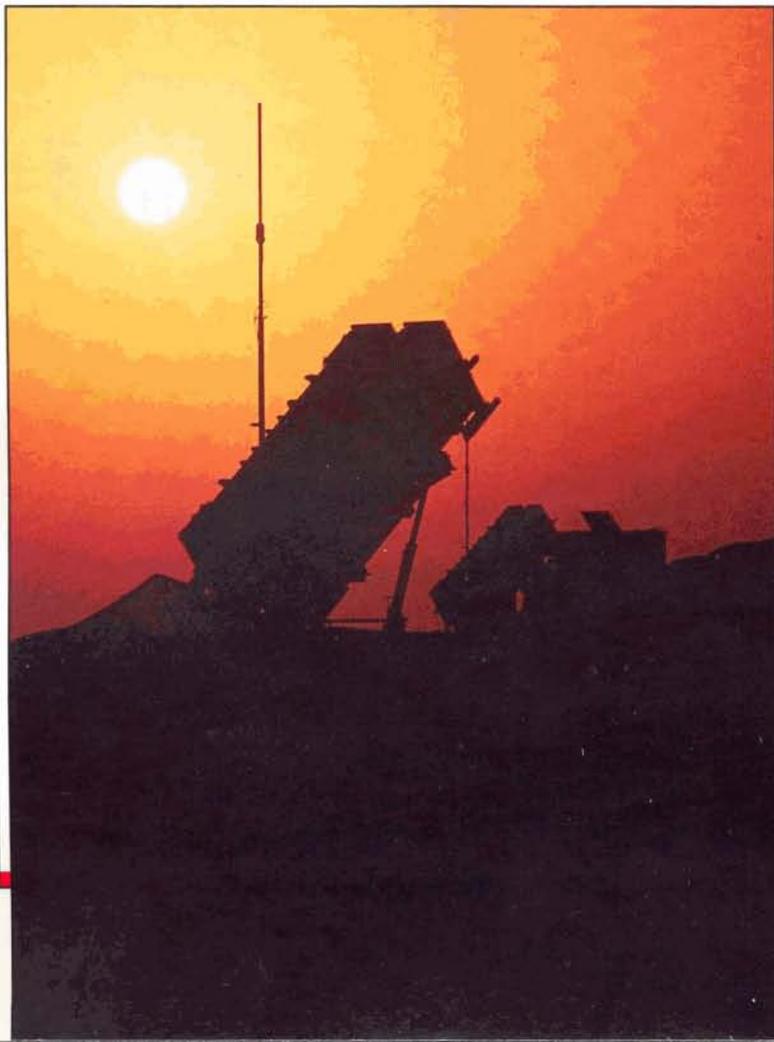
The concept of Air Defense Artillery organic to the corps is now embedded in Army doctrine and, although we were unable to deploy separate corps ADA brigades with XVIII Airborne Corps and VII Corps, each had an attached organic, composite Hawk/Patriot task force to protect against both the airbreathing threat and tactical ballistic missiles.

Because of the brilliant air operation conducted by coalition forces, forward area air defense systems did not have the opportunity to demonstrate their inherent abilities to protect ground maneuver forces. This fact cannot dilute our support for expeditious completion of FAAD modernization. One only has to observe the devastation caused by coalition air on Iraqi ground forces to recognize the essentiality of effective air defenses. We cannot permit the technology that defeated Iraq to be imposed, in some future war, on U.S. maneuver forces.

Desert Storm underscored what the ADA community has been saying for years: tactical ballistic missiles will be the weapon of choice in future conflicts — even by Third World nations. The psychological terror caused by the Iraqi employment of Scuds makes an effective defense absolutely essential. Not only were Scuds used in an attempt to disrupt our air operations and sustainment via attack on fields and ports, but Saddam also targeted population centers in both Saudi Arabia and Israel. Thus Patriot contributed both at the operational level of war in Desert Storm and, currently, made a theater-strategic contribution in protecting population cen-

ter Storm and, currently, made a theater-strategic contribution in protecting population cen-

Patriot represents the centerpiece of future HIMAD; ADA soldiers, the future of the branch.



DoD

MAJ James R. Adams

ters, clearly establishing a requirement for area defense in the future.

A corollary observation concerns the pre-Desert Storm conventional wisdom that stated emphatically "TBM launchers would be lucrative air operation targets and would be eliminated easily within the first few days of conflict." This proved to be dramatically false in Desert Storm. Despite a massive, intense attempt to locate and destroy tactical equipment launchers by the allied air operation, the mobility of Saddam's launchers preserved the capability to launch Scuds until the very end of the war.

While it is certainly important to assess Desert Storm within the context of observations such as those above, one must be careful to recognize that we will never again fight Desert Storm. So as important as these anecdotal data may be, it is equally important to discern what might be different in the future. For example, every potential enemy of the United States, in observing our performance, will recognize that we cannot be permitted a five- or six-month buildup to generate the enormous combat power that defeated Iraq. Similarly, just as tactical ballistic missiles today abound in Third World countries, we must anticipate that the Tomahawks' successes will encourage these countries to make the cruise missile, and the targeting technology that made Tomahawk so effective, the next weapon of choice. As well, the tremendous success of our air operation and the immense power that can be generated against ground forces, especially by helicopters as was evident in the final destruction of the Republican Guard, will encourage potential adversaries to employ such capability against us in the future.

Indicated Modernization

Our ADA master plan for modernization continues to make good sense against emerging AirLand Battle doctrine and also within our laboratory of Desert Shield and Desert Storm, with full recognition that future conflicts will not be identical to the one in which we just achieved victory.

First, we have to field our FAAD systems. While we did not have to defend forward area maneuver elements against the standoff attack helicopter

in this war, we will certainly face that requirement in the future. The U.S. Army cannot have it both ways: we can't love the attack helicopter in our force for the great battlefield leverage it provides and not expect our potential enemies to do the same.

Moreover, no one but us can defeat this threat. The Air Force cannot deal effectively with the attack helicopter. The only way we can defend the cutting edge of our future forces is with ADATS, the line-of-sight forward (heavy) FAAD component. While ADATS came through operational testing superbly, our contractor is fixing a reliability problem and, as soon as criteria are met, we will move into full-scale production.

NLOS, the non-line-of-sight FAAD component, has had some programmatic turmoil as a result of budget reductions, but NLOS' fiber-optic guided missile technology is recognized as essential on the future battlefield — for air defense as well as anti-tank roles and missions.

Avenger, deployed during Desert Storm with the 3rd Armored Cavalry Regiment, the 1st Cavalry Division and the 11th ADA Brigade (borrowed from the 6th ADA Brigade), is well into production, ahead of schedule and below cost. It provides a tremendous improvement in our ability to defend forward forces.

Command, control and intelligence (C²I) continues in development. We hope to deploy a lightweight interim sensor (LSDIS) to the light and specialty divisions soon and, at this writing, the ground-based sensor (the replacement for the forward area alerting radar in our divisions) competition is well underway. ADA software and common hardware to support force management in ADA operations will be deployed along with the lightweight sensors soon.



ADATS is just one of the FAAD systems that will defend future forward area maneuver forces.

In the high to medium air defense (HIMAD) and anti-tactical missile defense world, Hawk and Pa-

triot provide the near-term foundation for our future HIMAD vision. Phase III product-improved Hawk will serve us into the 21st Century with state-of-the-art upgrades, including a passive engagement capability. We anticipate Hawk will have an important role to play not only in the corps ADA brigades, but also in those ADA formations that will support the theater Army. Finally, Hawk represents the force structure we must preserve to accommodate Corps SAM, a follow-on weapon system.

Patriot, which proved itself so magnificently in the TBM role in Saudi Arabia and Israel, certainly represents the centerpiece for future HIMAD. In its strategic role during Desert Storm, Patriot protected larger volumes of



Martin Marietta

theater Army (to include low observables and cruise missiles) and defeat short-range tactical ballistic missiles such as Frogs and SS-21s.

Force Structure Challenges

Unprecedented success in Desert Storm notwithstanding, our Army *will* build down substantially over the program years. Certainly ADA will sustain a portion of the coming reductions — but a percentage share or “salami slice” approach will not accommodate our requirements in this changing world. Forming our combat- and threat-based hardware systems (discussed above) into viable organizations that parallel Army organizations will produce no less turbulence in ADA than in the rest of the Army.

Restructuring the European force will permit remissioning and restationing some ADA forces in support of other CinC requirements. I envision a

reduction of forces to an artificial ceiling. Then our study defines the remainder of our global ADA requirement based on input from all the war-fighting CinCs. This super piece of work, approved at DA and now at the Joint Chiefs of Staff, will serve as an objective blueprint for retaining the right amount of ADA force structure in our smaller Army.

The Human Dimension

Finally, the performance of our leaders and soldiers at all echelons in Desert Storm has been absolutely magnificent. Our training systems and leadership optimized the human element of warfare to an unprecedented level. No one could have asked more of soldiers, and they delivered 100 percent on every occasion. Although several software modifications were created and delivered to fielded Patriot units to accommodate phenomena observed during Scud attacks, our Patriot soldiers found procedural alternatives even before we were able to deliver new software. So while we can spend much time improving our ADA hardware systems, we must never neglect the high-payoff human element when articulating our road ahead.

Our recruiting efforts, not only for quality enlistees but also for great future officers coming to us from ROTC, OCS and the Academy, must be redoubled. Retention of top quality soldiers across the force within the very turbulent period ahead must be absolutely top priority for every ADA commander. The modernization described will bring us into the 21st Century, but will be effective only if motivated, highly trained and skilled soldiers man such systems. The doctrine, tactics, techniques and procedures that we will write at the ADA School must be lavishly enhanced by input from experienced ADA soldiers and leaders who were participants in Desert Storm.

Our future is bright only if we can articulate positively, persuasively and successfully the role Air Defense Artillery plays within the context of the Army's AirLand Battle Doctrine as is now being modified by future concepts in development. To this end and to this extent, the way ahead for Air Defense Artillery will be, as always, challenging and exciting.

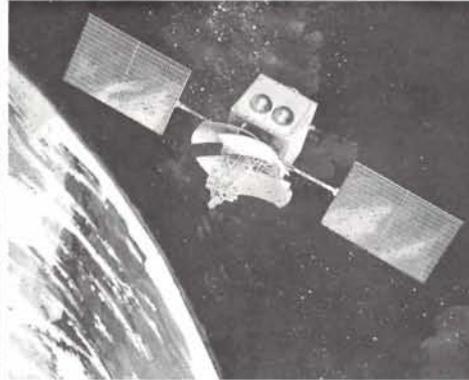
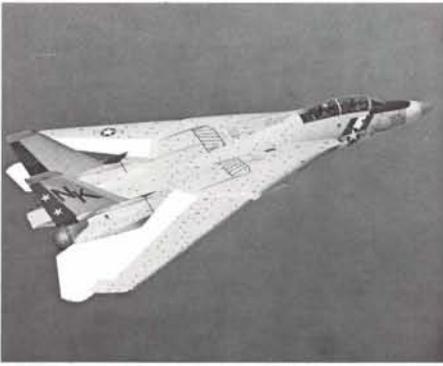
airspace than ever anticipated, thus underscoring the need for an active tactical ballistic missile defense capability beyond what is currently envisioned.

While near-term improvements in the Patriot's range, altitude and lethality are planned, we are working closely with the Strategic Defense Command, fulfilling the role of combat developer, to define user requirements for a theater area air defense system. One candidate could be the developmental work ongoing in the Strategic Defense Command on Theater High Altitude Air Defense, a system that would defeat tactical ballistic missiles at much greater ranges than Patriot could achieve, and would protect not only the theater Army and field forces, but also critical population and infrastructure within the host nation.

Finally, we will continue to develop Corps SAM, which will replace Hawk, defeat the airbreathing threat in the

much higher percentage of our force CONUS-based than before and, particularly, see a Patriot battalion organic to each corps ADA brigade . . . at Bragg, Hood and Lewis . . . joining the Hawk and Chaparral forces already assigned. It's not inconceivable that one of our 32nd AADCOR brigades will relocate to CONUS as a corps brigade. Finally, I would hope to retain 32nd AADCOR, reduced in size but, nevertheless, essential in a restructured European Command.

But visions like these are fundamentally opinions. To effectively embed these philosophies with the leadership requires objective data. Our analytic foundation for the future HIMAD force is incorporated in ADA 2000 . . . a comprehensive study conducted under Col. Jeff Ellis' leadership. It seeks to answer first the question of the post-conventional force reductions in Europe SAM requirements — based on threat and mission, and not



Telos salutes the performance of America's troops and allies in Operation Desert Storm

Our performance depends on your performance
...and your performance was great.

Thank you!

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Shutterbugs freeze-frame Air Defense Artillery

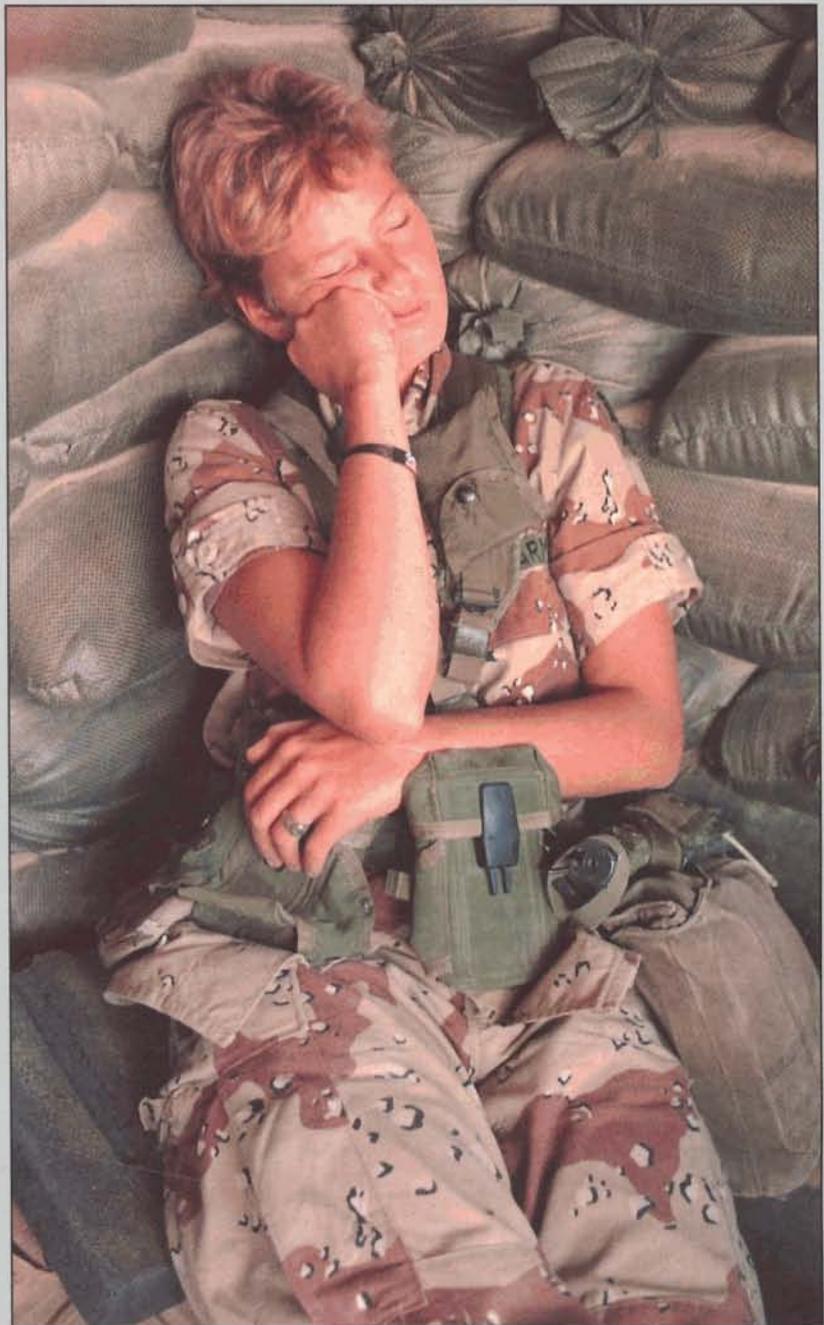
A photograph of an ADA soldier asleep against the sandbagged wall of a guard post during Operation Desert Storm took the \$500 Sweepstakes Award in the first annual ADA Photo Contest. "The soldier in the photo is Spec. Tanya Rackly of Charlie Battery, 2-1 ADA," said Sgt. John Originales. "She wasn't asleep on guard duty. She decided to stay and talk after being relieved. She fell asleep and I took the shot."

"Originales' photo caught some of the human dimension of combat," said Cleveland McKnight, one of four contest judges. "It's a picture of complete exhaustion. Most of the photos we looked at focused on weapon systems rather than soldiers. The human element was missing."

First place in the ADA in Action category, a photo depicting a Vulcan emplacement in Saudi Arabia, went to Maj. Jim Boling, a public affairs officer at Fort Hood, Texas. PFC Charles Story of Headquarters and Headquarters Battery, 5-5 ADA, Camp Stanton, Korea, took second place with his picture of Stinger gunners training in a snowstorm. 2nd Lt. James Crabtree of Charlie Battery, 2-1 ADA, Fort Bliss, Texas, won third place for his dramatic shot of 11th ADA Brigade Hawk fire units moving into Iraq beneath a tattered U.S. flag (see page 38).

Michael D. Kimak, El Paso manager of ARES Corp., swept first, second and third places in the Fort Bliss category for his photograph of sunlight glinting off the installation's "First to Fire" statue, a panorama of massed Patriot fire units on parade and a twilight photo of old buildings along the post's Sheridan road (not shown).

The 1991-92 ADA Photo Contest is now officially underway. Sponsored by the U.S. Army Air Defense Artillery School and Fort Bliss, the photo contest is designed to create an archive of quality ADA photos for use in a wide variety of ADA and Fort Bliss publications. Submitted photographs (regardless of whether they are prize winners) become the property of the U.S. Army.



SGT John Originales



MAJ Jim Boling

The cash awards for the 1991-92 Air Defense Artillery Photo Contest will be identical to last year's photo contest. A \$500 savings bond goes to the Sweepstakes winner. First, second and third place in each of the two categories (ADA in Action and Fort Bliss) pay \$350, \$250 and \$150 savings bonds respectively. Funds for awards are provided by the Directorate of Personnel and Community Activities, Fort Bliss, Texas.

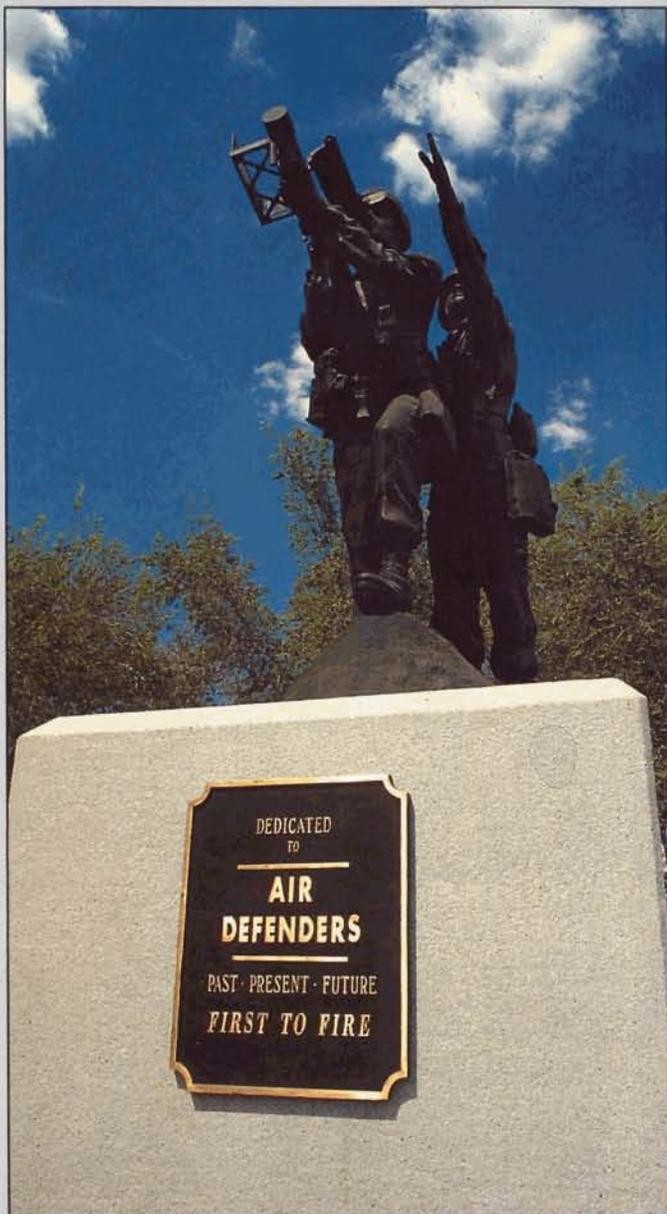
The Fort Bliss category gives you an opportunity to submit photographs that portray operations, training and facilities at Fort Bliss, McGregor Range and Biggs Army Airfield. Photos submitted for this category may include, but are not limited to, scenic shots of Fort Bliss and its training ranges and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

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



PFC Charles Story

Your slides will be reproduced and the originals returned, provided you enclose a stamped, self-addressed envelope. Prints will not be returned unless a negative is furnished as part of the entry. Your name will be included in a photo credit line each time your photograph(s) is published. Only glossy prints (4x6, 5x7, 8x10 or 11x14) or slides will be accepted. Identify, when possible, the names of units, locations and individual soldiers and include a brief description of the action taking place in the photograph on a separate sheet of paper.



Michael D. Kirmak

Contest judges are drawn from the staffs of *ADA* magazine, *Fort Bliss Monitor* and the Fort Bliss Photo Lab. Contest judges consider the news value of submitted photographs as well as their technical excellence.

Anyone, except members of the *ADA* magazine or the Fort Bliss *Monitor* staffs, may enter the contest. The entry deadline is March 1, 1992. Photos received after this deadline will not be eligible for prizes. To enter the contest, simply copy the entry form at right and mail it to: Photo Contest; *ADA* Magazine; ATTN: ATSA-ADA, Building 55; Fort Bliss, TX 79916-7004.

