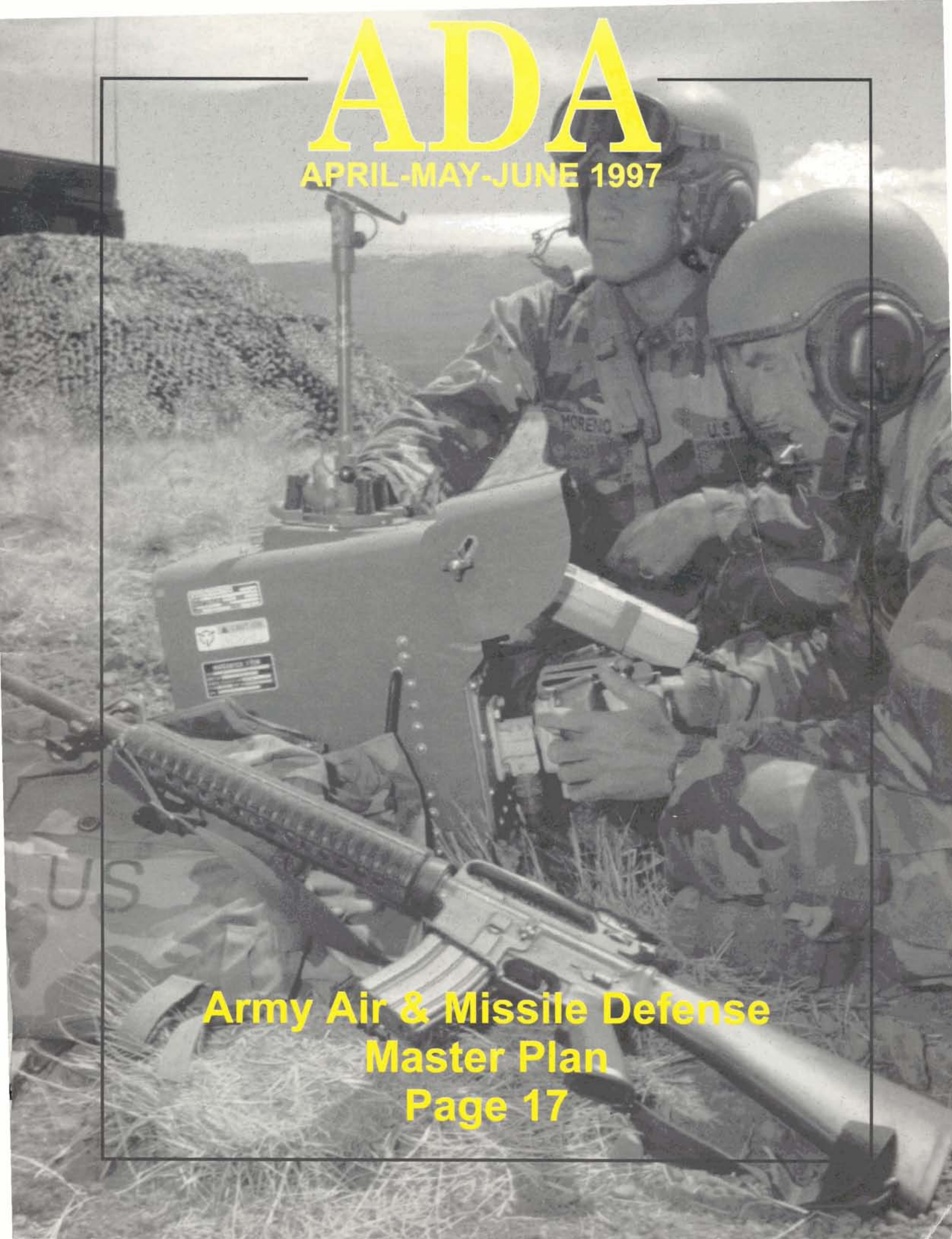
ADA

APRIL-MAY-JUNE 1997



Army Air & Missile Defense Master Plan

Page 17

HQDA PB 44-97-2 APRIL-MAY-JUNE 1997

FEATURES

Meeting the Global Missile Challenge 10

National Missile Defense 14

Army Air and Missile Defense Master Plan 17

The Threat: Evolution and Future Trends 18

Warfighting Concepts 27

Air and Missile Defense Initiatives 33

RCMAT Pilots "Keep 'em Flying" 41

1-3 ADA Medals at the Olympics 44

Tenth Patriot Battalion 49

Digital Training 52

Operation Enlightenment 54

DEPARTMENTS

Intercept Point 1
Observation Post 2
ADA Digest 3

ON THE COVER

Photographer Dennis McElveen of the U.S. Army Air Defense Artillery Test Directorate, Fort Bliss, Texas, photographed the 1-62 ADA Avenger crew on this issue's front cover as they participated in a field training exercise. The 25th Infantry Division's ADA battalion is stationed at Schofield Barracks, Hawaii.