1991-1992 ADA Photo Contest

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

Name _____

Address _____

City _____

State _____ Zip _____

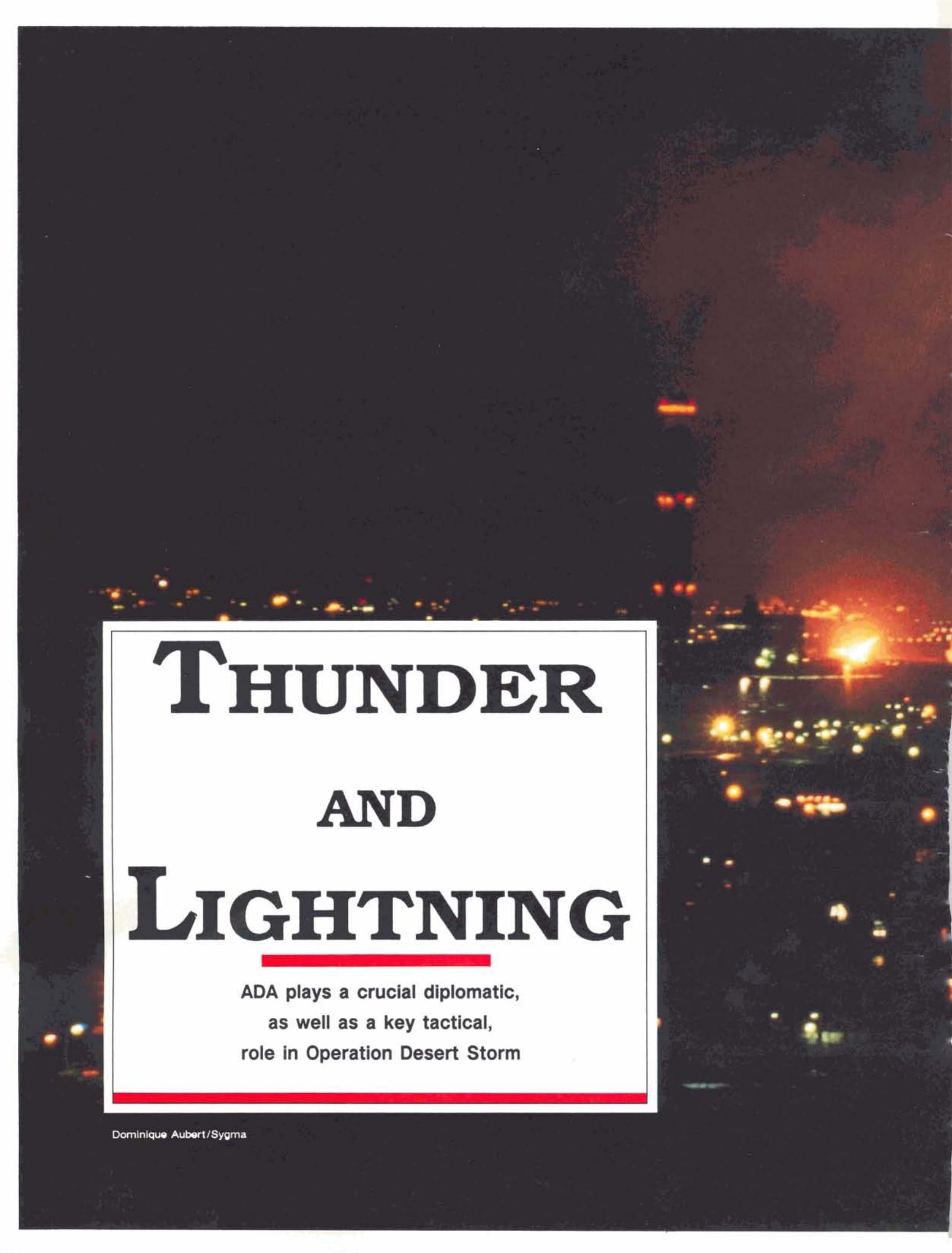
I certify that the attached photograph(s) is an original made by myself. I grant the Army or its civilian publishers exclusive rights to reprint the attached photograph(s) as they see fit without compensation to myself. I understand that upon submission the photograph(s) becomes the property of the United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

Signature _____

Mail photos to: Photo Contest
ADA Magazine
ATTN: ATSA-ADA, Bldg. 55
Fort Bliss, TX 79916-7004



Michael D. Kirmak



THUNDER AND LIGHTNING

ADA plays a crucial diplomatic,
as well as a key tactical,
role in Operation Desert Storm



Desert Storm generated scores of graphic images that indelibly burned themselves into the nation's psyche. A barrage of anti-aircraft fire illuminates the night sky over Baghdad. A Tomahawk cruise missile streaks from the deck of a battleship. A laser-guided smart bomb impacts with pinpoint precision atop a concrete bunker. Iraqi battle tanks blaze in the desert sand.

But perhaps the most unforgettable images were the fiery midair collisions of Iraqi Scuds and Patriot missiles over Saudi Arabia and Israel.

By destroying Iraqi Scuds in midair, or by nudging them away from logistics and population centers, coalition ports, airfields and staging areas, Patriot accomplished a vital tactical and strategic mission. During the maneuver phase of Desert Storm, including the massive shift of coalition forces to the western flank and the surge of armored and air assault spearheads deep into Iraq and Kuwait, Patriot, along with Hawk and short-range air defense units, demonstrated that the "First to Fire" branch can accomplish its Air-Land Battle mission by providing air defense for the maneuver force during fast-moving offensive operations on a highly fluid battlefield.

ADA soldiers proved something to America (according to polls, the public now holds the Armed Forces highest in esteem among national institutions — a vote of confidence unthinkable two decades ago) and something to themselves. "We were like a team preparing for the Super Bowl," said Lt. Col. Pete Thomson, 11th ADA Brigade deputy commander. "This was our Super Bowl, and we won."

They won under intense pressure. Many of the Scud attacks and Patriot intercepts, including the historic first intercept and the multiple engagements that occurred during the "Battle of Riyadh," were broadcast live to prime-time viewing audiences. Had Patriot failed to perform as designed, the effect on public support for the war effort would have been disastrous. Every soldier new to combat wonders how he or she will perform under hostile fire, and the Patriot crews performed to near perfection.

There's no target identification problem with tactical ballistic missiles



AP/WideWorld Photos

(TBMs). Nothing else flies like they do. And to the tactical control officer ensconced in the air-conditioned engagement control station, there's no readily apparent difference between a simulated TBM engagement and the real thing. The incoming TBM appears as a diamond-shaped symbol that moves from top to bottom of the Patriot radarscope. Operating in the automatic mode, the Patriot system detects and identifies the incoming Scud and launches missiles when the intercept appears in the high-lethality engagement zone. The tactical control officer can verify engagements by moving a cursor to the rapidly descending Scud symbol and then hitting the HOOK button on his keyboard. This gives the tactical control officer amplifying data on the target, including speed, range and altitude. But if the tactical control officer elects to continue in the automatic mode — the doctrinally correct procedure — the system automatically ripple fires two missiles less than 10 seconds apart to ensure interception inside the engagement zone. The Patriot missiles exploding from their canisters at Mach 3 appear on the scope as football-shaped

symbols accelerating rapidly toward the incoming TBM.

Combat is just like training, except that the tactical control officer knows that in the real world exterior to the computer matrix, up in the dark sky, a real, live TBM is descending, plummeting toward the ports of debarkation, the logistic centers, the airfields, the population centers, the Patriot battery, or maybe even the engagement control station itself, though that's not a thought upon which it's profitable to dwell.

Outside the engagement control station, away from the dim green glow of the radarscope, things are more spectacular. There is the wail of sirens and the scramble for shelters. Then, the earth shakes and a screaming comes across the sky, followed by the thunder and lightning of warheads detonating in midair. Patriot maintenance Spec. Susan Mueller offered probably the most succinct description of what exactly was at stake during the dramatic duel between Patriot and Scud. "We are history makers, but we could have been toast," she said.

Before the war, not many people outside the defense establishment



Alain Keler-Odyssey/Matrix



Patriots defend Israel and Saudi Arabia.

To the Americans who watched live satellite relays of Scud intercepts, Patriot did indeed seem a technological marvel, but the real miracle was that Patriot, its anti-tactical ballistic missile (ATBM) capabilities intact, was in place and prepared to accomplish its mission when the first Scud blazed through Saudi Arabian skies.

"As one of those who has closely followed Patriot from the beginning, it strikes me that it almost didn't happen," said Brig. Gen. John H. Little, assistant commandant of the U.S. Army Air Defense Artillery School, Fort Bliss, Texas. "By this, I mean there were several critical junctures during the fielding of the Patriot where it was uncertain whether the system would become a reality. There were the early days when many viewed it as a technically risky system.

"Critics said we were pushing technology too far," he continued. "They said we would never get a single radar to track or engage multiple targets in a difficult electronic countermeasure environment. That a computer-driven system wouldn't work. Later there were those who said we couldn't afford such an expensive system. Then there were those who said the system was too complex: we would never get all the parts orchestrated and we would never be able to train soldiers to operate such a sophisticated piece of equipment.

"On Jan. 18, 1991, Alpha Battery, 2nd Battalion, 7th Air Defense Artillery, proved them wrong. They became the first in the history of warfare to intercept a TBM in combat by destroying an Iraqi Scud missile aimed at Dhahran. Patriot worked and worked to perfection. To prove it was no fluke, it continued to work with amazing effectiveness for the next six weeks of Desert Storm," Little added.

Patriot began its long road to success in 1965 as SAM-D, an acronym that stood for Surface-to-Air Missile-Developmental. It was the brainchild of a group of visionary scientists and air defenders who saw the need for a system to defend against a growing manned aircraft threat. They also saw in the emerging digital computer technology an opportunity to build a multi-function phased-array radar that would enable the new missile system to engage multiple targets. They pursued that dream relentlessly for 20 years, working their way through seemingly insurmountable technical, production schedule and fiscal difficulties. They prevailed and, in 1983, fielded the first battalion to conduct operational tests.

Early results were not spectacular: the prototype system shot down targets, but failed to meet exacting reliability requirements. After two more years of continuous labor, the system passed its operational tests and Patriot battalions began taking their places in the NATO defenses in Germany.

knew about Patriot; now it is difficult to find anyone who hasn't heard about the system. During the six weeks of the air war, Americans grew accustomed to hearing about Scud alerts and Patriot intercepts. The entire nation grew fond of this "ugly duckling" missile system that successfully denied Saddam Hussein his psychological terror from the sky.

Patriot's performance inspired a flood of testimonials and even poetry. A combat support soldier wrote of one intercept: "It was as if the hand of God had reached down and plucked it [a Scud] from the sky." An F-15 pilot, among the most self-assured of warriors, watched from his cockpit as a Patriot intercepted a Scud above a Dhahran runway and allowed that his respect for air defense artillerymen had increased tremendously. "The Patriot system is manned by some of the Army's best and brightest," said NBC's Tom Brokaw. "Weapons experts are calling the success of the Patriot a monumental event in the history of warfare." "America loves the Patriot," said Vice President Dan Quayle, and President George Bush exclaimed, "Thank God for Patriot!"

"To everyone's surprise, the initial units, and all subsequent battalions, not only exceeded all expectations for operational reliability, but also established new expectations for what should be required of a surface-to-air missile," said Little. "The Germans, Dutch, Italians and Japanese joined the United States in buying Patriot. By this time we realized the Soviets had a significant theater ballistic missile capability. Our engineers pointed out that, with minor modifications, the Patriot had great potential as an ATBM system."

"In 1985, a series of test firings proved the engineers were right," Little continued. "Yet it was also apparent that we needed to modify the missile and warhead so it could destroy the warhead of an incoming missile, not just knock it out of the sky."

After a tough procurement and acquisition fight, the Patriot ATBM program continued. January 1991 was the originally-scheduled delivery date for the PAC-2 (the first production missile modified for the ATBM role) and new software (which would allow Patriot to acquire and track incoming missiles and control the outgoing PAC-2 interceptors). The Iraqi invasion of Kuwait in August 1990 and the president's decision to deploy forces into Saudi Arabia dramatically stepped up the production schedule.

When the president decided to deploy forces to Saudi Arabia, Army CENTCOM planners quickly recognized that Iraq had a significant TBM capability and that air and sea ports of debarkation would become lucrative targets. The 11th ADA Brigade, Fort Bliss, Texas, had participated in a CENTCOM-sponsored exercise, Internal Look, in mid-July. This exercise was used to develop tactics and deployment options for the defense of Saudi Arabia. It clearly showed the value of Patriot in the ATBM role within an overarching integrated air defense network. Therefore, shortly after deploying the Division Ready Brigade-1 of the 82nd Airborne Division, CENTCOM requested the 11th ADA Brigade deploy Patriot fire units to the air base and port complexes at Dhahran and Ad Damman.

The brigade was tipped off to its imminent departure by a telephone call

from an Air Force logistics officer. "The call came at 0630 on Aug. 2," said Thomson. "The Air Force representative asked for the minimum aircraft requirements for a Patriot battery and battalion. This was the first indication that the brigade might deploy units into Saudi Arabia."

The official alert notification came via a midnight phone call on Aug. 6. Following an all-night meeting at the Fort Bliss Emergency Operations Center, 11th ADA Brigade commander Col. Joseph "Skip" Garrett met with his battalion commanders to present planning guidance and designated B/2-7 ADA, commanded by Capt. Joseph DeAntona, as the first battery to deploy. In finalizing the design of the minimum contingency battery package, the brigade and battalion staffs, keeping in mind that a Patriot battery operates at minimal staffing levels and unsure of what might await Bravo Battery on the ground in Saudi Arabia, decided to attach Stinger teams and a ground defense augmentation from the brigade's 5-62 ADA (a Vulcan/Stinger battalion) to the deploying Patriot battery. Two Avenger fire units from the 6th ADA Brigade, Fort Bliss, also deployed with the Patriots.

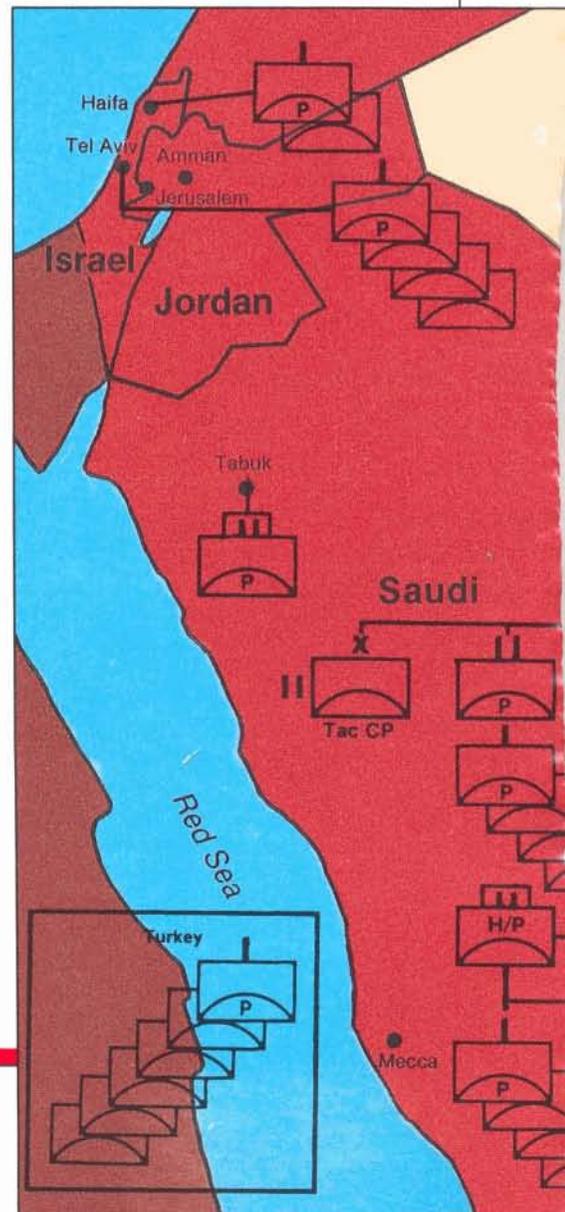
Meanwhile, Maj. Dave Enriquez, the brigade S-4, coordinated the delivery of Patriot and Stinger missiles. "Many, myself included, were concerned about the ability to get missiles stored at a depot moved to a theater of operations," said Thomson. "But this concern was quickly negated. The response from Red River Army Depot, the U.S. Army Missile Command and the Patriot Project Office was swift, well-coordinated and flawless. Red River shipped the missiles by truck to Little Rock Air Force Base, where they were transferred to C-141 aircraft for direct flight to Saudi Arabia. When our fire units arrived, the missiles were on the ground waiting for them."

Bravo Battery secretly departed the installation's Biggs Army Airfield near midnight on Aug. 11. The mood of the departing air defenders was one of apprehension and foreboding mixed with confidence in their training and a grim determination to accomplish their mission. The first C-5A Galaxy that touched down was loaded in less than an hour. Bravo Battery achieved

"wheels up" 72 hours after its initial notification to deploy, and was on the ground in Saudi Arabia 48 hours later.

Arriving after 9 p.m. aboard the first aircraft to touch down in Dhahran, the battery commander and Maj. Larry Hollars, the battalion S-3, discovered that no one at the airfield seemed to have heard of Patriot and, worse, had no idea where the battery was to emplace. Hollars asked directions to the U.S. Air Force Tactical Fighter Wing commander's quarters and got him out of bed. The Air Force officer not only knew what Patriot was, but told Hollars not to go anywhere while he dressed. He quickly got the air defenders established at the air base, and Bravo Battery achieved minimum engagement capability within hours of the arrival of its full complement.

The soldiers of Bravo Battery had no way of knowing whether they would be reinforced by other 11th ADA Bri-



gade batteries or would remain the lone high- to medium-altitude air defense battery in the theater of operations. However, near the end of August, with the buildup of U.S. forces rapidly expanding, CENTCOM directed the 11th ADA Brigade to deploy the five 2-7 ADA Patriot batteries remaining at Fort Bliss into the coastal area of Saudi Arabia from Al Jubayl to just south of Dhahran. Simultaneously, CENTCOM directed the brigade to deploy three 3-43 ADA Patriot batteries to defend the air base complexes at Riyadh. They completed their deployment by Sept. 27.

The first Patriot battery deployed arrived in Saudi Arabia with only three PAC-2 missiles, the only ones available from a test program underway at White Sands Missile Range, N.M. This meant that for nearly a month — from Aug. 13 until early

September — Patriot's ATBM capability was limited to mission kill rather than warhead kill. By early September, however, Patriot PAC-2 missiles were rolling off Raytheon and Martin Marietta production lines for direct shipment to Saudi Arabia. The manufacturing facilities operated around the clock, seven days a week, quickly building Patriot PAC-2 stocks to a sufficient level.

There were some lingering doubts about the software. No one was sure the intricate computer software that enabled Patriot to intercept TBMs during test firings would work against Iraqi TBMs under combat conditions. When Saddam Hussein's Republican Guard units stormed into Kuwait, Patriot's ATBM software was still in the initial phase of testing.

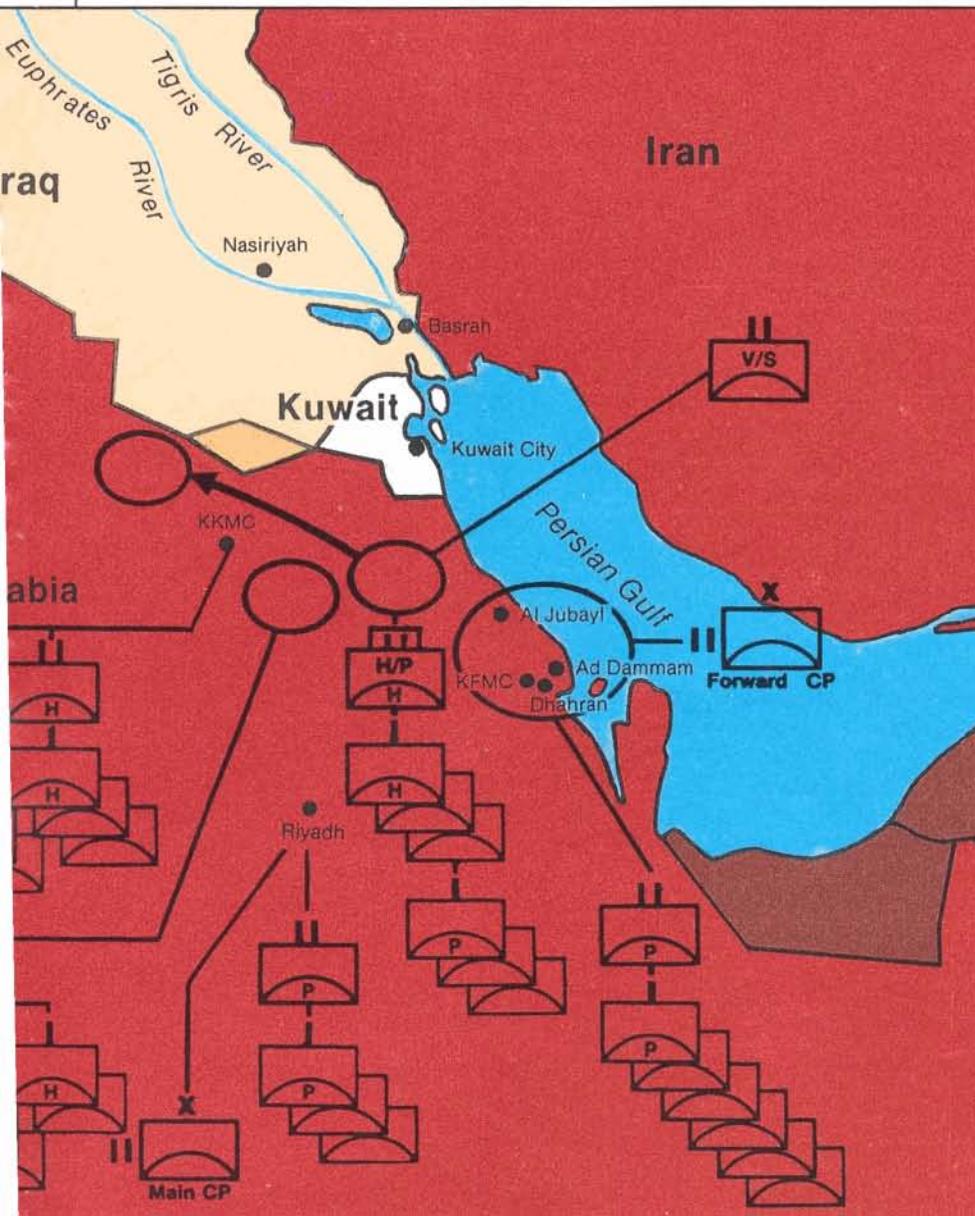
HIMAD unit locations at the beginning of the ground campaign.

An accelerated test conducted in Germany that used computer

simulations rather than actual TBMs helped establish Patriot's full capabilities. Analysis of computer simulations portraying variants of Iraqi Scuds revealed that several software modifications were needed to increase the weapon system's effectiveness. Continuing tests and analysis from actual firings produced six more software modifications designed to increase the system's lethality. These software modifications were soon programmed into the computers of Desert Shield's Patriot batteries.

During the initial lodgement phase of Operation Desert Shield, the 11th ADA Brigade deployed six Patriot batteries. B/2-7 ADA defended the air base at Dhahran while D/F/2-7 ADA defended ports at Ad Damman and Al Jubayl. C/D/F/3-43 ADA defended Riyadh, the capital of Saudi Arabia. They disembarked from the transport aircraft with just enough equipment to sustain limited engagements. The maintenance and ordnance companies, authorized stockage list materiel and prescribed load list supplies followed by sea. The 11th ADA Brigade established its main command post at Riyadh and its forward command post at Dhahran.

Theater force structure ceilings prohibited the deployment of separate ADA corps brigades with VII Corps and XVIII Airborne Corps, but each corps was provided with organic, composite Hawk/Patriot task forces. In September, 11th ADA Brigade formed Task Force Scorpion, the Army's first Hawk/Patriot task force, using 2-1 ADA (Hawk) and the remaining three 3-43 ADA Patriot batteries. Task Force Scorpion's mission was to protect the XVIII Airborne Corps against TBMs and conventional air attack. Since 3-43 ADA's fire direction center was with its batteries deployed to defend Riyadh, Task Force Scorpion called on the fire direction section from the 6th ADA Brigade's 1-43 ADA. The battalion needed the ICC rather than the TSQ-73 normally used with a Hawk battalion because only the ICC could effectively control and integrate the fires of both Hawk and Patriot at battalion level. When Task Force Scorpion departed Fort Bliss for surface shipment on Sept. 16, only three 1-43 ADA Patriot batteries remained at





American Joint Information Bureau

Bahrain, while D/1-7 ADA deployed to defend the fighter base at Tabuk.

During the build-up and expansion phase of Desert Shield, the 11th ADA Brigade forward command post split in two, with a tactical operations center at KKMC and the forward command post at Dhahran, the brigade log base. The brigade also established a forward support battalion with a transportation company, break-bulk point, Class IX warehouse and postal detachment. The support battalion, composed of non-dedicated brigade assets, moved an average of 40,000 pounds of repair parts and equipment and 28,000 pounds of mail an average of 10,000 miles every week. On the eve of the air campaign, 11th ADA Brigade units

were spread 1,250 kilometers east to west and 900 kilometers north to south.

Fearing that, once the war began, Iraq might retaliate against Turkey, which allowed U.S. and coalition forces to use Turkish air bases to launch strikes into Iraq, two 4-7 ADA Patriot batteries and two Dutch Patriot batteries from Germany deployed to Eastern Turkey. During the war, Iraq never launched strikes against Turkey, but the Patriot deployment highlighted NATO's resolve to reinforce Turkey and notified Saddam Hussein that an attack on Turkey would be considered an attack on NATO. In January, Germany deployed Hawk and Roland fire units to Turkey, further emphasizing this point.

The U.S. Hawk and Patriot crews had departed their home stations fully confident they could accomplish their mission, and during their months in the desert, their confidence had grown, as had their appreciation of what harsh conditions and the prospect of imminent combat can do for unit cohesion. The Hawk crews manning the outer perimeters of the Desert Shield air defense envelopes considered Patriot crews unlikely candidates for the glory that was soon to descend on them. There were plenty of hostile targets — Iraqi warplanes and helicopters probing U.S. air defenses along the border — showing up

Fort Bliss. They were, in fact, the only Patriot batteries left inside the continental United States. 5-62

ADA (Vulcan/Stinger), the 11th ADA Brigade SHORAD battalion, also provided support to the XVIII Airborne Corps.

In early November, when the Bush administration decided to increase troop levels in Saudi Arabia to give CENTCOM an offensive capability, the VII Corps was alerted to deploy from Germany. U.S. Army Europe formed a Patriot/Hawk task force out of 32nd AADCOR air defense units. Four batteries from 8-43 ADA (Patriot) combined with two Hawk batteries from 6-52 ADA (Hawk) to form Task Force 8-43 ADA. They deployed by surface to the theater. The 11th ADA Brigade exercised tactical control of the task force's fires, but command remained with VII Corps.

By this time the logistics buildup at King Khalid Military City (KKMC) was massive. Gen. H. Norman Schwarzkopf declared it his center of gravity, and the logistics center's survival became pivotal to the success of the campaign. A Hawk battalion, with its three Hawk Phase III batteries (2-52 ADA, Fort Bragg, N.C.), and a Patriot battalion (2-43 ADA, Hanau, Germany) arrived to help ensure its survival.

2-43 ADA, a 32nd AADCOR battalion, arrived ahead of its seaborne

Patriot crewmen stand guard over their system in Saudi Arabia.

equipment, several days before the start of the Operation Desert Storm air campaign,

which served as the trigger for the start of road movements that shifted the VII Corps and XVIII Airborne Corps far to the west. Using some of these soldiers from 2-43 ADA, operational readiness float assets from around the brigade and equipment taken from 2-7 ADA and 3-43 ADA, the brigade formed a provisional battery to begin the defense of KKMC. At the start of the air campaign, this battery provided the only air defense for the massive logistics base. It was augmented by C² assets provided by 2-43 ADA and two Patriot batteries from Task Force Scorpion. As 2-43 ADA equipment arrived, the KKMC anti-missile defense grew into an integrated four-battery defense and the provisional battery was disbanded.

Closure of 2-52 ADA (Jan. 16) and 2-43 ADA (Jan. 27) gave the KKMC logistics stockpiles and command complexes an integrated Hawk/Patriot defense. Integration of 2-43 ADA into KKMC defenses released the 2-1 ADA fire direction section and two Patriot batteries for movement concurrent with the start of the air campaign to protect the convoy routes north and northeast of KKMC.

Meanwhile, C/2-7 ADA deployed to defend the coalition staging area at



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on the Hawk radarscopes. None of the targets, despite positive identification as hostiles, had as yet fit the full engagement criteria, but the Hawkers figured that would change quickly once fighting began, and they were determined that not one would leak through their air defense barrier into the Patriot engagement zone. Besides, they reasoned, Hawk was a combat-proven air defense system while Patriot had never been combat-tested.

The news media, aware that Patriot had never been fired in anger, seemed startled to discover that the Patriot crews' peacetime training consisted almost exclusively of computer simulations rather than actual engagements. "It works the

same way," one crewman assured a network reporter. Although the media later attributed much of Patriot's success to superior technology, those who had followed the progress of our Patriot battalions from collective training through center certification or European tactical evaluations recognized it as a human achievement built on will and perseverance.

During days when the thermometer reached 120 degrees, it was cool inside the air-conditioned Patriot engagement control station where tactical control officers pushed the buttons that sent Patriot missiles on their way.

Outside, however, it was not a push button war. Sand kept mechanics, who maintained the bat-

Spec. Kenneth Hall signs a Patriot booster in a Dhahran hotel lobby.

tery's fleet of prime movers, busy around the clock. During drills, the "hot crew" moved through the sweltering heat from launcher to launcher, firing up diesel engines, powering up electronics and turning the torque tube handles on each canister to release the missiles for firing. Stinger teams, their equipment already loaded aboard trucks, fanned out to form a defensive perimeter against aircraft that might sneak underneath the Patriot's radar. The 50-page daily diagnostic printout showed the missile system repairmen that all systems were a "go," but the maintenance crew stood ever-ready to perform their battle damage assessment and repair drill in case something went wrong. Through the talcum powder sand, sergeants trudged from the launcher to the engagement control station to the information coordination central to the berm line. Everything was ready — had been ready practically forever — but still they checked.

When they first arrived in Saudi Arabia, the air defenders were optimistic that Saddam Hussein would bow to international pressure and withdraw his forces from Kuwait without a fight, but they grew more fatalistic with each rejected diplomatic overture. As the desert nights grew colder, and as the United Nations' Jan. 15 war deadline approached, they began to accept the inevitable. It's best to get it over with, they thought, and sooner rather than later. They didn't have much longer to wait.

Apache helicopters began the air campaign on the moonless night of Jan. 16 by taking out Iraqi early warning radars just across the border that had been laser-painted by special forces teams and commandos. At sea, Tomahawk missiles streaked from U.S. battleships, and a vast armada of warplanes streamed toward Baghdad. U.S. air defense units went on full alert all across Saudi Arabia and in Turkey, expecting instantaneous retaliatory air raids. At about 4 a.m. Saudi time, sirens wailed in Riyadh and the Tactical Air Command Center's screens lit up with a Scud alert, but the satellites had mistaken a flight of B-52 bombers over Iraq for a barrage of Iraqi missiles. Instead, the first Scuds rained down on Israel.



AP/Wideworld Photos



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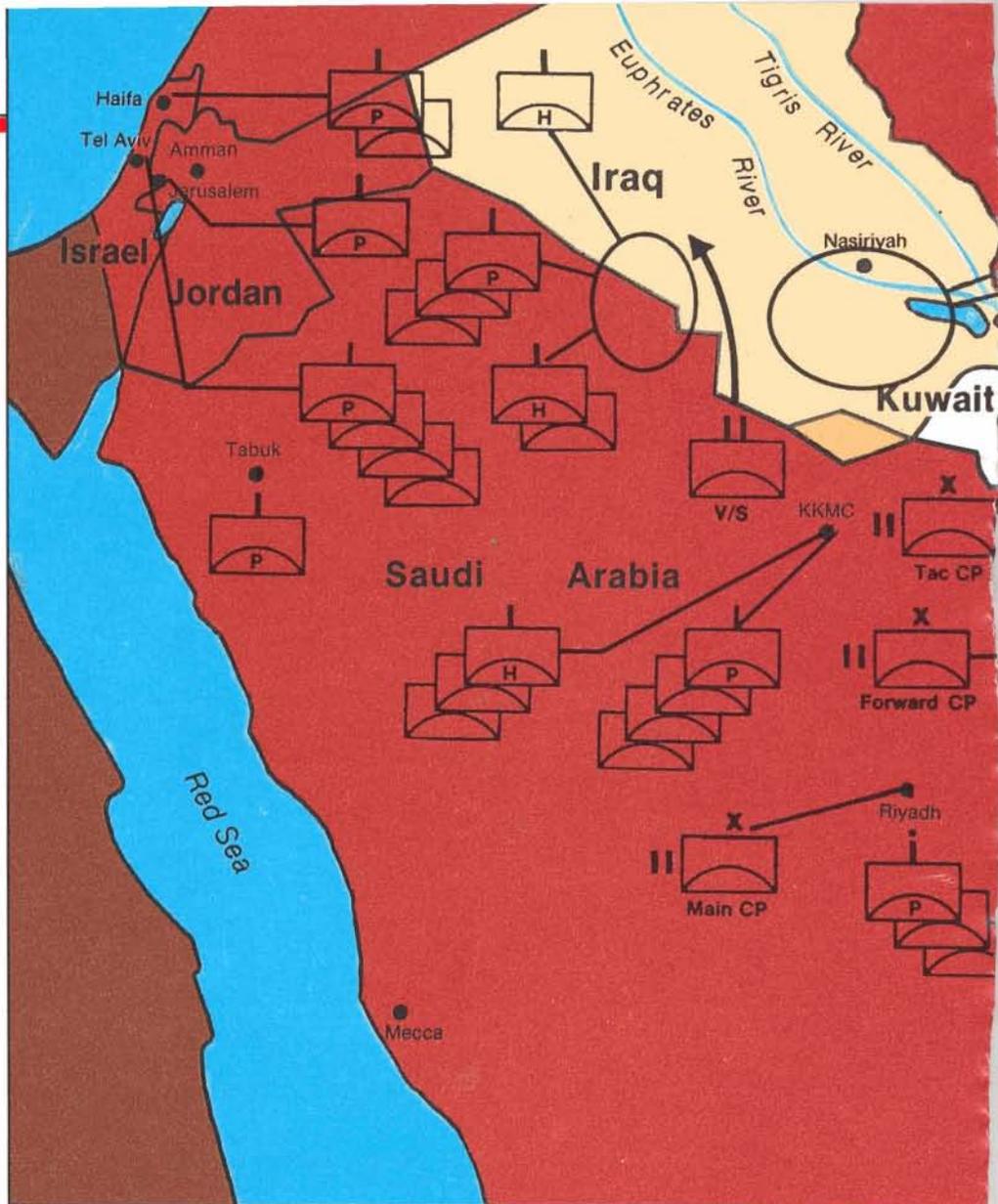
The streets of Israel's primary population centers became the front line of the war the night of Jan. 17, when the first Scud missiles impacted in Tel Aviv and Haifa, injuring 12 Israelis. Israeli jets scrambled for what the Bush administration feared would be a quick reprisal. Such a response against Iraq might have reawakened Arab-Israeli antagonism and unraveled the allied coalition. Within an hour after the first Scud fell, the Bush war cabinet assembled and President Bush phoned Prime Minister Yitzhak Shamir to offer U.S. Patriot batteries to defend Israel. Shamir had turned down a similar offer a few weeks earlier, but this time he accepted.

The United States had given Israel two Patriot fire units in October 1990 but, although the fire units were in place, their crews were still in training somewhere in the United States. The Army refused to say exactly where, even though the location of the training base was hardly a mystery.

"I've moved up through the Hawk missile system, starting as a technician and finally commanding a Hawk regiment," said the lieutenant colonel who commanded the Israeli Patriot detachment. "Then I was asked to put together a team to man the Patriots. We were looking for several important characteristics in each candidate and we tested them extensively and exhaustively. Finally, we selected our first Patriot operations and technical team and sent them to the United States for training. The U.S. Army developed a terrific program especially for us, and our team managed to plow through the material."

The Israeli Patriot operations team, which had almost completed its training, was sent back to Israel with a contingent of American maintenance personnel. This allowed them to leave their technical team behind to finish the course. The Israeli Patriot soldiers left the United States on Jan. 18 and placed the first battery in operation on Jan. 20.

"I think we achieved a world record for getting a Patriot battery operational," said the Israeli commander. Within 24 hours, the first Israeli Patriot battery was up and ready and, that same night, an Israeli crew became their country's first Scudbusters.



Meanwhile, a massive airlift transported two 4-43 ADA Patriot PAC-2 batteries from Germany to Israel.

These batteries reached Israel on Jan. 19, became fully operational by Jan. 22 and were soon shooting down Scuds. The 700 men and women of the battalion made history by becoming the first foreign troops to participate in the defense of the State of Israel. They also became instant celebrities. They were blown kisses in the streets and invited home for dinner. The Israeli Air Force produced an English-language newspaper titled "Scudbusters" especially for the Patriot crews.

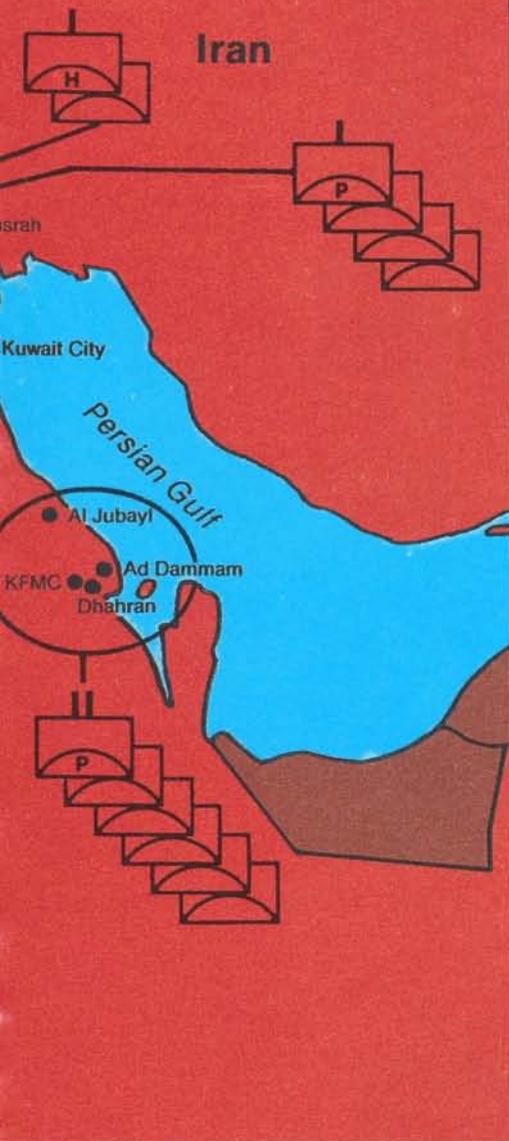
"I didn't think this is what war would be like," said Capt. Craig Prestenback of 4-43 ADA. "The people here are taking exceptional care of us, and we've established great working rela-

HIMAD units at the end of the Desert Storm ground war.

tionships." The crewmen received a standing ovation at a civic symphony when the orchestra played the "Star Spangled Banner," and one woman insisted that passing Patriot soldiers be included in her wedding photos.

"We have traveled around, and people stop us just to say thank you," said 10th ADA Brigade commander Col. David K. Heebner. "They want to say it in more than just words, and they give freely to make us feel welcome. This has never happened to me anywhere else — and I've been around the world. Every country is special in its own way, but we've never been smothered with hospitality as we have been here."

"We have received the full support and cooperation of the Americans, and



population centers. We are, however, certain that the Patriot system has proven itself."

The Scuds kept coming at Israel from western Iraq. The U.S. and Israeli Patriot batteries intercepted those that came within range of the fire units, but it soon became apparent that four batteries couldn't defend the large Haifa and Tel Aviv areas. So two additional Patriot batteries from 1-7 ADA left Germany to take up defensive positions. As the attacks on Israel continued, the Dutch and Germans agreed to provide one Patriot fire unit each to help in the defense.

Meanwhile, the Patriot batteries in Saudi Arabia made history of their own. On the night of Jan. 18, A/2-7 ADA at Dhahran was prepared for a possible Scud attack. The sun had set, the city lights had blinked on, and all was quiet except for the coming and going of fighter aircraft from the air base. After several hours, just as the crew started to relax, a diamond-shaped symbol flashed on the radar scope, indicating an incoming Scud. The quiet was suddenly shattered as a Patriot missile exploded from its canister. All eyes turned toward the streaking missile as it pierced the low cloud cover. A brilliant flash of light signaled the destruction of the first Scud missile by Patriot in Operation Desert Storm. In less than 60 seconds it was all over: the first intercept of a TBM in combat had become history.

"All the efforts of so many people, military and civilian, in the days leading up to this moment had suddenly paid off," reflected Thomson. "For as the debris fell to the ground, it quickly became clear that the missile would have impacted on the village housing a number of VII Corps soldiers. The number of lives saved by Patriot will never be known, but in this one engagement alone it would have been significant."

Amazingly, millions of Americans witnessed the first intercept live on prime-time television. A glowing orb streaked horizontally across the night sky above Dhahran and made a sudden vertical leap into clouds that were instantly illuminated by the glow of an intercept.

"What was that?" asked ABC's Ted Koppel. "I don't know," answered his

correspondent in Dhahran. But hundreds of air defenders watching television back in the United States thought they knew, and they stayed glued to their television sets until official confirmation came from the Pentagon: "A Patriot missile has intercepted a Scud missile over Saudi Arabia."

Capt. Jim Sprangler, A/2-7 ADA commander, said that the historic intercept went perfectly, just like in training. But, he added, "It's a lot different when you know, if you miss it, it could mean people will die. We're very excited. We're the first Patriot battery in the history of the world to shoot down a Scud."

"That's only one Scud missile intercepted," pointed out ABC's Sam Donaldson, "but so far, Patriot is batting a thousand."

Some analysts worried that the first intercept of a single Scud might have been a lucky shot. These fears, however, were quickly laid to rest the night of Jan. 21, when Patriot batteries countered salvos of Scuds.

"I was present at the 2-7 ADA command post as the multiple engagements were conducted," said Thomson. "We were reconstructing the events of the previous night's engagement when the first alert of a Scud launch was received. The battalion S-3, Maj. Larry Hollars, quickly ordered all units to ready status, and all personnel began to assume MOPP 4 in anticipation of Iraqi chemical weapons. Before we could get our masks on, less than 15 seconds after the alert, the first Patriot missile launched from the launch station just outside the command post entry. This was quickly followed by a second launch from an adjacent launch station.

"The rush of adrenaline, the excitement and pride mixed with fear, was enormous, particularly when confirmation of a kill came in," he continued. "There were some very tense moments when word was received of a possible missile hit at the 85th Evacuation Hospital on the air base, but it was soon clarified by a report that the impact was only debris and there were no injuries. After multiple attacks on the air base that night, the only runway repair needed was to run a street sweeper to clear away the debris."

I believe that, together, we can improve the performance of the Patriot," said Gen. Avihu Ben-Nun, Israeli Air Force commander. "We mustn't forget that this is the first operational use of the missile and, as with all firsts, there's a lot to learn and some changes to be made. Our Patriot teams have been learning as much as they can about Patriot tactics, and we have been adapting the software to our region. We have also been discussing changes to the missile, its seeker head and launcher with the manufacturer and other parties.

"We still have to improve our Patriot performance so that the entire incoming Scud is destroyed, especially the warhead," he added. "The State of Israel can never be satisfied with the performance of the Patriot missile as long as a single Scud can still fall on our

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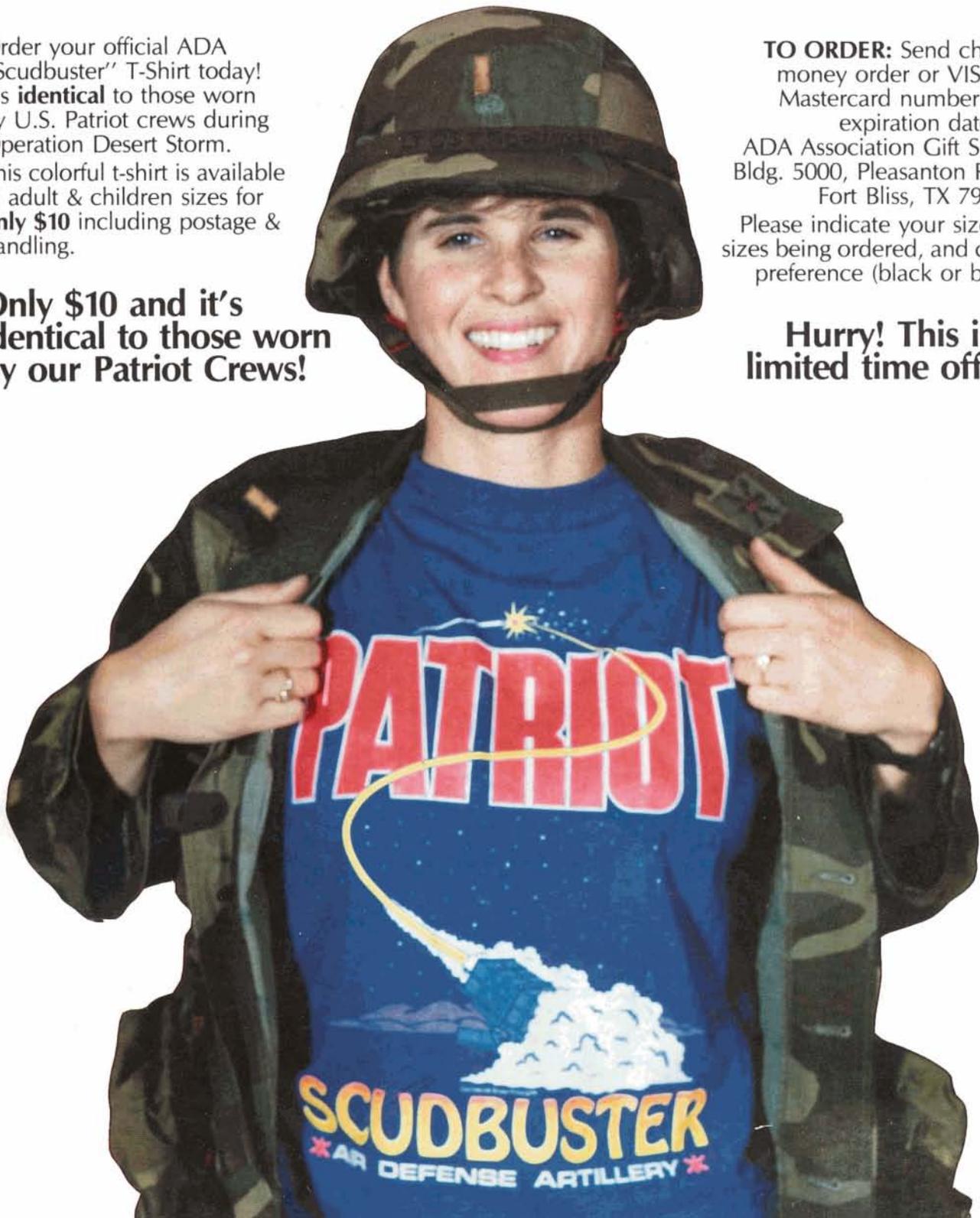
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At home, Americans watched the confusing action during breaks in the Buffalo Bills-Oakland Raiders playoff game. A CENTCOM briefing officer, Lt. Col. Mike Gallagher, later explained to Americans what they had seen on television earlier in the day. "We now believe 10 missiles were launched and U.S. Patriot air defense systems shot down nine of them," said Gallagher. "Iraq fired the first launch of three Scud missiles into eastern Saudi Arabia about 9:50 p.m. Saudi time. They were engaged by five Patriot air defense missiles and were shot down near Dhahran. In the second attack on Jan. 21, about 12:45 this morning Saudi time, Iraq fired seven Scud missiles: four at Riyadh, two at Dhahran and one into the Arabian Gulf off Dhahran. Six of these missiles were shot down by Patriot missiles. The one that landed in the water did not require engagement."