Blair Case
Editor

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Intercept Point

Former Director of Intelligence R. James Woolsey furnished the following colorful and, to my mind, highly accurate description of the post-Cold War threat environment: "We have slain the [Soviet] dragon. But we now live in a jungle filled with a bewildering variety of poisonous snakes." Of course, it's not just the threat that has changed; the U.S. Army has also changed, and will continue to change.

The Army of the early 21st century will be a very different Army than the one that is now emerging from its Cold War cocoon. But Force XXI, which should be fully operational by 2010, is only the first stage of an even grander metamorphosis into the "Army After Next." The soldiers of Force XXI will counter today's "rogue's galley" of regional threats; the soldiers of the Army after next will confront threats now only dimly perceived — perhaps an emergent superpower — with weapons yet conceived.

We expect the ADA mission to change little in the early decades of the 21st century. What will change is the way we will fight with Force XXI, the technologies we will apply and the threat we will face.

In this issue, *ADA* magazine begins publishing the first in a series of articles excerpted virtually intact from the Air and Missile Defense Master Plan, the guide to Army air and missile defense force modernization through 2010. The master plan responds to dramatic changes in national military strategy that, in turn, are, the products of several converging factors:

- The restructuring of the force has produced a smaller force based largely within the continental United States that must be capable of projecting power into contingency theaters and conducting operations across the spectrum of military operations from nation building to total war.
- Revised warfighting doctrine emphasizes joint action to achieve decisive victory with minimum casualties. Seamless interface between sister services will offset quantitative losses with qualitative advantages. The age-old rivalry between the Army, Navy and Air Force will, in the future, exist only on the athletic field.
- The proliferation of weapons of mass destruction, the availability of technology to deliver those weapons and the emergence of rogue states or sub-states (ethnic, cultural or religious factions) that possess a fanatical disregard for consequences have transformed the geopolitical environment.
- Despite declining modernization budgets, increasing opportunities have arisen to leverage weapons and information technologies that, when properly harnessed, will afford us an unparalleled ability to dominate any future adversary at any time, under any conditions.

The fielding of weapon systems and capabilities described in the plan, along with improvements in doctrine, leader development and organization, will allow ADA soldiers to execute Force XXI operations and achieve the ADA vision — a stabilized, reorganized, standardized, modernized, modularized and right-sized force that can fight and win on the Force XXI battlefield.

The future doesn't just happen; tomorrow is shaped by actions we take today. We can, in large part, determine our own destiny by . . .

Leading the Charge to Force XXI

Maj. Gen. John Costello
Chief, Air Defense Artillery

The increased range and accuracy of rifled firearms made tight formations prohibitively expensive (in human lives) by the mid-nineteenth century, yet commanders could not switch to open formations until the advent of portable radio communications during World War II. Radio allowed small groups of soldiers (platoons) to disperse, take cover and stalk the enemy, thereby decentralizing the decision-making process during battle. Artificial intelligence is now creating the means to recentralize decision-making through the use of "battle management systems" to control the implementation of a plan to the last detail.

War in the Age of Intelligent Machines
Manuel De Landa

Those whose power is threatened by the spread of democracy and markets will always have a personnel stake in resisting those practices with passionate intensity. When such leaders sit atop regional powers, such as Iran and Iraq, they may engage in violence and lawlessness that threatens the United States and other democracies. Such reactionary, "backlash states" are more likely to sponsor terrorism and traffic in weapons of mass destruction and ballistic missile technologies.

Anthony Lake
Former National Security Advisor

Observation Post

Saluting ADA Soldiers

People are the key to our military defense. Their willingness to serve, their williness to endure hardship, their willingness to endure the rigors of combat and their willingness to put their lives on the line for this country and suffer the slings and arrows of outrageous fortune that befalls them — that's the key to defense.

Senator Max Cleland

We recruit a soldier, but we retain a family. Sixty-three percent of the armed forces are married, compared to 47 percent at the end of the Vietnam War. We must concentrate on traditional incentives for recruiting and retention such as compensation, education, retirement benefits, reenlistment bonsues and so forth, but also medical care, child care, schools, housing, exchange and commissaries.

Maj. Gen. Alfonso Lenhardt
Commander, U.S. Army Recruiting Command

Marry a woman with brains enough for two and you'll come out even.

Jeffery G. Jordan
Command Sergeant Major

Greetings to all from my foxhole at Fortress Bliss, Texas. The first part of this column salutes ADA soldiers. The second part deals with issues — sexual harassment and retention rates — that we must resolve.