Counting the initial Jan. 18 engagement — and discounting the errant Scud that Patriot tactical control officers declined to waste a missile on — the score stood at 10 for 10 and ADA was still batting a thousand.

As Scuds continued to fall on Saudi Arabia and Israel throughout the Desert Storm air campaign, missile reload time became a critical factor. Interestingly, it was not uncommon to see the battery personnel joined by airmen at the Patriot launchers. One battery even had Air Force forklifts aiding them, allowing them to reload 10 Patriot missiles in about 90 minutes. Fortunately, there was always enough time between Scud launches to complete reload operations.

Patriot crews faced the constant rumors that plague all soldiers in combat zones. Were the Iraqis going to deliver chemicals by Scud? Were Iraqi fire direction teams using television broadcasts of Scud intercepts and impacts to improve their accuracy? The Air Force can't find and kill the Scud launchers, and the Scuds are specifically targeting Patriot now! Iraq has hundreds of Scuds, and we're running out of Patriot missiles! The rumors continued and only added to the "fog of war."

The Patriot crews sat for hours watching an uneventful scope until they received a warning. Then they executed as their training dictated, and

then they waited. Seconds turned into minutes and sometimes hours. Then the targets came — one, two or three. The Scuds often broke up on reentry — which was the warhead and which was the tail? Then, many times faster than the speed of sound, Scud and Patriot met on their collision course. Eyes stayed glued to the screen, looking for the probable kill indicator. Then more splits. Was it debris? Had the warhead survived? The tactical control officers watched for changing heading and speed indicators. Was the track tumbling? Another missile away, and a kill on who knows what. Then one by one, the targets dropped off the scope and the "All Clear" sounded. Missile reload became the priority, and a crew after-action review got underway. The life of the Patriot crews never lacked suspense.

CENTCOM briefers attempted to downplay the Scud threat as militarily insignificant, but they left no doubt about the dimensions of its political and diplomatic implications.

"Now I want to turn, finally, to Scuds, another subject that has been prominent in everyone's minds," said Schwarzkopf during a Jan. 30 briefing. "It's a terror weapon that's been targeted against civilian population centers, and that makes it important, so let's talk about Scuds for a minute."

"As you know, the total Scud launches have been 53 — 27 against Saudi Arabia and 26 against Israel. I think that it's significant . . . that in the first week they launched 35 and in the second week they launched 18. I like to feel like we're doing some good."

"We've flown almost 1,500 sorties against the Scuds to date, and the Patriot's success, of course, is known to everyone. It's 100 percent — so far, of 33 engaged, there have been 33 destroyed," Schwarzkopf concluded.

Patriot eventually killed 52 Scuds during the war, 35 in Saudi Arabia and 17 in Israel. Scuds killed and wounded civilians in Israel, and a Scud that apparently broke apart as it entered the Patriot engagement envelope hit a U.S. barracks in Dhahran and inflicted the Gulf War's severest casualties. But Patriot saved scores of lives by providing an effective defense of metropolitan centers, a task it was not designed to perform. And it performed superbly

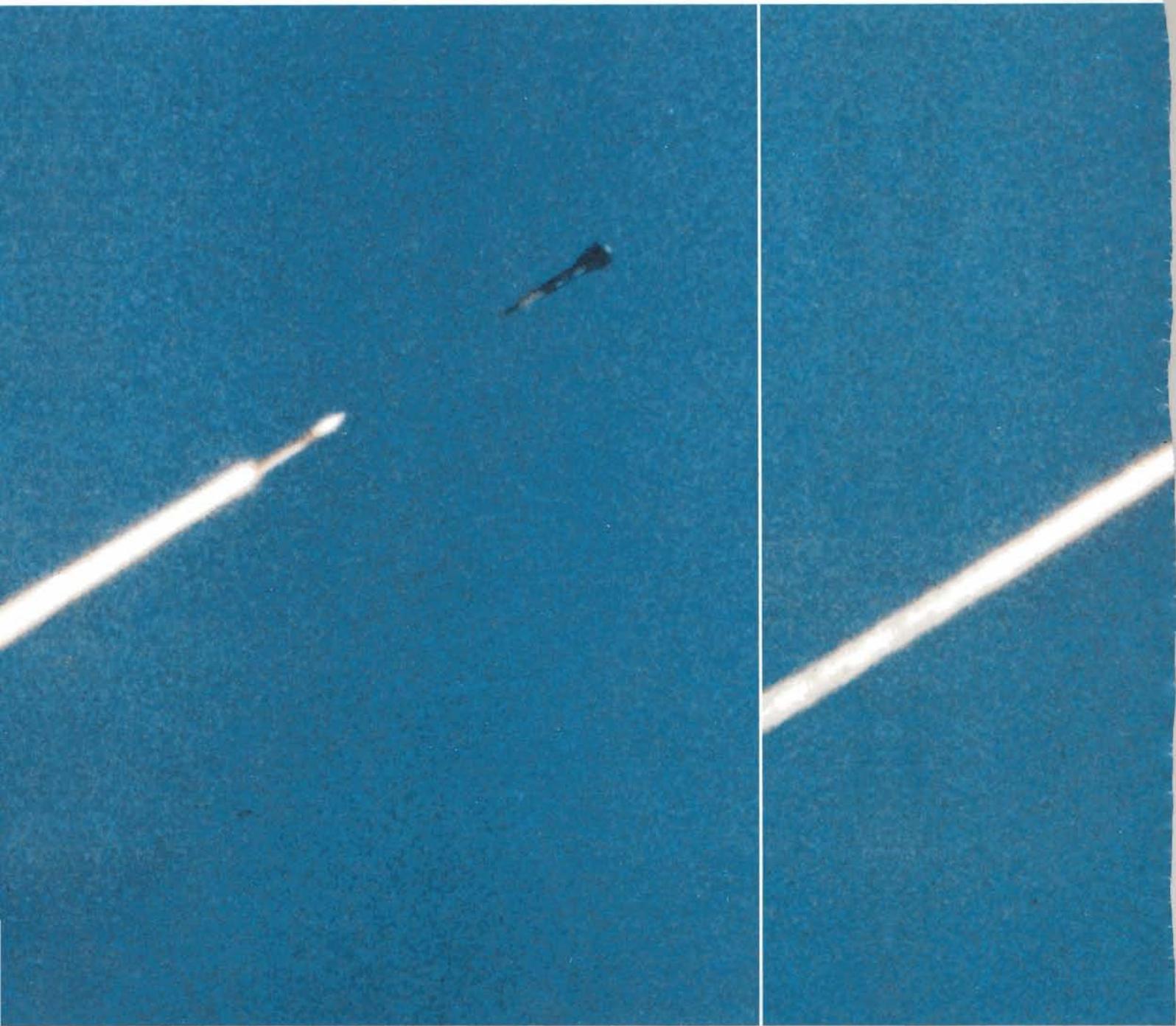
— perfectly, actually — at its primary mission of defending critical military assets. The Gulf War provided a wartime test of the Patriot that enabled the Army to test it thoroughly and make modifications quickly. Patriot undeniably captured the world's attention during Operation Desert Storm and proved that air defense is a viable member of the combined arms team. Patriot's dazzling performance won the "First to Fire" branch the confidence and appreciation of our joint and coalition partners in the Gulf War and the admiration of the nation.

"Desert Storm challenged our soldiers and their families as well as our weapon systems," said Col. Garrett, "and they responded magnificently. The Patriot crews got most of the publicity, but I'm just as proud of the soldiers in our Hawk and short-range air defense batteries and our maintenance and support units. I think we were all encouraged that the weapon systems worked as well as they did but for me, the technological marvels were eclipsed by the wonderful performance of our soldiers and the strength of support from the home front. The support provided by Fort Bliss and the El Paso community was truly outstanding. No commander could help but love these soldiers."

Operation Desert Storm was a remarkable campaign that showcased the performance of America's high technology weapons and the ability of U.S. soldiers, sailors, airmen and Marines to operate and maintain them. The world, for the first time, saw 21st Century technology, tactics and doctrine employed on today's battlefield.

The Patriot missile, with its deadly accuracy, quickly emerged as one of the "glamor" systems of the Persian Gulf war. Serving as a weapon of diplomacy as well as a weapon of war, the Patriot helped hold the fragile Gulf War coalition together by providing a measure of protection for Saudi Arabian and Israeli population centers as well as defending coalition ports, air fields, staging areas and logistics centers from TBM attack.

"When the history of Desert Storm is written, the Patriot system will be singled out as the key," said Schwarzkopf. "Patriot's success has ensured coalition solidarity."



Patriot. Built to take out today's air threats.

Today the accuracy, quick reaction, and firepower of the Raytheon-developed Patriot surface-to-air missile system are more than a match for supersonic aircraft. Even in a heavy ECM environment.

Patriot's anti-tactical missile (ATM) capabilities have also been clearly demonstrated by its interception and destruction of numerous tactical ballistic missiles. Software and hardware modifications to the system have been implemented.

But what about tomorrow? What about the more sophisticated

threats we can expect in the future, like advanced TBMs?

The answer is that readily achievable software and hardware changes will make Patriot responsive to anticipated threats as they arise.

Patriot's reliability, like its growth capability, stems from Raytheon's attention to the fundamentals of radar guidance, software development, and systems management. The end result is that deployed Patriot systems perform at better than twice the

PURPLE HEARTS

Remembering those who fell in battle

Ask squad leader SSgt. Jon V. Smith about Sgt. Jimmy DeWayne Haws and he will tell you unabashedly that the Vulcan gunner lived and died a hero. "He's my hero! When I get older and I'm talking to my kids, I'll tell them about a guy I knew who, in my eyes, was a hero and one hell of a guy," said Smith. Haws was the only ADA soldier killed in action during Operation Desert Storm.

A Vulcan senior gunner with C Battery, 4th Battalion, 5th Air Defense Artillery, Fort Hood, Texas, Haws was mortally wounded Feb. 20, 1991, approximately 30 miles inside Iraq, when an anti-armor round scored a direct hit on his self-propelled Vulcan.

Smith described "Jimmy Jam" (as Haws was affectionately known) as "the kind of guy you never had to check on. If Haws did it, you knew it was done right, it was good to go. He took a lot of pride in his gun and in his job. He was excellent!"

Posthumously promoted to staff sergeant, Haws was on his third enlistment and had served two tours in Germany. He is survived by his three-year-old son, Roger Lee Haws, parents Walker (Wayne) and Alma (Faye) Haws of Travers, Calif., and a sister, Darla Robeson.

Haws' mother, Faye, is proud that her son earned his GED after joining the Army and had decided to pursue a career in the military. "I was proud to call him my son," said Haws' father, Wayne. "I told him he didn't have to prove anything by staying in, but he said he loved the Army and wanted to make it a career."

Faye worries that her grandson may be too young to remember his father. "At the funeral Roger saw Jimmy's picture in a wreath and pointed, saying, 'Daddy,' but later at the cemetery he pointed to other uniformed soldiers and called them Daddy too," Faye cried. "There's just not much a kid remembers when he's three years old."

"Jimmy was a good kid," Faye reflected. "He was a man but, to his parents, he'll always be their son, their baby. My baby! I fought for him all of my life, no, all of his life. But this was one battle I couldn't fight for him. It's just a numb feeling, knowing that he's not coming home. It's so hard to believe."

"I feel sorry for all the parents who will go through this," said Wayne.

Haws, just 28 on the day he was notified of his deployment, was engaged to Barbara Carroll, a Killeen, Texas, schoolteacher. "Jim Haws was a quiet man, a proud man. He was proud to be an American — and when he was called to go, he felt it was his job. Something that needed to be taken care of," said Carroll. "He was a good man, and he did not die in vain."

"He was most comfortable in a shirt, jeans and western boots. He liked rock and country and western music. Jim played the guitar, shot pool and rode motorbikes. He recently purchased a new ski boat, that we (Jim, myself and my son Michael) loved to take out on the lake on weekends," Carroll recalled. "He loved his son, Roger, more than anything. He just loved life and tried to make the most of it."

"It just doesn't seem possible," Carroll grieved. "I never thought on Oct. 7, when I drove him to the post, it would be the last time I would ever see him alive." Almost to herself, she whispered, "Jim had wanted us to get married before he left. Who would have thought that of the 23,000 soldiers sent from Fort Hood, Jim would be one of the 11 killed?"

Carroll's first meeting with Haws' family was at his funeral. She arrived in California wearing a pin of yellow ribbons with Haws' picture in the center so his family could recognize her.

A flight attendant who saw the pin assumed she was on her way to a joyful homecoming and was very excited for her. "She came up to me and said, 'you must be ecstatic the war is over.' I then explained the circumstances of my trip," Carroll recalled.

"Had it not been for the genuine sympathy, generosity and patriotic spirit of my friends and coworkers, I might not have been able to attend Jim's funeral at all," she said. "I appreciate all they did for me."

"It seemed like the whole town came out to honor Jim and say farewell. It was right out of a Norman Rockwell picture. People lined the streets to pay their last respects to Jim, holding their hats over their hearts, saluting and waving American flags. The whole police force turned out to escort us to the cemetery. Jim's mother was presented with the flag that had draped the coffin and his son, Roger, who just turned three on March 10, was given a second flag containing seven spent shells from the 21-gun salute."



SSgt. Jimmy D. Haws
1962-1991

"It had rained on and off the whole time I was there, but the day of the funeral, the rain held off until after the service at the cemetery. As soon as the service ended, it began to rain and then turned to hail. Jim's mother turned to me and said, 'they're tears from heaven.' By the time we got back to the house, a brilliant double rainbow had appeared," Carroll recalled.

Staff Sergeant Jimmy D. Haws believed in the cause for which he fought. He rolled into combat proud of his country and confident in his mission, giving his best.

S Sgt. Jon V. Smith was severely wounded by shrapnel during the same encounter. Amidst the flame, and bleeding profusely, Smith radioed for assistance. Knowing there was nothing more he could do for Haws, he made sure the other members of his squad safely vacated the vehicle. He then extinguished the flames engulfing the Vulcan.

"While under fire, my driver, PFC Eric D. Morland, and my Stinger gunner, PFC Earl R. Idle Jr., rendered immediate medical attention to me. It could have been much worse for me if not for their immediate attention and professionalism," said Smith. "We were a team and we acted as a team."

Smith had to be trucked back to the Saudi border before he could be airlifted out. "Every time we stopped to have the helicopters pick us up," Smith recalled,

"they (the Iraqis) started firing artillery rounds in on us.

"I didn't know how badly I was wounded. I wasn't sure I still had my eye, there was so much blood, and they had given me morphine. I had this hole in my head. At first, the doctors thought metal had gone through my eye and lodged in my brain, but it hadn't. I still have pieces of metal in my head, but they're working their way out," Smith said.

Smith's vehicle was one of two Vulcans that accompanied a contingent of the 1st Cavalry Division's Bradley Scouts into Iraq the previous night to provide air defense. The Bradleys' mission: call in artillery fire on an Iraqi observation post and command posts. Iraqi ground troops engaged the Bradley Scouts the morning after they successfully completed their mission. The Bradleys quickly defeated the Iraqis but, while taking prisoners, they were fired upon by artillery and tanks. One round scored a direct hit on the Vulcan.

Smith, his wife Bobbi and four children, Vincent (14), Angelika (12), and surviving triplet sons Jon and Dwayne (2) (their daughter, Christine, died just months before Smith was deployed) are anxiously awaiting the medical



SSgt. Jon V. Smith

evaluation that will determine whether or not he will remain on active duty. A 15-year veteran, Smith served three overseas tours, earning an Army Commendation Medal and seven Army Achievement Medals prior to Operation Desert Storm.

Smith added, "I sure miss the guys over there too, the guys in the unit."

On Feb. 27, 1991, shortly after the final battle of the war and just hours before the cease-fire, PFC Clayton E. Martyn Jr. became the third ADA casualty of Operation Desert Storm. He got out of the ammo truck he was driving to stretch his legs and stepped on an Iraqi mine. Martyn's Vulcan/Stinger battery was in support of VII Corps as it thrust eastward to trap the retreating Republican Guard.

Martyn, a Vulcan driver/gunner assigned to B/5-3 ADA, Wackernheim, Germany, deployed to Saudi Arabia in December as a 5-ton vehicle driver.

"We had previously engaged a large Republican Guard unit and were heading north through the lines of passage. The battle site was littered with burnt out Russian vehicles, deserted weaponry and the bodies of Iraqi soldiers. We had traveled two or three miles more when our convoy stopped to take a small break," Martyn recounted. "I was the only one hit when I stepped on it. I was totally conscious and in a lot of pain. I thought I'd lost my legs."

According to Martyn, Sgt. Frederick G. Baker was the first to reach him. "Baker's not only my track commander, he's also my best friend. Oblivious of any danger to him-

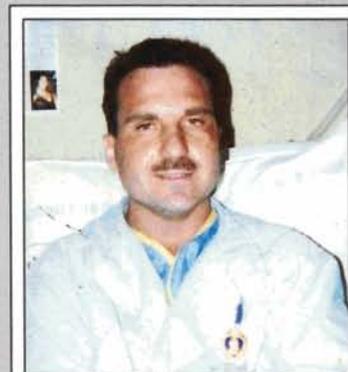
self, he did not hesitate to come to my aid. I was in a bad way, I cried out for help and he was there. I think what he did was very heroic."

Martyn also praised the medics, the doctors and the MEDEVAC team, crediting their quick response and professional care for the miracle of saving not only his life but also his shattered legs.

"I was told that I was airlifted out in one of the fastest times of the whole campaign. Probably 18 to 19 minutes after I stepped on the mine, the MEDEVAC chopper flew me out. They were just super."

Martyn, 35, is originally from Fort Lauderdale, Fla., and is the father of two, a daughter Christina (11) and son Michael (8). He had his own business until two years ago when he decided to join the Army for a change of pace. He wanted a little adventure in his life, so he enlisted for a combat arms MOS.

B/5-3 ADA was his first unit assignment after completing advanced individual training, and Martyn is extremely



PFC Clayton Martyn

proud to have served with them. "In the beginning, I think we were all a little scared. We were in Dhahran at the MGM hotel complex across from the airfield when the Scud attacks started. Although the threat of chemical attack concerned us, we had a lot of trust in our MOPP gear and a lot of trust in our leadership. Personally, I think our training held us all together."

Although Martyn's Vulcan unit didn't engage the enemy, he opined, "I think if we engaged anything they threw up against us, we would have been very well prepared and victorious. We had few breakdowns and the sand and mechanical problems were minimal. The maintenance was terrific."

Martyn concluded by saying, "I feel kind of bad being laid up in the hospital. I wish I were back there with them and could have come back with them. I just want to let the guys know, I'm damn proud of them."

Martyn is currently recuperating in a stateside hospital and is very positive about the future.

Pvt. 2 James Richard Ard was assigned to A/1-5 ADA, Fort Stewart, Ga., in December 1990, his first assignment upon completion of advanced individual training as a Stinger gunner. He traveled halfway round the world to join his unit.

On Feb. 28, 1991, just one day after the cease-fire, Ard's section was supporting a bunker-destroying, mine-clearing operation. He climbed out of the driver's hatch of his armored personnel carrier, walked to the rear of the vehicle and stepped on what was suspected to be an unexploded cluster bomb.

Ard, 18, from New Zion, S.C., is a June 1990 graduate of East Clarendon High School. He enlisted immediately after graduation. When asked why he selected Air Defense Artillery as his branch and 16S as his MOS, Ard answered, "I saw it in a recruiting film. It looked interesting, something I'd like to do."

Ard was granted 10 days of leave before being deployed. At home everyone was on edge. When his leave was up, his father, a Vietnam veteran, drove him to Fort Stewart. Along the way Ard's father imparted some words of wisdom from his own experiences: "Watch out for yourself. Don't worry about what's going on around you or about anybody else. Take care of yourself first."

Upon arrival at his unit, Ard admitted being a little scared. "Being the new kid on the block is no fun. The guys tend to tease you a lot. There was this one guy, Spec. John Cox, who kind of took me under his wing and watched out for me," Ard recalled.

Cox said, "Ard was eager to learn and picked up on things quickly. He really wanted to learn, so I taught him as much as I could, and I tried to watch out for him. In his way, I guess he watched out for me too. He would share Bible scripture with me and make me think of things I kind of put in the back of my mind. He's a great guy."

Capt. Mark K. Carlson, Ard's battery commander, recalled, "Private Ard joined us in the desert. He fit right in. Some didn't adapt as well to the desert or the battery, but Ard never let himself get isolated as the new soldier.

He made friends right away. He had a good attitude and he never complained about anything."

SSgt. Jeffery Prude, Ard's section chief, said, "Ard is the type of soldier that could bring morale up when things seemed down." SFC Reinalda Pinero, Ard's platoon sergeant, recalled, "Ard was well liked and fit in from the first day of his arrival. We will always remember him as one of our team members. Private Ard, we're all proud of you for a job well done . . . Victory!"

Ard admitted that the circumstances surrounding the events of Feb. 28 are vague. He does remember hearing rumors of 200 Iraqi tanks heading in their direction.

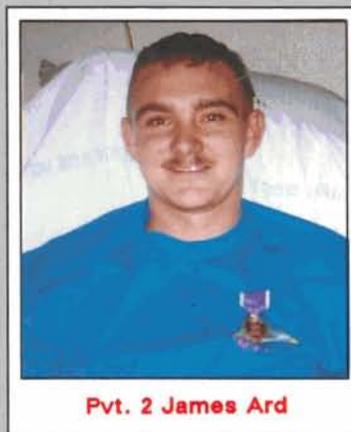
"All our vehicles were bottlenecked on the highway. I got out to see if there was any available cover in case we were attacked. I don't remember seeing anything, but I do remember the blast, flying up into the air and landing on the ground. I didn't go into shock or anything, but I didn't look down at my legs either, so I don't know what I stepped on. The medic got to me in less than a minute and then I was MEDEVACed out. When I got to the hospital

in Germany, I called my parents and told them I had lost my right leg."

Ard plans on marrying his fiancée, Hope Mims, in July 1992. "She's been so supportive. She even came up here and spent a week with me. She sure is proud of me," Ard declared. "I get to go home for a visit on Saturday and I can't wait."

Contemplating the future, Ard said, "I'm going to school as soon as I get out of here — hopefully I'll get married — and I'll have to get a job. I can't just sit around the house all day."

Ard is currently recuperating and undergoing therapy at Walter Reed Army Medical Center. He is very optimistic and in good spirits. When asked to smile for a photo, he replied, "I'm always smiling. You've got to make the best of it: no use being down in the dumps."

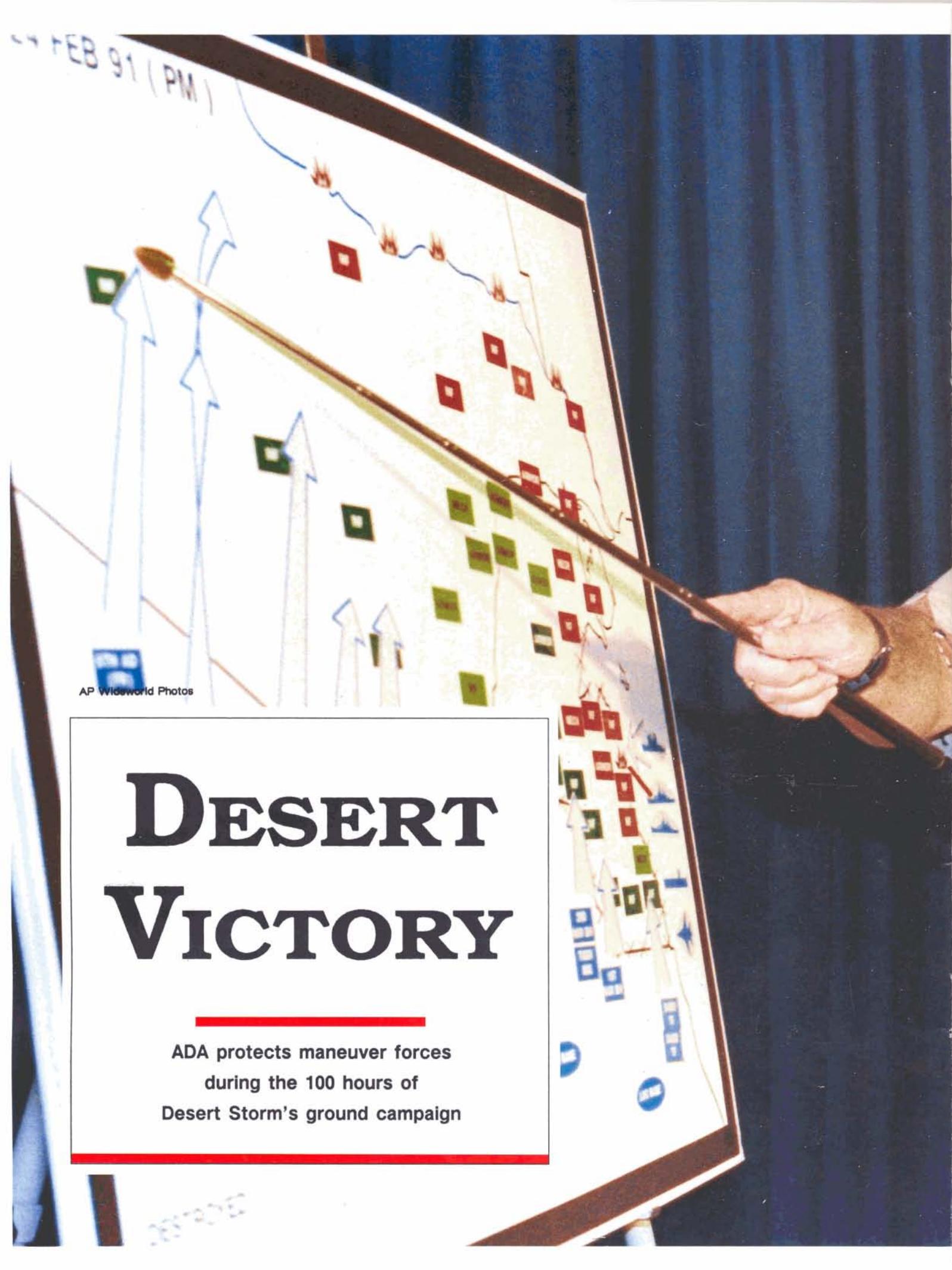


Pvt. 2 James Ard

War is more than countries at odds with each other, more than disagreements between world leaders. War shapes the future and leaves some only the past. No matter how long or short, war changes the lives of soldiers and their loved ones forever. Air Defense Artillery is proud to call these men air defenders, and gratefully acknowledges their sacrifice and devotion to duty and country.

KATHLEEN COVER

Soldiers in this article were carried on casualty lists immediately following Desert Storm. Other ADA soldiers not listed as casualties at the time of publication may qualify for Purple Hearts.



AP Wideworld Photos

DESERT VICTORY

ADA protects maneuver forces
during the 100 hours of
Desert Storm's ground campaign



SCHWARZKOPF

U.S. ARMY



A few hours before "G-Day," Gen. H. Norman Schwarzkopf, architect of Operation Desert Storm, took a final look at the situation map in the U.S. Army Central Command (CENTCOM) war room. He saw that Iraqi field commanders had not realigned their forces in reaction to his massive shift of coalition forces — two whole corps of armor, mechanized infantry and airborne divisions — to the western flank. Most of the Iraqi army, Schwarzkopf saw, was still bottled up in Kuwait, drawn up in static positions to defend against a frontal assault directly against the "Saddam Line" in southern Iraq or to repel amphibious landings on its eastern flank. The Iraqi command seemed blissfully unaware of the armored avalanche poised to come crashing down on its army's lightly defended right flank.

"Gotcha!" the burly general exclaimed.

Saddam Hussein had boasted that Americans attempting to breach Iraqi defense lines "would swim in their own blood." For weeks expert analysts, most of them retired generals, had captivated television audiences with harrowing descriptions of seasoned Iraqi soldiers, fire barriers, acres of minefields, massed artillery pieces, elite Republican Guard units and the specter of chemical warfare. War protesters struggling to revive the anti-war movement of the 1960s predicted their ranks would swell once thousands of GIs, victims of frontal assaults against the vaunted Saddam Line, started being shipped home in body bags.

Schwarzkopf, however, had a different game plan, and he was uniquely prepared to execute it. During the summer of 1989, Schwarzkopf and his CENTCOM staff had begun work on revising plan 1002-88, an outdated scenario that pitted the United States against the Soviet Union in a superpower confrontation fought out in Europe and Southwest Asia. A new scenario, 1002-90, based on new assumptions emerged and, by luck, CENTCOM had just staged an elaborate command post exercise projecting Iraq as the opponent when Iraq's Republican Guard stormed into Kuwait. So Schwarzkopf knew what it would



Z.T. James Crabtree

take to crush Saddam Hussein's army and, as a Vietnam veteran, he was determined not to repeat the mistakes that led America into its Southeast Asian nightmare.

From the beginning, Schwarzkopf advocated applying overwhelming force toward a clear-cut objective — the destruction of the Iraqi military. His grand design was strengthened and enhanced at every step by American President George Bush, Secretary of Defense Dick Cheney and Chairman of the Joint Chiefs of Staff Gen. Colin Powell. Soldiers deploying for Operation Desert Shield worried that the American public might abandon them in the sand dunes of Arabia the way it had abandoned soldiers in the jungles and rice paddies of Vietnam, but their fears proved unfounded. Public support for the war never flagged, and the patriotic fervor the

Gulf War generated rivaled the national unity displayed during World War II.

The Desert Storm ground campaign that crushed the Iraqi army lasted only 100 hours and produced miraculously few casualties. Iraqi soldiers, for the most part, demonstrated an aversion for martyrdom, greeting advancing coalition soldiers with white flags and surrender leaflets instead of machine gun fire and artillery rounds. "Now we know what it would be like if somebody gave a war and nobody showed," said a disgruntled infantry captain. Iraqi units that didn't surrender in mass raced desperately for the narrow corridors leading out of Kuwait across the Euphrates River.

It was a blowout from start to finish, a textbook operation in which everything went almost exactly as planned except the enemy — who failed to put



up much of a fight. **Hawk and Vulcan**
 Within 48 hours of **convoys on the**
 the Feb. 24 kickoff, **move inside Iraq.**
 the Desert Storm

ground campaign disintegrated into a race for the exits. Even when coalition forces ran into determined resistance, in some cases Republican Guard armor units counterattacking or attempting to break out of the encirclement, the results were the same: Iraqi forces were quickly routed or annihilated. Asked if he was engaging the Republican Guard's elite Tawakaina Brigade, a 3rd Armored Division battalion commander replied, "No Sir, we are *destroying* the Tawakaina Brigade."

No one expected things to be that easy in the beginning. Stinger teams from Headquarters and Headquarters Battery, 2nd Battalion, 52nd Air Defense Artillery, Fort Bragg, N.C., were the first air defenders on the ground.



2LT Mark Hayden

They touched down with the XVIII Airborne Corps headquarters within 24 hours of the decision to deploy U.S. forces. Elements of the 3-4 ADA, 82nd Airborne Division, Fort Bragg, arrived shortly after. They were followed closely by B/2-7 ADA, the first 11th ADA Brigade Patriot battery to deploy. The situation confronting the air defenders who were among the first to draw the "line in the sand" was grim. They faced not only a robust conventional air threat, but a formidable tactical ballistic missile threat. During the opening days of Operation Desert

Shield, their best hope of stopping Iraq's huge, modernized army, had it plunged across the border during the lodgement phase of Operation Desert Shield, was a decisive victory in the opening air battle — a victory that would have largely depended on the ability of rapidly deploying Patriot batteries to defend Saudi air bases.

The situation grew less desperate with the arrival of each heavy mechanized infantry or armored division with their organic divisional air defense units. Air Defense Artillery continued to play a key role as planners shifted

priorities from defensive to offensive operations and set up Saddam Hussein for the "left hook" that demolished the Iraqi army. In the middle of November, the Bush administration decided to increase U.S. deployment to counter the large numbers of Iraqi forces that had flowed into Kuwait and southern Iraq. At this time, Schwarzkopf made a deliberate decision to align coalition forces opposite Iraqi forces manning the Saddam Line in southern Kuwait, a move that kept the Iraqi force bottled up inside Kuwait where they would be vulnerable to a flanking attack. The Marine Corps, with thousands of troops at sea, practiced highly publicized amphibious landings in the Persian Gulf to keep the Iraqis worried about a seaborne assault against their eastern flank.

"They put a very, very heavy barrier of infantry along here [eastern Kuwait], and they proceeded to build an extensive barrier that went all the way across the border, down, around and up the side of Kuwait," explained Schwarzkopf. "Basically, the problem we were faced with was this: when you looked at the troop numbers, they really outnumbered us about three to two. And when you considered the number of combat service support people we had, that's logisticians and that sort of thing, in our armed forces, as far as fighting troops, we were really outnumbered two to one. In addition to that, they had 4,700 tanks vs. our 3,500 when the buildup was complete, and they had a great deal more artillery than we did.

"I think any student of military strategy would tell you that to attack a position, you should have a ratio of approximately three to one in favor of the attacker," Schwarzkopf continued. "And to attack a position that is heavily dug in and barricaded, such as the one we had here, you should have a [troop] ratio of five to one in favor of the attacker.

"So you can see basically what our problem was at that time. We were outnumbered a minimum of three to two as far as troops were concerned, we were outnumbered as far as tanks were concerned, and we had to come up with some way to make up the difference. What we did, of course, was start an extensive air campaign.

"One of the purposes . . . of that extensive air campaign," Schwarzkopf continued, "was to isolate the Kuwaiti theater of operation by taking out all the bridges and supply lines between the northern and southern part of Iraq. That was to prevent reinforcement and supplies coming into the southern part of Iraq and the Kuwaiti theater of operation. It was necessary to reduce these forces down to a strength that made them weaker, particularly along the front-line barrier we had to go through. We continued our heavy operations out in the sea because we wanted the Iraqis to continue to believe that we were going to conduct a massive amphibious operation."

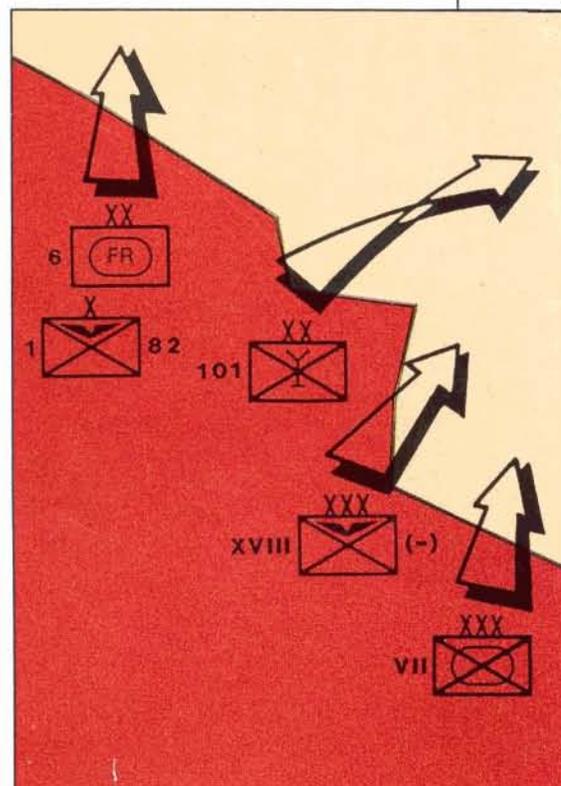
A barrage of Tomahawk missiles, the thunder of Apache attack helicopters and the roar of a vast air armada on Jan. 17 announced the beginning of Operation Desert Storm's air campaign. The Iraqi air force was quickly knocked out of the war. The few Iraqi aircraft that rose to challenge coalition pilots were shot down, others fled to Iran and the remainder cowered in hardened bunkers or hid in civilian neighborhoods. Once the Iraqi air force had abandoned the battlefield, Schwarzkopf was free to begin the massive shift of forces to the west.

"Very early on we took out the Iraqi air force," Schwarzkopf said. "We knew that he had very limited reconnaissance means; therefore, when we took out his air force, for all intents and purposes, we also took out his ability to see what we were doing down here in Saudi Arabia. Once we had taken out his eyes, we did what could best be described as the 'Hail Mary' play in football. I think you recall, when the quarterback is desperate for a touchdown at the very end, he steps up behind the center, and all of a sudden every single one of his receivers goes way out to one flank. They all run down the field as fast as they possibly can into the end zone, and the quarterback lobs the ball. In essence that's what we did.

"When we knew he couldn't see us anymore, we did a massive movement of troops all the way out . . . to the extreme west, because at that time we knew he was still fixed in this area [southern Kuwait] with the vast majority of his forces, and once the air cam-

paign started, he would be incapable of moving out to counter this move even if he knew we made it," Schwarzkopf continued. "There were some additional troops out in this area [Iraqi territory west of Kuwait], but they did not have the capability or the time to put in the barrier Saddam Hussein described as 'an absolutely impenetrable tank barrier that no one would ever get through' — I believe those were his words. So this was absolutely an extraordinary move. I must tell you, I can't recall anytime in the annals of military history when this number of forces have moved over this distance to put themselves in a position to be able to attack. Not only did we move the troops out there, but we literally moved thousands and thousands of tons of fuel, of ammunition, of spare parts, of water and of food . . . because we wanted to have enough supplies on hand so that if we launched this and if we got into a slugfest battle, which we very easily could have gotten into, we'd have enough supplies to last for 60 days."

Gen. Robert E. Lee tried something like it at Chancellorsville, sending Stonewall Jackson and two-thirds of the Army of Northern Virginia, its



flank exposed, on a long march across the front of the Army of the Potomac. Had Fighting Joe Hooker discovered the maneuver, he could have easily cut the Confederate army in half. To keep Hooker distracted, Lee ordered the skeleton force left facing the huge Union army to feign preparations for a frontal assault. Brigadiers stood in dense patches of forest shouting orders to imaginary troops. The deception worked perfectly. Jackson turned Hooker's right flank, and his men, bursting out of the woods in a battle line two miles long, bowled over the Union left flank like nine pins. Now Schwarzkopf was trying the same thing, but on a much grander scale.

The "great deception" moved 150,000 troops, positioned just south of the Kuwaiti border, hundreds of kilometers to the west. The XVIII Airborne Corps began its migration west on Jan. 17, moving its three-and-a-half divisions 500 miles in 12 days. A 100-man "stay behind" detachment erected inflatable tanks and generated radio traffic typical of a corps headquarters to make the Iraqis think the corps was still in place. The 3rd Armored Cavalry Regiment, which

moved 250 miles, dubbed the deployment the "Road Trip from Hell" because of the hazardous driving conditions that killed more U.S. soldiers than had died during the air campaign phase of the war. Most of the move was made at night, some of it through blinding dust storms. VII Corps began its sidestep to the west on Feb. 16, moving in precisely the formation it would use in the attack, then wheeling 90 degrees into position northeast of Hafar Al Batim. VII Corps left behind its own deception detachment with phony transmitters and a device that faked Hawk electronic emissions.

Air Defense Artillery continued to play a key role in coalition planning during the shift of forces to the west and during the subsequent ground campaign. Once the air campaign got underway, the "First to Fire" branch's battle against Iraqi tactical ballistic missiles quickly became one of the most highly publicized events of the war, but coalition commanders never lost sight of the threat posed by Iraqi war planes and attack helicopters. In a

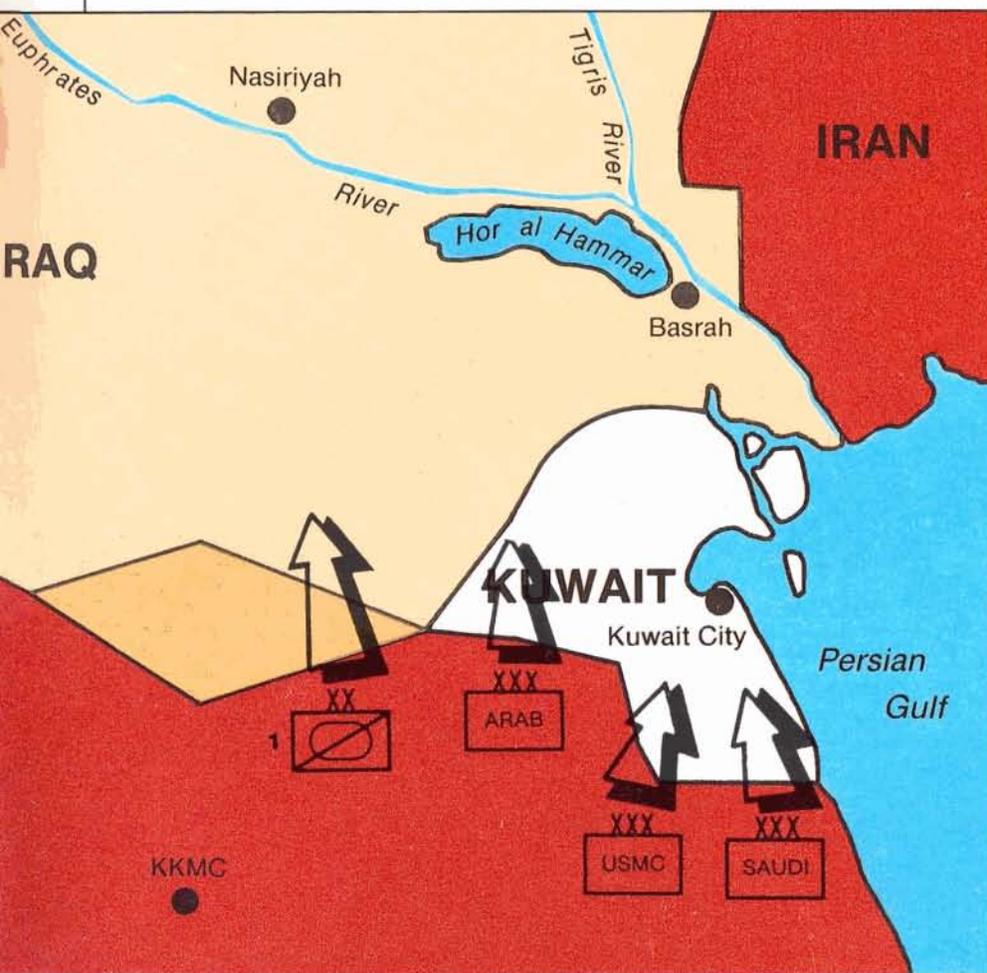
briefing delivered on the eve of the ground war, Schwarzkopf told newsmen that "the

0+24: Coalition spearheads thrust into southern Iraq and Kuwait.

only thing that's really surprised me, as I've already stated many times, about the Iraqis is the fact that their air force particularly hasn't chosen to fight. And also how easy it was to completely take out his air defense systems in such a way that we have freedom of action. But," Schwarzkopf had added, "the Iraqi air force will always remain a threat so long as they have one airplane, but, as Gen. [Colin] Powell stated earlier this week, we have gained and maintained air superiority. We have freedom of action to operate any time we want to up there. And every time they fly, we shoot them down . . . but the threat is always there, and we're never, ever going to assume away the threat."

The initial challenge for the 11th ADA Brigade was to provide air defense protection of the XVIII Airborne Corps during its part of the Hail Mary move and maintain anti-missile defense at the ports, air bases and capital while not providing any advance warning of the move west. The Vulcan/Stinger units of the brigade's 5-62 ADA moved with the elements they were supporting, the 3rd Armored Cavalry Regiment and corps artillery, and provided short-range air defense throughout the move. A bigger problem was providing continuous coverage with Hawk and Patriot while the corps was on the move. At the height of the movement phase, military supply route (MSR) Dodge, or "Tapline Road," was bumper-to-bumper with tanks, artillery, multiple launch rocket systems, Bradley fighting vehicles and supply trucks moving at an average convoy speed of 20 to 25 miles per hour — an almost irresistible target for any kind of air attack.

The most tempting of all targets, however, was Log Base B near King Khalid Military City. This colossal log base, site of Schwarzkopf's 60-day stockpile of supplies, sprawled over 40 square miles and ranked as the largest logistics base in the history of the Army. Log Base C, which lay alongside Tapline Road northwest of King Khalid Military City, was the largest XVIII Airborne Corps logistics base. Both of these log bases, as well as the tactical air base near Rafha, were key air defense priorities throughout the days leading to the ground war.





2LT James Crabtree

As the Hail Mary move began, Task Force Scorpion had three Hawk batteries, one Patriot battery, its headquarters and an ordnance company remaining in the original positions. The task force soon embarked on the longest tactical Hawk and Patriot convoy in the Army's history. Its southern battery began its move north to Tapline Road, then northeast past Hafar al Batim to Rafha. Covering a distance of more than 1,200 kilometers in a convoy that drove more than 27 hours without a break, the battery was operational within hours of its arrival. The remaining elements soon duplicated this move. In effect, Task Force Scorpion had extended its coverage the length of the corps movement.