I recently visited ADA units from Germany to Hawaii and from the desert sands of Saudi Arabia to the desert sands of the National Training Center (NTC). Each time I talk to soldiers and see how professionally dedicated they are, I swell up with pride and go look for the retention NCO to reenlist. You're all doing a hell of a job! This includes soldiers who wear Signal, Quartermaster, Ordnance and other combat service support insignia. Without these soldiers in our ranks, we could not accomplish our ADA mission.

When I asked soldiers if they were good at their job, I got that "RCA Dog look" and then a resounding "Hooah! Sergeant Major, I am the very best at my job."

I watched soldiers do Scud drills at Alkarj, Saudi Arabia, after three months in country with the same enthusiasm they displayed the first day in country.

At the NTC, during the 4th Infantry Division's advanced warfighting exercise, Avenger crewmen were bursting with pride as they described battle scenarios and explained they were waiting for orders to continue Hind-hunting in the "Dust Bowl."

Soldiers who tested the Bradley Linebacker, Avenger Slew-to-Cue, Sentinel and Forward Area Air Defense Command, Control, Communications and Intelligence system at the NTC did an outstanding job. They set the warfighting standard for Division XXI. Even the Army chief of staff joined in the unanimous accolades.

CSM Robert Fox of 4-3 ADA continues to keep me informed of the contributions soldiers of his battalion are making to peacekeeping efforts in Bosnia. And I surely don't want to forget the great job divisional ADA and Patriot soldiers are doing in Korea — the world's hottest "hot spot." I still have ADA soldiers to visit at the Joint Readiness Training Center and Forts Drum, Riley, and Campbell. But for now, I need your help in a few areas.

Sexual Harassment. You have received the chain teaching and heard horrible stories about your comrades in arms. I'll give you some quick advice: Do what's right. Ask yourself if your mother would approve of your behavior; if she wouldn't, don't do it! Respect all human beings. Walk a mile in their boots and spend some time in their foxhole before you decide to strip them of their respect and dignity.

Retention. Too many good soldiers are leaving the Army in large numbers. I ask that before you leave, you take a hard look at your life in the military and weigh all that is good against all that is bad. If you still feel you must go, then thanks for all you've done to make our Army stronger and our country a shining example to the world. But make sure you leave for the right reasons, not because you've listened to rumors that benefits and pay are on the decline. The Army has launched several initiatives to significantly improve soldier quality of life. Give these initiatives time to take hold. And don't let "friends" make the decision for you. Make the decision on your own. Do what's right for you and your family.

By all means, don't make a decision while you're angry. If I had quit because something or someone made me angry, my career would have been a very short one. Remember: "That which doesn't kill you only makes you stronger." We need good soldiers to stay and become great leaders.

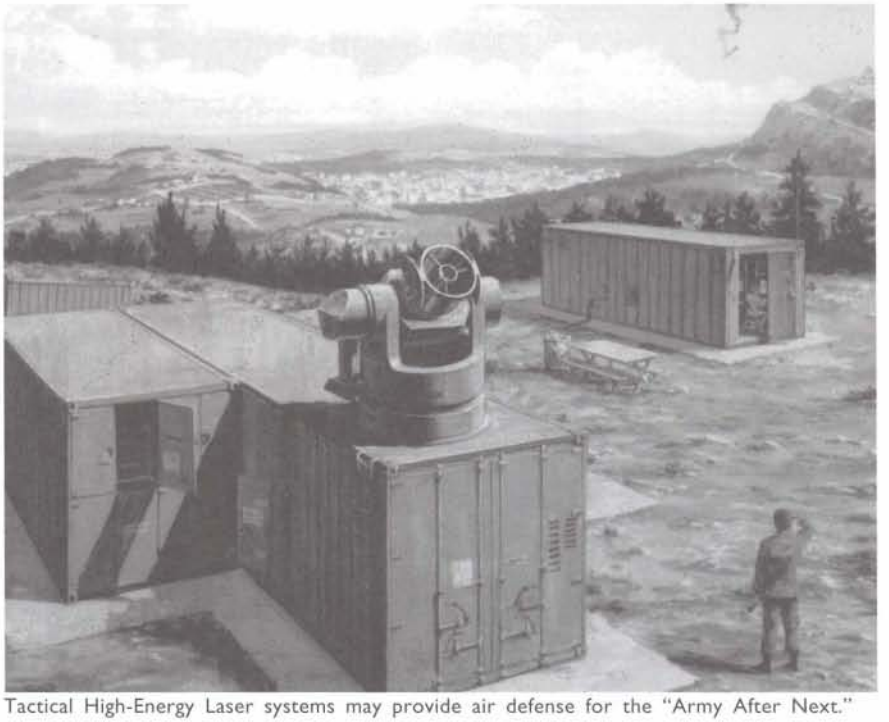
From my OP to yours, this is "ADA 7" out!