Lt. Col. Walter Kilgore, 2-1 ADA commander, briefs his soldiers prior to their move into Iraq.

As the corps elements closed, the task force closed up its units from the end into their new positions. Gaps created

in coverage as units moved were filled by units of Task Force 8-43 (Hawk/Patriot), already in position along Tapline Road with the VII Corps.

During the opening weeks of Desert Storm, divisional air defense soldiers (the Chaparral, Avenger and Vulcan crews and Stinger teams) continued to provide short-range air defense for their supported units. They watched the orange glow of ordnance detonating inside Kuwait and Iraq as coalition pilots pounded Iraqi positions.

As G-Day approached, the Vulcan crews and Stinger teams covered prob-

ing attacks past the berm line deep into Kuwait and Iraq. Sgt. Jimmy DeWayne Haws of C/4-5 ADA became the only air defender killed in action on Feb. 20, when an Iraqi anti-armor round slammed into his Vulcan track. The Vulcan had been providing air defense for 1st Armored Cavalry Division Bradley fighting vehicles dispatched deep into Iraq to knock out enemy command posts in preparation for the coming ground offensive.

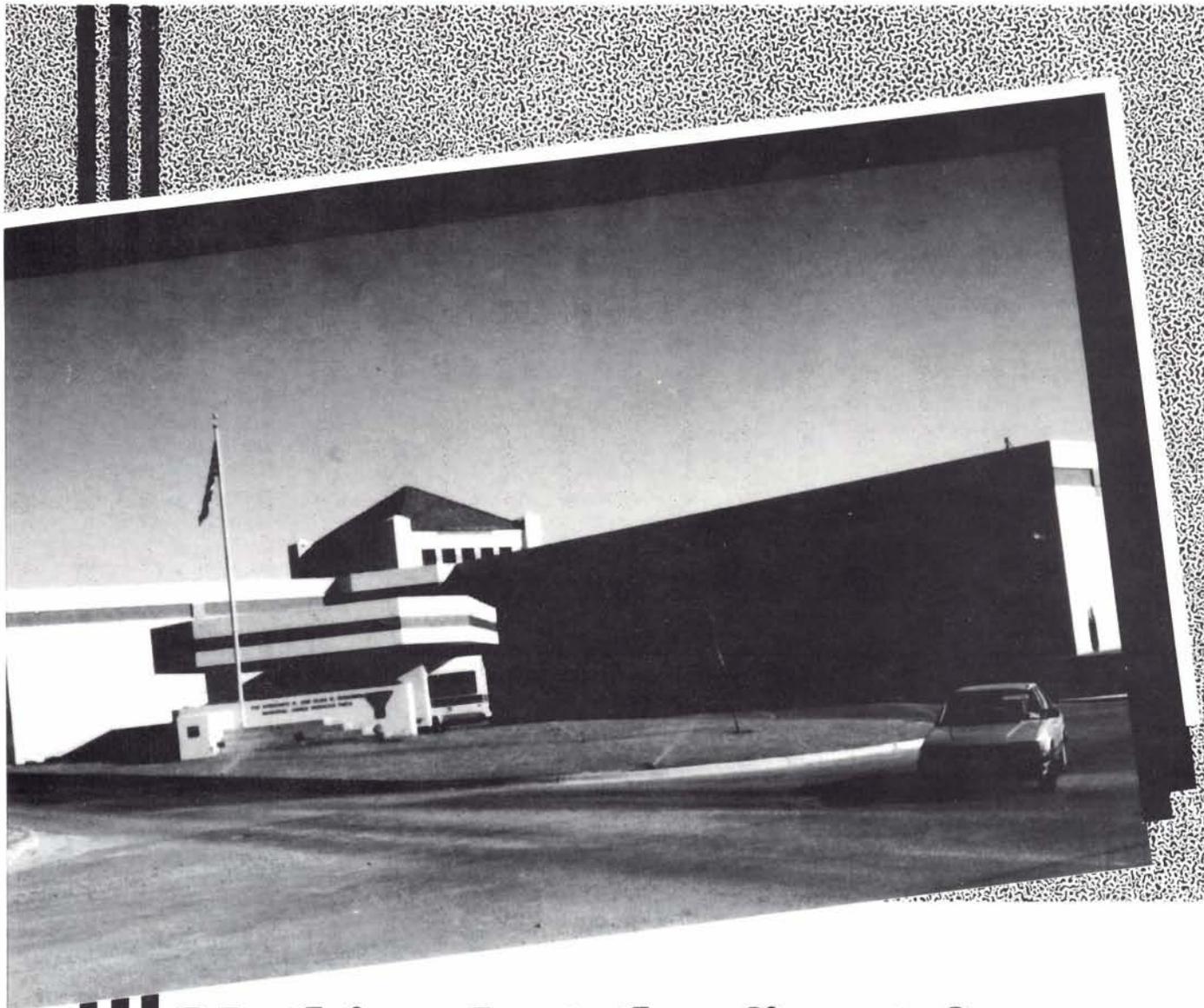
Schwarzkopf launched the major ground offensive on Feb. 24. All that could be planned had been planned and, after spending months in the desert, the Desert Storm troopers welcomed the final act of the Gulf War.

"Those who are home in bed this day will hold their manhood cheap," Maj. Ed Parrish of the 101st Airborne (Air Assault) Division quoted Shakespeare's Henry V.

"This is not only for the liberation of Kuwait — it's for the liberation of me from my situation," said Spec. Keith Doty. Armed Forces Radio stations broadcast "Hit Me With Your Best Shot" and "Saturday Night's Alright (for Fighting)" as the assault forces moved toward their objectives.

At 4 a.m., the 1st and 2nd Marine Divisions, accompanied by the 2nd Armored Division's Tiger Brigade, launched attacks through the barrier systems in southern Kuwait. As the Marines drove north, two Saudi task forces attacked toward Kuwait City along the Persian Gulf coast highway. The attacks against the Saddam Line were designed as feints to distract Iraqi attention from the main offensive brewing on the western flank.

"Our planning initially had been to start over here in this area [Saudi-Kuwaiti border] and do exactly what the Iraqis thought we were going to do, take them on head-on into their most heavily defended area," Schwarzkopf explained. "Also, at the same time, we launched amphibious feints and naval gunfire in this area [Kuwait's Persian Gulf coast] so that they continued to think that we were going to be attacking along this coast, and therefore fixed their forces into position. Our hope was that by fixing their forces in this position [inside Kuwait] . . . they wouldn't know what was going on out in this area [western flank]."



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2LT Mark Hayden

Far to the west, the XVIII Airborne Corps was on the move. The 6th French Armored Division and 82nd Airborne Division struck overland toward Al Salman Airfield to establish the coalition's left flank. The 101st Airborne (AA) Division was held up by bad weather, but by eight in the morning had launched an air assault 75 miles into the enemy territory and established forward operating base Cobra, a forward arming and refueling point to sustain XVIII Airborne Corps' drive into Iraq.

The following morning, the "Screaming Eagles" moved nearly 100 miles farther north to the banks of the Euphrates where they cut Highway 8, the link between Baghdad and

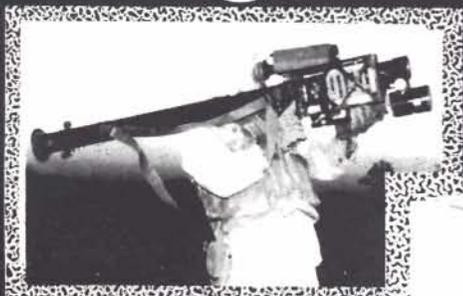
An A-15 ADA Vulcan moves past exploding Iraqi vehicles in the Rumalla oil field.

Basra. The 24th Infantry Division (Mechanized), its right flank guarded by the 3rd Armored Cavalry Regiment, drove north to link up with the 101st in the Euphrates River Valley. Having marched to within 150 miles of lightly defended Baghdad, the XVIII Airborne Corps was astride Highway 8 in position to slam the door on Republican Guard units attempting to retreat across the Euphrates.

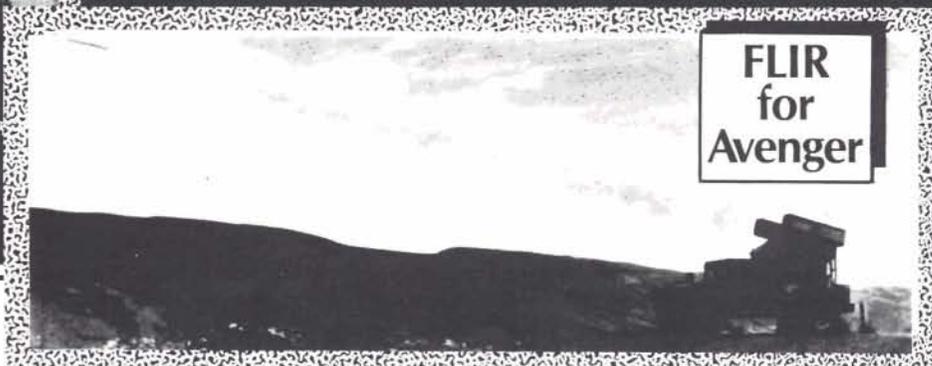
The VII Corps, comprised of the 1st and 2nd Armored Divisions, 1st Infantry Division, 2nd Armored Cavalry Regiment and the British 1st Armored Division, drove north deep into Iraq and then wheeled east to confront Republican Guard divisions. The 1st Infantry Division (Mechanized) attacked up the Wadi al Batin, a natural invasion corridor. The attack served partly to cover the right flank of VII Corps and partly as a diversion largely designed to fool the Iraqis into thinking it was the main offensive thrust. It succeeded by luring a counterattacking Republican Guard division deeper into Schwarzkopf's trap.

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Divisional ADA units poured into Iraq along with VII Corps and XVIII Airborne Corps. Elements of the 11th ADA Brigade were also on the move. B/5-62 ADA moved immediately into Iraq with the attack of the 3rd Armored Cavalry Regiment. The remaining elements of 5-62 ADA accompanied their supported artillery units as they moved into Iraq in support of the XVIII Airborne Corps. Task Force Scorpion made its initial move at approximately 0+24 hours, when B/2-1 ADA moved north along MSR Texas into Iraq to protect XVIII Airborne Corps forces driving toward Al Salman and then toward An Nasiriyah on the Euphrates River.

Mine-clearing took on a whole new meaning for the soldiers of B/2-1 ADA. Minefields existed all along MSR Texas, and the engineers only cleared 10 meters on either side of the road. The battery had to clear its own access to its positions. Because of the distance involved in this initial move, standard command and control linkages with the task force fire direction center were impossible. Command and control was provided by a direct downlink between the brigade controller flying aboard the airborne warning and control system and the battery's fire platoons, the linkage provided by the task force's adaptive surface interface terminal van. An additional Hawk battery, one Patriot battery, and the task force headquarters were scheduled to follow, but the abrupt end to the war canceled their moves.

Task Force 8-43 had an extremely difficult and complex mission — providing protection for VII Corps. One of its key missions was to cover the 1st Infantry Division (Mechanized) as it breached the Iraqi defensive line and drove northeast up the Wadi al Batin. The "Big Red One" opened 24 lanes through the berm and then through minefields. Supporting the attack required Hawk and Patriot fire units to deploy much closer to the forward line of own troops than current doctrine allowed. Patriot anti-tactical ballistic missile and Hawk protection had to extend across the entire breaching operation. One successful hit by either fixed-wing aircraft or Scud missiles could have disrupted the entire operation. As the breach expanded, Task

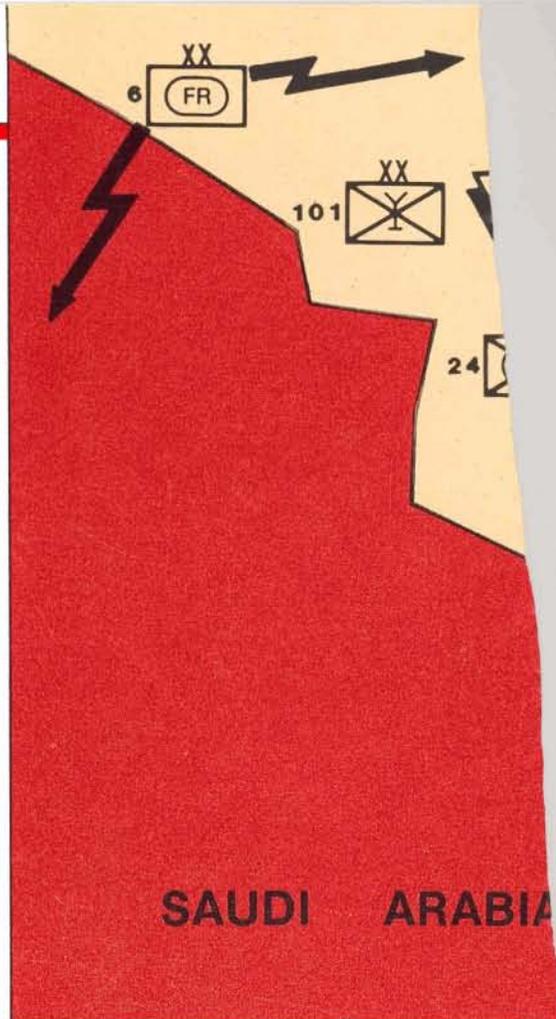
Force 8-43 units flowed into Iraq in support of the attacking units.

As they drove through Iraq, the U.S. air defenders were amazed at the destruction wrought by the air campaign, the tide of enemy prisoners of war and the light resistance offered by Iraqi ground forces. Troopers of the 82nd Airborne Division in southern Iraq found about 12 Iraqi aircraft, including French-built Mirage and Soviet-built MiG fighter-bombers and a group of Soviet-built Mi-8 and Mi-24 helicopters, still hidden in bunkers and still in good operating condition. However, air defenders were surprised and more than a little frustrated by the disappearance of the Iraqi air force. Instead of photographs of downed Iraqi aircraft, Hawk and Patriot air defense crews settled for photographs of themselves posed on the abandoned or bombed-out Iraqi air defense guns strewn across the battlefield. Vulcan crews had better luck. They didn't have to depend on the Iraqi air force to supply them with targets.

"During Operation Desert Storm, my platoon supported Task Force 4-64, a 24th Infantry Division (Mechanized) armor task force," said 2nd Lt. Mark E. Hayden, 3rd Platoon leader, A/1-5 ADA. "On March 2, we moved west into the Rumalia Oil Field to counter the Republican Guard and destroy all their equipment. Following in a column formation behind the lead tank company, we came under resistance from the Republican Guard. The Vulcans and the armored personnel carrier started engaging enemy combat and support vehicles, buildings and bunkers. The tankers were really surprised when the Vulcans opened up, firing 20mm rounds down range. Our Vulcans inflicted their fair share of damage by destroying three bunkers and numerous enemy vehicles.

"Moving on the roads of this oil field with burning vehicles exploding as their ammunition and fuel cooked off gave me a deep appreciation for the protection an armored personnel carrier provides," he continued. "As we passed the burning vehicles, explosions would rattle and shake our tracks. Fragments flew by in all directions.

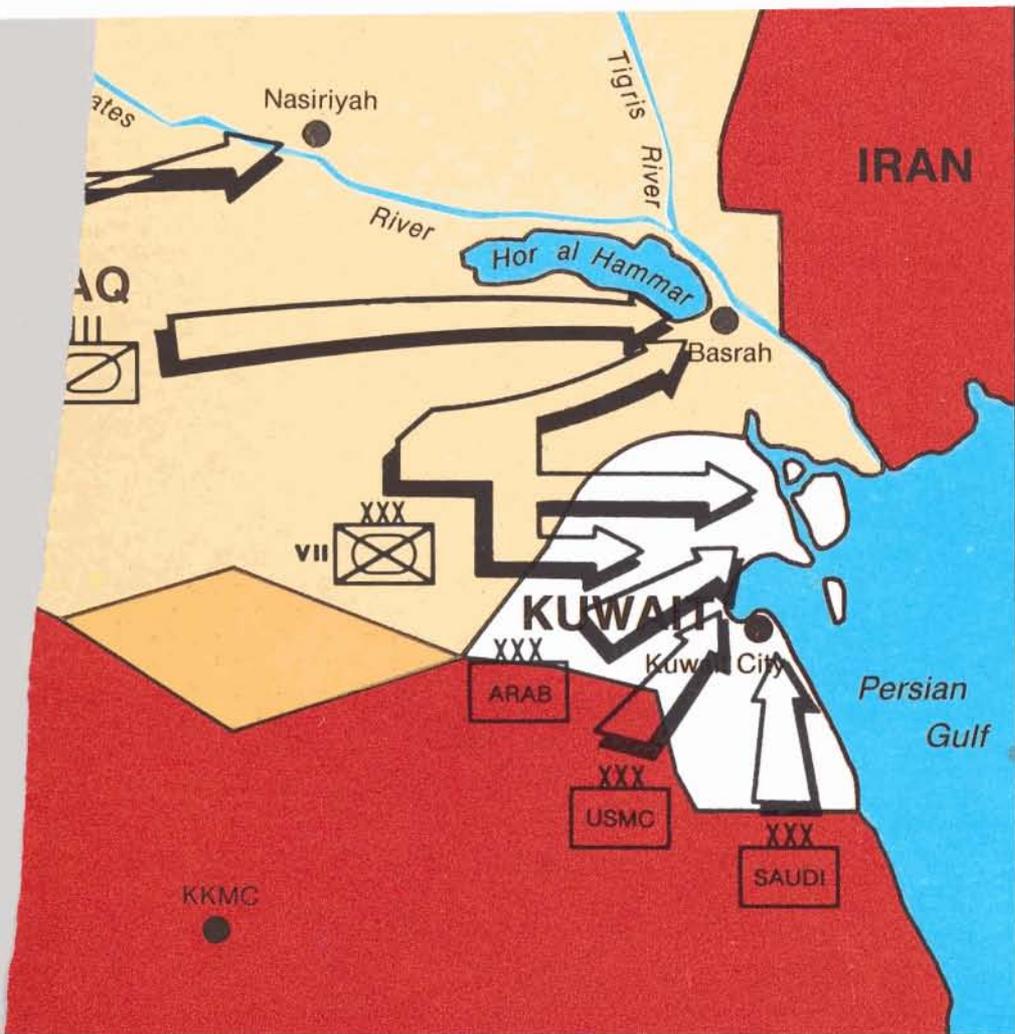
"The most courageous act I witnessed during the battle was when



SFC Shane Gray, my platoon sergeant, and PFC Shane Geiger, his driver, drove a Humvee down roads lined with exploding vehicles to provide the platoon with maintenance support," Hayden said.

Air defenders of 2-3 ADA, 1st Infantry Division (Mechanized), while relocating the tactical operations center to keep up with the division's advance into Iraq, came across a company-size group of abandoned Iraqi T-55 tanks emplaced in an elaborate arrangement of sand dunes designed to funnel coalition forces into a killing zone. Headquarters Battery used Claymore mines and Swedish AT-4 anti-tank weapons to destroy the tanks. "That's got to be the most beautiful sight I've seen in weeks," said Lt. Col. Clifford Willis, 2-3 ADA battalion commander, as flames from secondary explosions engulfed the tanks.

On Feb. 27, the final day of the ground offensive, the Marine divisions and Saudi task forces completed the liberation of Kuwait City while the VII Corps and XVIII Airborne Corps completed the destruction of the Iraqi army. The XVIII Airborne Corps, led



herents following the hostilities as the soldiers of Desert Storm witnessed the human suffering inflicted by Saddam Hussein reflected in the faces of thousands of refugees. But the war of weapons had ended, and the war of diplomacy had resumed.

The Gulf War cease fire was negotiated in a green tent set up along an airstrip captured by the 1st Infantry Division in its thrust across the Saudi border. The helicopter squadron that bore the commander of coalition forces to Safwan Airfield included six Apache attack helicopters armed with Hellfire missiles.

Flying in through the thick black smoke erupting from burning Kuwaiti oil wells, Schwarzkopf thought the region looked like a vision of Hell. American flags, flown from tent poles and vehicle antennas, flapped in a brisk wind. "Welcome to Iraq. Courtesy of the Big Red One," read a sign propped against a battle tank.

Schwarzkopf had ordered the airfield ringed with field artillery pieces, M-1A1 battle tanks and Patriot missile launchers. The Patriot launchers, from Task Force 8-43, were there partly for security precautions, partly as a show of force and partly as a tribute to Air Defense Artillery.

During the Desert Storm ground campaign, the "First to Fire" branch engaged not a single hostile aircraft, but after Patriot's dazzling performance against Iraqi Scuds, no one any longer doubted the branch's ability to shoot down aircraft. Throughout the Hail Mary move and the climactic sweep of armor across the desert sand, ADA's high- to medium-altitude and forward area air defense units dramatically demonstrated their ability to maneuver with, and provide air defense coverage for, maneuver forces during one of history's most dramatic armored campaigns — a campaign that moved so swiftly even helicopters had trouble keeping the pace.

For air defenders enplaning for the homeward flight back to the United States or, as they termed it, "back to reality," the challenge of Desert Storm was a challenge met. They looked forward to meeting the challenges of the future with increased confidence — a confidence based on proven performance during Operation Desert Storm.

by the 24th Infantry Division (Mechanized), turned east and roared down Highway 8 toward Basra, engaging and destroying more than 200 Iraqi tanks in the largest tank battle since World War II. The VII Corps continued to maul its way eastward into Kuwait, crushing several Iraqi divisions and forcing the Republican Guard to flee into the path of the XVIII Airborne Corps.

The Iraqi army, fourth largest and best equipped in the world after the military forces of the United States, the Soviet Union and China, had enjoyed a fearsome reputation prior to the unleashing of Desert Storm. Hardened by eight grueling years of war with Iran and triumphant after its cruel but effective blitzkrieg of Kuwait, the Iraqi army was indeed a formidable fighting force, but it was a 20th Century army completely outmaneuvered, outgunned, outclassed and outfought by a 21st Century opponent. The coalition onslaught destroyed the Republican Guard's Tawakalna and Medina Divisions and heavily damaged its Hammurabi and Adnan Divisions.

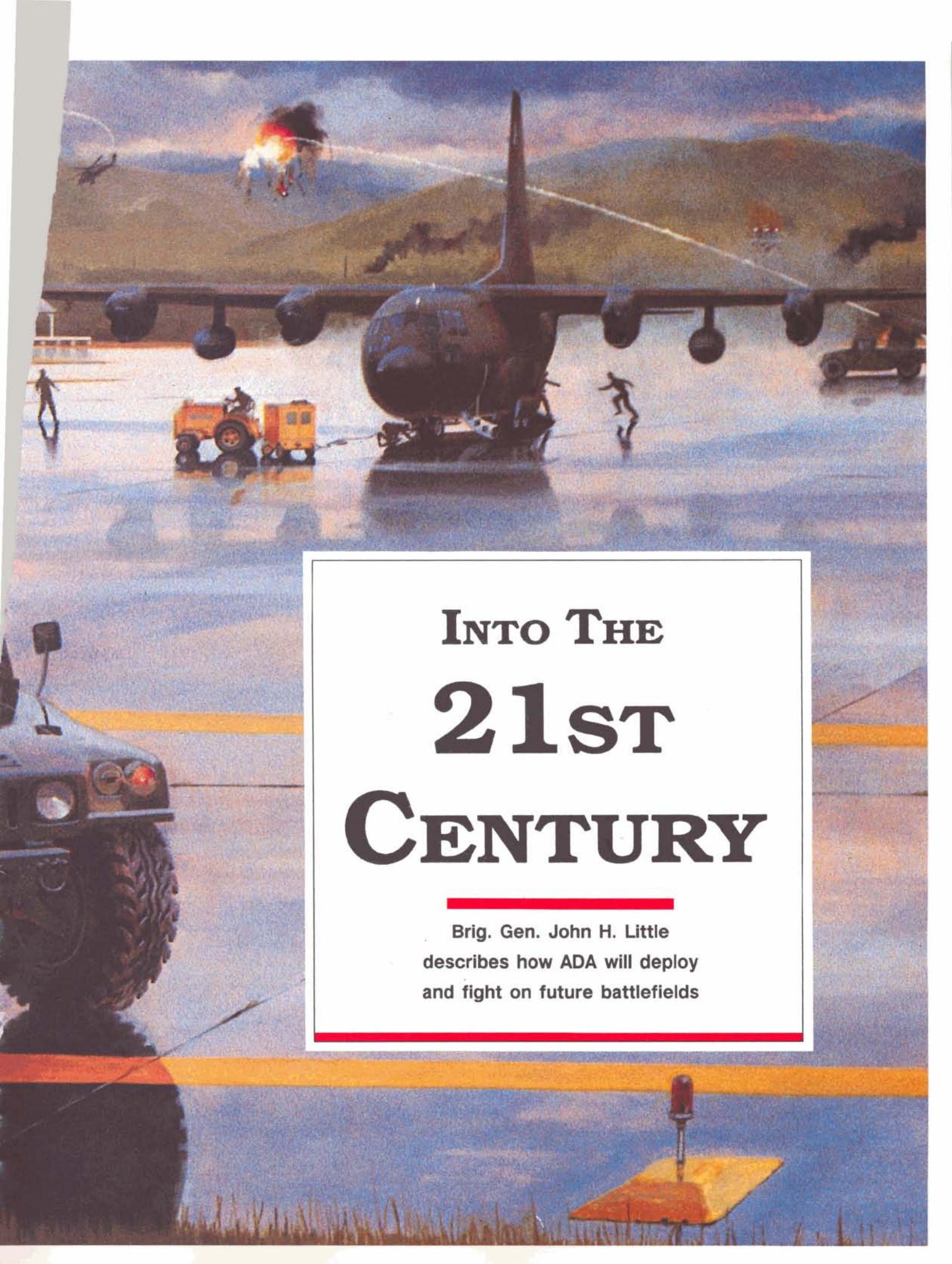
0+100: Cease-fire halts coalition spearheads on final day of the war.

When the informal cease-fire took effect at 5 a.m., Feb. 28, XVIII Airborne Corps elements were poised to slam into the remnants of the Republican Guard Hammurabi and Adnan Divisions dug in on the outskirts of Basra in a battle U.S. commanders thought would have been over by noon.

The 100 hours of the Operation Desert Storm ground campaign produced surprisingly few casualties. "Casualties were miraculously light," said Schwarzkopf. "They will never seem miraculous to them [families that lost loved ones] but, nevertheless, they were miraculous." At this writing, ADA's losses totaled one killed in action and three wounded in action.

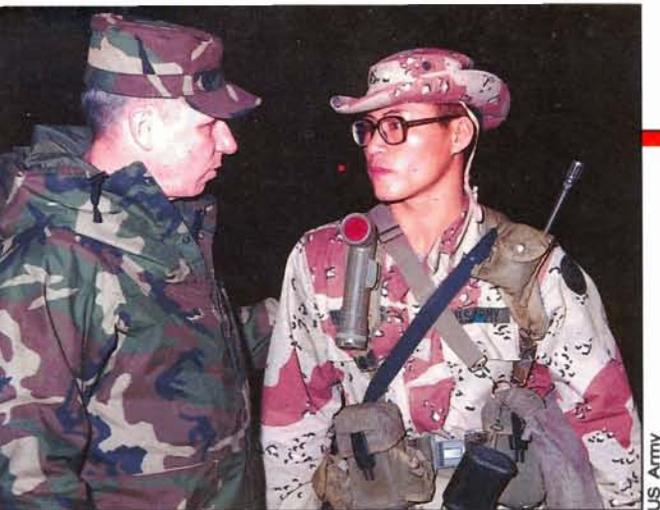
Most, but not all, air defenders greeted the cease-fire announcement with relief. One of the exceptions, a Vulcan gunner atop his track parked amid the smoking ruins of Iraqi T-72 tanks, told an ABC News camera team the morning of the cease-fire that he wasn't ready to quit, not with Saddam Hussein still in power in Baghdad. His was a sentiment that was to gain ad-





INTO THE 21ST CENTURY

Brig. Gen. John H. Little
describes how ADA will deploy
and fight on future battlefields



US Army

Most of us realistically expect the Army of the '90s to be smaller and more oriented to contingency operations than the Army of the '80s. This Army is likely to be largely based in the continental United States. Our preoccupation with preparing for land combat in Europe will probably be replaced with developing a more versatile force capable of going any number of places and facing a wide variety of foes.

For the last two years, the U.S. Army Training and Doctrine Command has been developing a new concept for how we will fight our future wars. This concept is called AirLand Battle Future (ALB-F). It is a maturation of ALB doctrine for an Army postured for power projection rather than forward stationing. The basic principles of ALB-F are really quite simple, and some of them were applied during Operation Desert Storm.

In the future we expect the forces opposing us to be closer to parity in raw numbers than in the past. For example, conventional force reductions in Europe will create something closer to parity in Europe than the huge numerical advantage the Soviets have enjoyed. Because of this, we may fight over extended frontages with fewer troops. This may create a discontinuous, more open or nonlinear battlefield. Given this less structured battlefield, future commanders must be prepared to fight a nonlinear battle. As Gen. John Foss pointed out in his article, "AirLand Battle Future" (*Army*, February 1991), "Nonlinearity is a condition that occurs on the battlefield, while nonlinear warfare is a method of fighting." Because of the dispersed nature of forces, gaps between units may create a nonlinear forward line of own troops (FLOT) trace.

Other contributors to nonlinearity are the offensive nature of ALB-F doctrine, the primacy of maneuver, avoidance of contact until the decisive maneuver and rejection of the requirement to retain terrain solely for political reasons, as in the ground defense plan in Europe.

Even though we are focusing on the nonlinear battle, we must not forget that, at times, the nonlinear condition may not exist and we, therefore, can be forced back into a linear fight. Our forces must be prepared to fight either a conventional linear or nonlinear battle. However, given the opportunity, nonlinearity offers clear advantages.

When you look at the vertical dimension of the battlefield, the air fight has always been nonlinear, as it is discontinuous both in time and space and in many ways represents the key elements of ALB-F. Thus, the air-to-air and ground-to-air battles will not be transformed as dramatically as the ground-to-ground battles.

It is easiest to describe ALB-F by developing it a stage at a time. In Foss' article, he discusses four distinct stages: detection-preparation, establishment of conditions for decisive operations, decisive maneuver and reconstitution. Since we are focusing on contingency operations, I have taken the liberty of adding two additional phases at the front end that I call the strategic deployment stages. These phases allow us to build up our forces so we can conduct the ground campaign. They are the lodgement and expansion phases.

Lodgement

We assumed early on that the Army of the coming decade would be based in the continental United States and contingency-oriented. If that is the case, before we can join the fight described in ALB-F, we will have to deploy the force into the contingency area and expand it sufficiently to provide force ratios to ensure success. Our national military strategy since Operation Urgent Fury, the restoration of democracy in Panama, has been one of using overwhelming military force to

ensure rapid success and minimize casualties. Assuming this strategy will continue requires execution of a deliberate force buildup that will guarantee success.

The lodgement phase will be characterized by establishment of air and sea ports of debarkation (APODs and SPODs) and the establishment of security for these facilities. These APODs and SPODs will have to be in the vicinity of the area of interest. Depending on the threat, they may be established directly in the theater where forces are to be employed. In other, more threatening, cases, they will have to be established in adjacent areas from which we can project our forces. We will have to provide space and facilities adjacent to the APODs and SPODs to assemble the force. The APODs and SPODs are critical chokepoints in the contingency operation, therefore vulnerable to attack and interdiction. We must defend them vigorously. The more APODs and SPODs available, the less vulnerable any one will be. Defensive combat operations may be necessary to protect the lodgement during this stage. This stage may also include interdiction fires, both ground and air, as part of the defensive operations.

Expansion

The second phase of strategic deployment in support of contingency operations is the expansion phase. During this phase the forces deploy out of the lodgement and posture themselves to conduct limited combat operations. These operations, either offensive or defensive, are more than operations in the local area of the APODs and SPODs. They may include the development of forward staging bases and tactical assembly areas as well as the buildup of logistical systems and the establishment of command and control (C²) infrastructure.

Once we have deployed the requisite combat power into the theater and have positioned this power to support the campaign, we are prepared to enter into offensive combat operations.

Stage I

In this, the detection-preparation stage, we do a detailed intelligence preparation of the battlefield (IPB).

Given this information, we use all technological reconnaissance and detection means available to find and maintain surveillance of the enemy. In the past, we were most comfortable when we were in direct "contact" with the enemy. That way we knew where he was and what he was doing. Today technology is such that we can find the enemy and know what he is doing through electronic means just as well as, if not better than, through direct contact. Maintaining contact with the enemy creates two inherent problems.

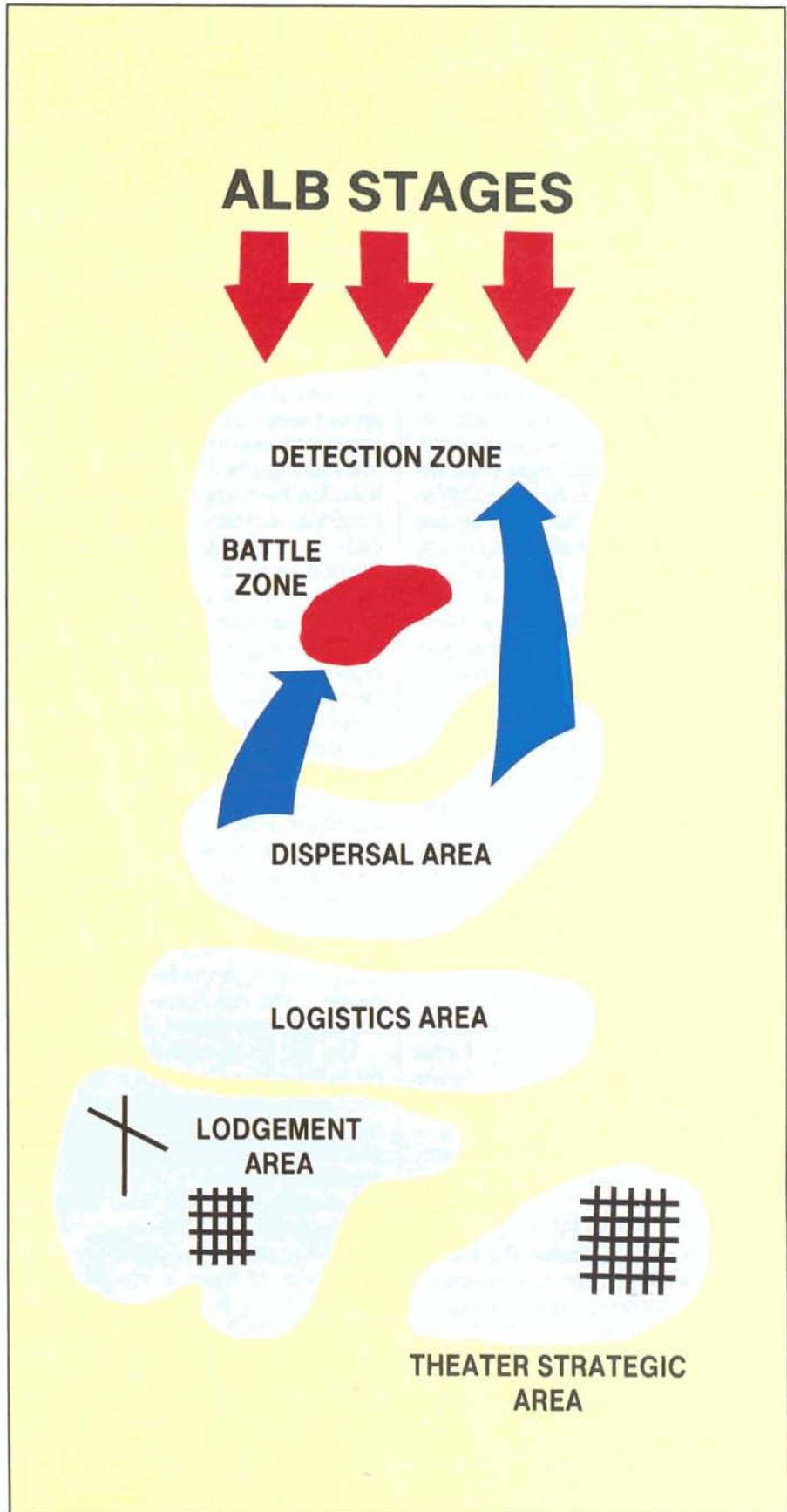
First, if you are in contact with the enemy, he knows just as much about you as you know about him. Second, maintaining contact is synonymous with attrition. Parrying back and forth along the line of contact on both sides takes a toll in manpower and equipment. In today's environment, we must avoid stalemates and attrition to maintain political and popular support. This is not to suggest that we will not employ scouts in a ground reconnaissance role. To the contrary, we would expect to use them even more, but would equip them with sophisticated equipment to allow them to see the enemy without being seen.

A second part of Stage I is to deny the enemy's ability to see us through either direct or electronic means. We must execute a plan that includes deception, emission controls, electronic warfare, stealth, camouflage and active counter-reconnaissance. It is in this stage that the commander executing the campaign develops his course of action.

Stage II

The second part of the ALB-F concept, establishing conditions for decisive operations, covers the use of long-range fires to shape the battlefield and to attrit and fix the enemy. These fires include aerial-delivered munitions from both Air Force aircraft and organic helicopters as well as indirect fire, field artillery weapons. The combination of these fires will destroy the enemy's C² and logistical support and attrit his combat formations. This stage will separate the enemy forces in time and space and set the conditions for the decisive maneuver stage.

The purpose of this phase is fundamentally different from the deep fires



activities of the existing ALB doctrine. The deep fires under the existing ALB doctrine, in the European context, were designed to deter, attrit or retard the arrival of the follow-on echelons of the Soviet attack so they could not achieve overwhelming mass at the FLOT. The intent was to prevent second echelon forces from arriving at the FLOT earlier than, and in concentrations greater than, the friendly forces could deal with in the close fight. This was essential because our forces were expected to fight, at least initially, a defensive battle tied to terrain along the ground defense plan against forces greatly outnumbering our own. In ALB-F the intent is to use terrain and deep fires to attrit and/or separate enemy forces to allow us to maneuver to a position to attack and destroy the enemy in a way that is advantageous to us. We will use these fires to whittle the enemy down to an acceptable size for our attack. We may also use them to block terrain, forcing the enemy to use a different avenue of approach.

Stage III

The decisive maneuver phase focuses on the destruction of the enemy force at the time, place and under the conditions of our choosing. Under the existing ALB doctrine, we let the enemy come to us — we let the enemy choose the time and place. ALB-F takes a more proactive approach. Our intent is to force the enemy into an engagement at the place we choose and at the time we want. ALB-F maneuver will create a short, violent engagement where the friendly forces have the advantage in terrain, forces available, formation, surprise, firepower, visibility and timing. The focus is the destruction of the enemy force, not the seizing and holding of terrain.

Stage IV

Once we have defeated the enemy force, we will enter the reconstitution stage where we refuel, rearm, resupply and repair in preparation for reentering Stage I. Our forces will disperse both in the forward and rear areas to prepare for future operations.

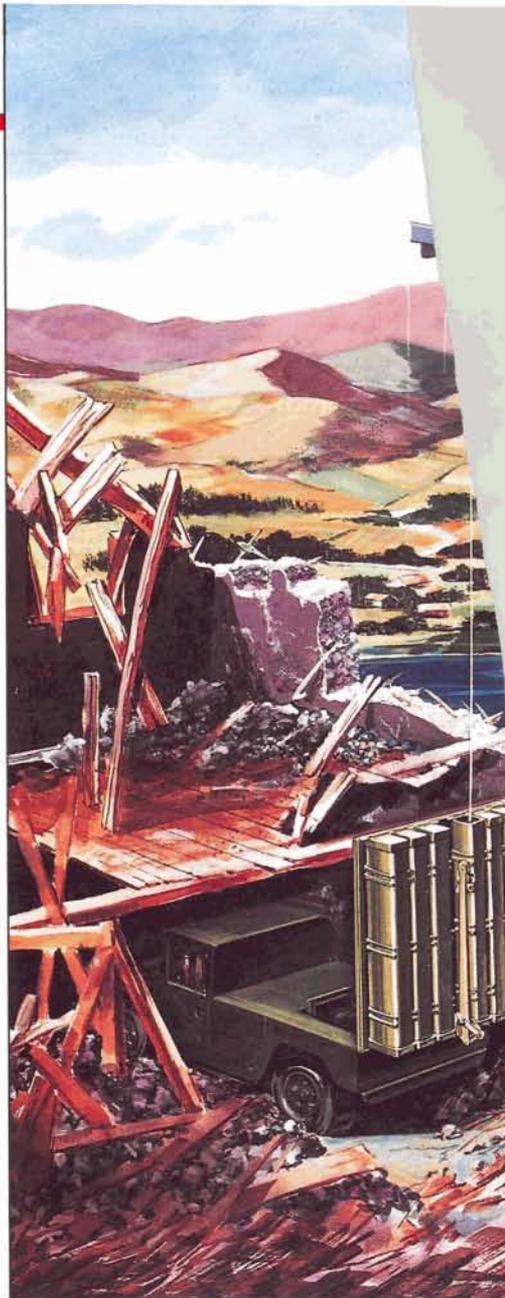
Nonlinearity poses special problems for logistics and, in some cases, communications. It implies the necessity to carry some support with any element

that expects to operate discontinuous from other forces. The lack of connectivity between friendly forces complicates network routing for modern communications systems and may reduce the opportunity for redundancy and multi-routing. At the same time, the very nature of a fluid, fast-paced battlefield makes the gathering, processing, fusion and dissemination of information extremely time-sensitive. This type of battle will require fast, reliable and highly automated systems to handle both friendly and enemy information. We will need the capability to see what the enemy is doing, develop our own course of action and execute it before he can react.

Desert Storm clearly demonstrated what we have known for some time: American military power, at least for mid- to high-intensity conflicts, is predicated on an airpower-dominated strategy. One of the ALB-F assumptions is air superiority. Given these facts, one might ask, "Why is an ADA capability necessary for the future?" Our Desert Storm experience provides a clue to the answer. We had total air supremacy, yet Scud missiles continued to launch. The Air Force could not find and effectively kill the mobile launchers. Had it not been for our Patriot systems, we would very likely have seen the coalition disintegrate. The bottom line is that the Air Force does some things very well, but there are also things they cannot do. Air Defense Artillery in the future must complement the Air Force and focus on the things they cannot do.

The Air Force cannot kill the tactical ballistic missile (TBM). They have difficulty destroying the tactical equipment launcher before missile launch and they have no capability to destroy missiles in flight.

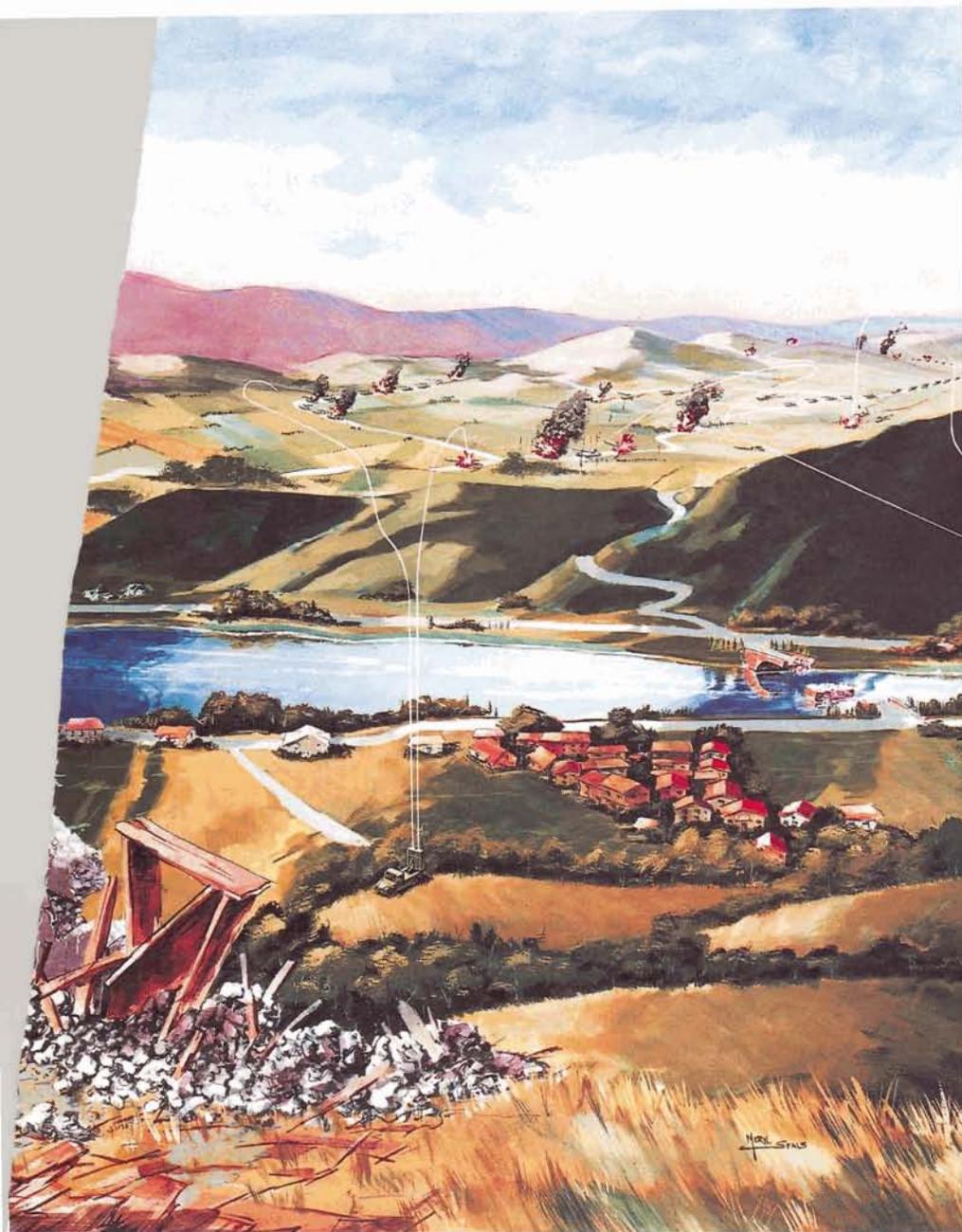
Secondly, they will have difficulty taking on the cruise missile threat. The U.S. Navy has all the capability of the Air Force in their interceptors, yet they must rely on surface fires to destroy the relatively simple Silkworm threat. The same will be true of the Air Force. Once the world recognizes that we have an adequate defense against the TBM, efforts will likely shift to cruise missile technology. The level of technology necessary for the development of, and improvements to, cruise



missiles is probably less than that needed for TBMs.

The third Air Force disadvantage is unmanned aerial and remotely piloted vehicles (UAVs and RPVs). UAVs are well within the state-of-the-art for any country that has the capability to build a remote-control model airplane. ALB-F requires our ability to see the enemy and, at the same time, deny his ability to see us. UAVs and RPVs are a simple, effective way to monitor enemy activity. According to reports, the Iraqis experimented with UAVs along the Saudi border. These vehicles are so small and their signature so slight, Air Force systems will have difficulty seeing or engaging them.

Attack helicopters pose another threat the Air Force cannot counter.



Boeing

Attack helicopters of the future will probably be the close air support system of preference for major powers and Third World countries. Helicopters offer the advantage of providing excellent platforms for fire support, but are somewhat immune to attack from high performance interceptors. Attack helicopters flying at terrain contour or nap-of-the-earth are a difficult target for even advanced Air Force look-down/shoot-down systems. Alternatively, Air Force interceptors that try to fly in that low-level regime and intercept a helicopter become vulnerable to both anti-aircraft fire from the ground and weapons like air-to-air Stinger mounted on attack helicopters.

NLOS' technology offers a low-risk defense against attack helicopters.

Helicopters also offer the advantage of not requiring an air base. They can operate from remote locations and can hide relatively easily. The level of sophistication necessary to field this kind of capability is within the reach of many Third World countries.

Lastly, you cannot have it both ways. If attack helicopters are good for us and for our Third World client states, they must also be good for others.

The final capability the Air Force cannot provide is 100 percent assurance that no leakers will get through their formidable defense counter-air systems. We have what is probably the best interceptor capability in the world assigned to our carrier battle groups at

sea, yet these ships still rely on massive surface-to-air missiles and anti-aircraft guns. Every ship of the line has some type of air defense capability, and a large percentage of the capital ships (note the number of missile cruisers and destroyers assigned to the fleet) are primarily dedicated to anti-air because they want high assurance that no leakers get through. For those high-value assets we must protect, surface-to-air missile fires are essential to provide that same high assurance of survival.

Air Defense Artillery's Support Role

The AirLand Battle of the future will evolve through the six distinctive stages outlined above. We must prepare the ADA force to accomplish the missions assigned to it in each phase of operations.

Lodgement. Air Defense Artillery is critical to the development of the APOD or SPOD as it provides defense from missile and aircraft attack that threaten to interdict the force projection. Depending on mission, enemy, terrain, troops and time available, air defense must be considered for early deployment as a point defense for the APODs or SPODs. Patriot offers the important advantage of providing both air-breathing and TBM defense. The number of batteries needed will depend on the number of high priority assets that must be defended, their relative proximity and the need for all-around defense. If the threat includes low-observable aircraft or cruise missiles, it may be prudent to include Hawk fire units in a task force configuration with the Patriots. If the threat includes attack helicopters, it will be necessary to deploy forward area air defense systems to counter them.

Desert Storm has pointed out an additional requirement for active defense. C² in the lodgement poses special problems. If the lodgement is based on an APOD, the deploying ADA will have to tie into the host nation's ground air defense C², if any, as well as the Air Force's C² system. Likewise, if the lodgement is built around a SPOD, similar coordination will have to be effected with the host nation and U.S. Navy. This will have to

be planned for in advance to provide proper communications. Since this will likely be an undeveloped theater, an air operations order will have to be developed to include airspace control measures and rules of management.

Joint surveillance plans will be critical in the early deployment. Initially, broad area surveillance will probably have to depend on some or all of these aircraft: E-3A AWACS, E-2C Hawkeye, EC-135 Rivet, and joint or E-8A JSTARS, in addition to any surveillance capability of the host nation.

Desert Storm has highlighted an additional aspect of contingency operations we must consider: the use of TBMs in the terrorist role. Iraq used relatively inaccurate short-range ballistic missiles to attack population centers in an effort to create public panic, weaken the will to fight and break down alliances. Future attacks of this nature may be targeted against either the host nation or other allies. In the event of this type of threat, we must deploy surface-to-air missile units to provide area TBM protection for these

theater-strategic assets. It may also be necessary to develop weapon systems with unique capabilities to better perform these functions in the future.

Expansion. In addition to the continuation of the support provided during the lodgement stage, Air Defense Artillery will have to defend the tactical staging areas as they are established. Air Defense Artillery will also participate in any ground combat operations that are conducted. The counter-reconnaissance fight is a key part of this stage in which Air Defense Artillery will play a key role. We must deny enemy aerial reconnaissance of our buildup. We must deny not only his manned reconnaissance aircraft, but also his UAVs and RPVs and possibly his reconnaissance satellites.

As we enter offensive operations, we must still maintain defense of the APODs and SPODs as well as our logistical facilities. The requirements for the offensive stages are somewhat sequential; however, the strategic deployment phase requirements are additive.

Detection-preparation. After the initiation of offensive ground combat operations, Air Defense Artillery must shift its focus. During Phase I, Air Defense Artillery's priority must be on the security of the force. We must ensure the force is protected from attack while in its assembly areas and during movements, with emphasis on vulnerabilities such as C² nodes, our sensors and sensor ground stations. ADA must deploy with the ground reconnaissance elements to provide counter-reconnaissance fires against manned, fixed- and rotary-wing aircraft as well as UAVs. Our forces *must not* be detected during this stage. We must not create an identifiable electronic or other signature that gives away the unit we are protecting. We will have to use our airborne sensors and corps high- to medium-altitude air defense (HIMAD) overwatch, thus keeping our organic sensors in the divisional units in emission control silence. Stage I will require HIMAD assets in the corps to provide overwatching coverage of the divisions in their tactical dis-

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sal areas. We must supplement this coverage with divisional ADA assets, concentrating on point defense of the critical assets.

ADA commanders at all levels must concentrate on planning during this stage. As a maneuver commander develops his plan, ADA commanders will have to develop the aerial IPB of their general areas and provide it to the maneuver staff. The airborne planning cycle may prove the most effective. This planning method starts at the objective of the decisive maneuver stage and works in reverse to the tactical dispersal areas.

Establishment of conditions for decisive operations. During this stage, Air Defense Artillery must provide defense of the fire support assets organic to the corps. This will include the multiple launch rocket system (MLRS) and Army tactical missile systems (ATACMS) as well as Army attack helicopter forward arming and refueling points and operating fields. Air Defense Artillery may also have to defend Class V resupply efforts for the MLRS/ATACMS units.

Maneuver units may start moving out of their dispersal areas in preparation for Stage III; therefore, we must provide route security and aerial counter-reconnaissance for these elements. It may be best for some ADA elements to move with the lead security elements along the movement routes to ensure aerial reconnaissance is denied along the routes of advance. Likewise, if there is an exposed flank during the movement, ADA assets may be necessary with the flank security. We must continue to protect critical sensor and C² nodes as well.

Decisive maneuver. The decisive maneuver stage is the most demanding for everyone, and Air Defense Artillery is no exception. Defense of the maneuver force during its movement to attack positions continues to be critical. Special emphasis must be placed on refueling points (if used) and natural or man-made chokepoints along the route of march. Once the maneuver force shifts into its attack formations and starts the movement to attack, Air Defense Artillery is a must to protect against attack helicopters and close air support/battlefield air interdiction aircraft. The maneuver force is

most vulnerable during this phase of operation.

Air Defense Artillery must provide sensor coverage of the third dimension to prevent surprise from the air. Careful planning of sensor coverage will be necessary. Pre-positioning forward of ADA sensors is desirable in the movement to the attack positions so they can be in position early in the event the operation is compromised. Once forward, they will remain in emission control silence until the attack is initiated or otherwise directed.

Aerial IPB will be essential to the proper allocation of ADA combat power to associated maneuver elements. In this type of operation, the main attack may not necessarily be the most vulnerable to air attack; therefore, they may not receive the highest air defense priority. A supporting attack on an exposed flank may be more

Stinger will remain in ADA's arsenal for years to come.

vulnerable and thus receive more ADA support.

Reverse planning is necessary. If two ADA platoons are needed to support a battalion task force, they will have to move with the task force to the attack position even though that much Air Defense Artillery may not be needed during the road march. There will not be time to reorganize prior to the attack. The maneuver unit is unlikely to stop at the attack position; they will change formation on the move.

Corps ADA brigade elements will have to provide aerial security along the routes of advance behind the maneuver division to allow combat support and combat service support units to follow. Corps MLRS and ATACMS units will continue to be high-value assets to be defended during this stage as well.

General Dynamics



Reconstitution. The rearm/refuel/refit stage is characterized by consolidation of the objective after the attack and preparation for future operations. ADA will have to provide aerial security of the objective and any adjacent assembly areas where rearm/refueling operations are being conducted. Routes to these areas will have to be secured to allow Class III and V vehicles to move forward. In addition, ADA units will have to perform rearm and refuel operations themselves to facilitate future operations.

Planning for ALB-F

The Gulf War exhibited many of the vulnerabilities likely to plague future ALB-F operations. Our APODs and SPODs were extremely vulnerable to TBM and air attack during the lodgement phase. Pilots described the confused convoy of Iraqi vehicles that fled on the highway leading north of Kuwait City as the "Mother of all Target Opportunities," but the real "Mother of All Target Opportunities" was the 150,000 troops, tanks, vehicles and

equipment of the VII Corps and XVIII Airborne Corps strung out along a single desert road during the "Hail Mary" shift of forces to the west. Fortunately, Saddam Hussein let opportunity slip away during our lodgement phase. By the time Gen. Norman Schwarzkopf shifted forces to the west to set up the left hook that trapped the Republican Guard, it's doubtful Hussein possessed the capability to disrupt the maneuver even if he had known it was occurring.

We cannot always count on such good fortune. We must eliminate or reduce as many vulnerabilities as possible prior to initial deployment.

ALB-F operations depend on highly developed reconnaissance, intelligence, surveillance, target acquisition and C². Maneuver forces can gain great advantage in these types of operations; however, there are attendant risks. Air Defense Artillery can reduce many of these vulnerabilities.

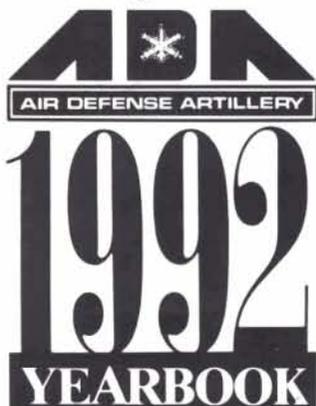
The ALB-F force must preserve itself up to the point of the attack through stealth. Part of that stealth is

an aggressive counter-reconnaissance operation. Enemy air, to include UAVs, must be denied overflight friendly assembly and dispersal areas so we can avoid detection of our force and our intentions. Our ALB-F force will also become vulnerable in its movement to the attack. In many cases this move will be over a considerable distance. ADA must protect the march serials as well as the advance, flank and rear guards. The survival of friendly sensors and the C² nodes is essential and a high priority for ADA elements. These elements are so vital we must have a very high assurance of no leakers getting through.

Finally, ALB-F is characterized by a quick, violent fight in the decisive maneuver stage. Air Defense Artillery must protect the maneuver force in the execution of this act for it to be successful. Even with air superiority, there are important roles for ADA in this concept. We must adjust our thinking and develop the doctrine, organizations, tactics, techniques and procedures to make it happen.

ANNOUNCING

Space Reservations are now being taken for the



For information contact: Glynn Leach
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ADA ASSOCIATION

Local chapters spur Association growth

Chartered in 1975, the original Air Defense Artillery Association struggled through its formative years with few members and a small budget. Today, the association has an ample operating budget and its membership has reached 4,476 and is still climbing.

The association has pumped more than \$42,000 into its awards program, and its 1991 operating budget of \$129,326 promises to provide for the future growth and development of a variety of programs, including the establishment of Best Soldier, Best Battery and Top Gunner awards. The ADA Association gift shop continues to generate funds for association projects with annual sales approaching \$100,000 per year. Gift shop sales have been recently enhanced by the high turnover of Operation Desert Storm memorabilia, including the immensely popular "Scudbuster" T-shirts.

Local association chapters are the key to the association's continued success. And the association's recent growth has been enhanced by the establishment of several association chapters away from Fort Bliss, Texas, the home of the association and Air Defense Artillery.

The first ADA Association chapter was formed at Huntsville, Ala., in February 1989. Col. Robert Huston, chapter president, reports the chapter now lists approximately 140 individual and 18 corporate memberships.

During 1990, the chapter contributed \$500 to the Redstone Chaplain Fund to support Operation Desert Storm, sponsored its annual Saint Barbara's Day dinner dance and hosted several distinguished guest speakers. During 1991, the chapter will co-sponsor a golf tournament to benefit the Army Emergency Relief Fund.

Write the Redstone Arsenal/Huntsville Chapter, P.O. Box 8321, Redstone Arsenal, AL 35898, for membership information and application forms.

The first OCONUS ADA Association chapter formed in May 1989 at Kaiserslautern, Germany. Founded by Col.(P) Vernon L. Conner (then commander, 94th ADA Brigade) and Col. James J. Cravens Jr. (then commander, 108th ADA Brigade), the U.S. Army Europe (USAREUR) Chapter became the second association chapter.

The USAREUR Chapter invites anyone interested in becoming a member of the association's only European chapter to contact HHB, 32nd AADCOC, APO NY

09175, to obtain membership information and application forms.

In August 1989, the 35th ADA Brigade formed the Rainier Chapter of the ADA Association at Fort Lewis, Wash., as a professional organization for the promotion of Air Defense Artillery and the professional development of Air Defense Artillery soldiers.

The deployment of hundreds of 35th ADA Brigade soldiers to Southwest Asia for Operation Desert Shield and Desert Storm overshadowed chapter activities during the past year. The 3rd Battalion (Chaparral), 2nd Air Defense Artillery, deployed to Saudi Arabia as a provisional transportation battalion. Some 3-2 ADA soldiers qualified on the Bradley Fighting Vehicle to provide perimeter defense for the port at Ad Damman while others unloaded cargo ships. 1-52 ADA (Hawk) furnished a five-man adaptive surface interface terminal team to detect and identify incoming Iraqi Scuds for hand-off to Patriot batteries for engagement. The 35th ADA Brigade also provided numerous individual soldiers to Desert Storm as well as support to several Army Reserve units mobilized at Fort Lewis.

With units returning home from Operation Desert Storm, the Rainier Chapter will resume its mission of promoting Air Defense Artillery with new vigor fueled by the remarkable achievements of 35th ADA Brigade soldiers and other air defenders whose contributions, in Southwest Asia and at home, made the Desert Storm victory possible.

The remainder of the year offers both the Rainier Chapter of the ADA Association and the 35th ADA Brigade ample opportunity to significantly contribute to the enhancement of the branch image. The brigade will conduct the Army's only ROTC Advanced Camp this summer, sponsor the Washington State Special Olympics and participate in five division- and corps-level Warfighter exercises.

The Bataan Chapter of the ADA Association applied for full chapter status in December 1990, received notification of approval in January and held its first dinner meeting in May in Albuquerque, N.M.

The ADA Association's newest chapter is named in honor of the 200th Coast Artillery Regiment, New Mexico Army National Guard, which served in the Pacific Theater during World War II. The regiment was among those

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its captured by Japanese forces in the fall of Corregidor and forced to make the infamous Bataan "Death March" to internment in Japanese prisoner of war camps. These "Battling Bastards of Bataan" were the forerunners of today's 200th Air Defense Artillery Regiment.

The Bataan Chapter's officers are Maj. Daniel J. McCormack, president; Col. Francisco J. Estrada, vice-president; SFC Jose R. Lara, secretary; and Maj. Timothy J. Olaivas, treasurer.

Association members living in New Mexico should contact the Bataan Chapter secretary at 505-294-8994 to update the membership roster. The chapter, of course, invites all those who wish to join the association and the Bataan Chapter to contact the chapter secretary for membership applications.

The ADA Association's Phantom Corps Chapter, Fort Hood, Texas, received full chapter status Oct. 11, 1990, and is off to a fast start. Brig. Gen. John H. Little, assistant commandant of the U.S. Army Air Defense Artillery School, presented the new chapter its "chapter check" during the Air Defense Ball in November, and the chapter's membership roster already contains 55 names.

Col. William D. Hubbard, 31st ADA Brigade Commander, is the chapter's first president while Lt. Col. John S. Warren, 31st ADA Brigade deputy commander, serves as vice president. Maj. Wayne Marshall, 3-1 ADA S-3, is the chapter secretary and Maj. James D. Bobbitt, chief of the III Corps air defense element, serves as treasurer. Board members are Lt. Col. Stephen J. Kuffner, 3-1 ADA commander; Lt. Col. Gary A. Smith, 2-2 ADA commander; Lt. Col. James R. Prouty, 2-5 ADA commander; Lt. Col. Randall D. Harris, 4-5 ADA commander; Capt. Rui O. Cunha, 31st ADA Brigade HHB commander; and 31st ADA Brigade CSM Robert P. Robinson.

During its first months of existence, the Phantom Corps Chapter established an ADA Association Gift Shop which has already sold approximately \$1,200 worth of merchandise, launched a post-wide ADA Unit Recycling Program and supported the 31st ADA Brigade's Afro-American Heritage Month art contest by awarding the first and second place prizes. The chapter has also made plans for its first general membership meeting and will soon host an ADA Monte Carlo Night.

Contact the chapter secretary at 817-288-4337 or AV 737-4437 to obtain membership information and application forms.

Why does membership continue to grow? The reason is simple: association members support Air Defense Artillery. The means of support are easily identified by looking at the association's goals. During its recent years of rapid growth, the association's goals have remained the same: support ADA soldiers, retirees and the ADA Museum, and promote the history and traditions of Air Defense Artillery.

Today, the association is spearheading the drive to build a new facility to house the ADA Museum. It continues to publish the "First to Fire" newsletter and, in partnership with Image/Southwest, the bimonthly *ADA* magazine. During Operation Desert Storm, the association designed and delivered hundreds of free "Scudbuster" T-shirts to U.S. Patriot units in Saudi Arabia, Israel and Turkey in recognition of the worldwide acclaim they won the branch during their dramatic duels against Iraqi Scuds. The Association continues to recognize distinguished BNCOC and ANCOC graduates and awards the ADA Association plaque to the top-ranked USMA cadet among those who select Air Defense Artillery as their branch of service and to outstanding enlisted soldiers in each Active and Reserve Component ADA battalion.

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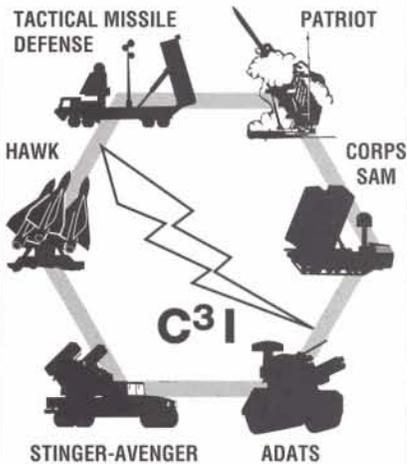
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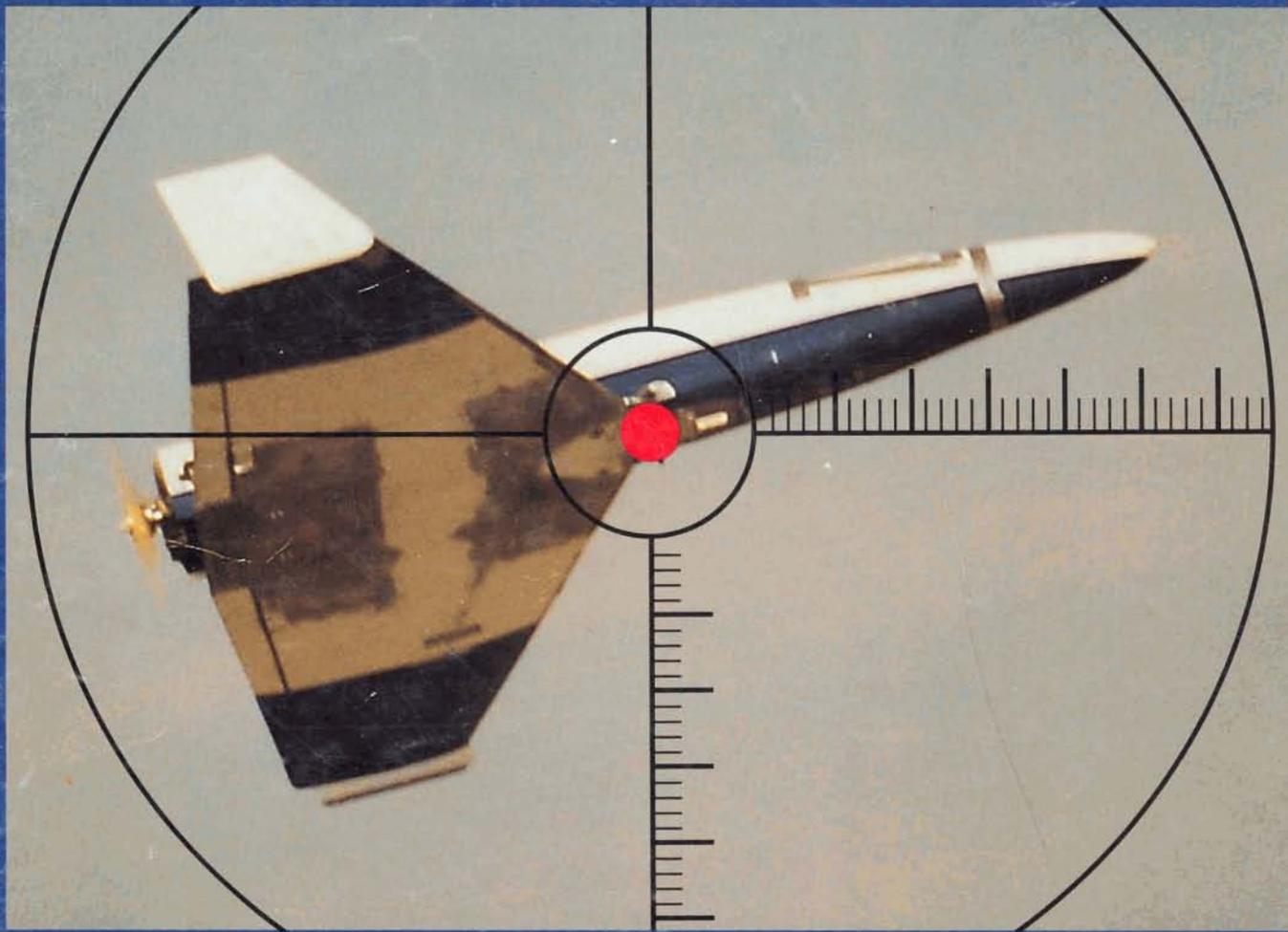
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