Jeffery G. Jordan
Command Sergeant Major

Tactical High-Energy Laser

Space and Strategic Defense Command's experimental laser system will counter short-range rockets

The U.S. Army Space and Strategic Defense Command is working on a new active defense weapon system concept to enhance protection for combat forces and theater level assets for the Force XXI Army. The mobile Tactical High-Energy Laser (THEL) weapon system will provide an innovative solution for the acquisition and close-in engagement problems associated with so-called "dumb munitions" — a primary concern because counter-battery fire may not be an option in densely populated areas.



Tactical High-Energy Laser systems may provide air defense for the "Army After Next."

For several years, the Space and Strategic Defense Command has pursued development of a mobile THEL concept that could provide new air and missile defense capability. Numerous Department of Defense high-energy laser development programs over the last 20 years have proven and demonstrated the effectiveness of beam-generation and beam-pointing technologies that support the THEL concept. Force XXI advancements in the area of real-time situational awareness now make it possible to capitalize on the prime attributes of a THEL in operational scenarios.

THEL will fire at the speed of light for close-in engagements where time lines are very short. Costs will run only a few thousand dollars per kill or less, with a deep magazine to counter saturation attacks. Not only can a THEL weapon system destroy a target, but it can also degrade, disrupt, or damage targets. This enhances operational flexibility and effectiveness against a wide variety of air threats. The THEL weapon system will enhance the effectiveness of the short- to medium-range air defense architecture.

The effectiveness of high-energy lasers against short-range rockets was tested and demonstrated in the Nautilus program, an outgrowth of Project Strong Safety, in collaboration with Israel. The program was conducted primarily at the U.S. Army Space and Strategic Defense Command High-Energy Laser Systems Test Facility at White Sands Missile Range, N.M. It used only a fraction of the power of the Mid-Infrared Advanced Chemical Laser to emulate the THEL weapon concept performance.

The Mid-Infrared Advanced Chemical Laser is a megawatt class, deuterium fluoride chemical laser operating since the early 1980s. After a series of static and dynamic tests, the program successfully destroyed a short-range rocket in flight on Feb. 9, 1996. This success triggered the next development in the Space and Strategic Defense Command's THEL development effort.

In April 1996, the prime minister of Israel, Simon Peres, met with President Clinton and Secretary of Defense William Perry. During the meeting, the United States made a commitment to assist Israel in the development of a THEL Advanced Concept Technology Demonstrator Laser by the end of 1997. This commitment, based on the success of the Nautilus program, will help Israel defend cities in northern Israel from the threat posed by Katyusha and other short-range rockets.

In July 1996, the Space and Strategic Defense Command awarded a contract to TRW of Redondo Beach, Calif., for the design, development and fabrication of the THEL demonstrator, which will be a transportable, tactical-sized deuterium fluoride chemical laser. The effort includes development and testing of the laser and/or fluid supply assembly; the pointer

and/or tracker; a command, control, communications and fire-control system; modification of and interface with a radar provided by Israel; and limited aspects of support equipment to demonstrate feasibility and to support possible future field testing.

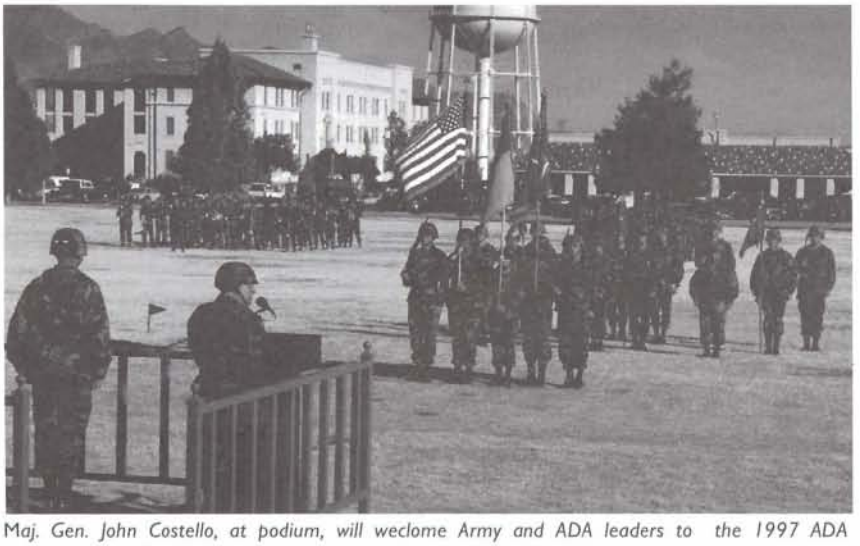
It will take about 21 months to design and build the system, followed by 12 to 18 months of field testing. The THEL demonstrator will provide the first opportunity to assess the utility of high-energy lasers in an operational scenario.

If successful, the demonstrator may pave the way for future development of a THEL User Operational Evaluation System for use in U.S. peacekeeping and contingency operations. The U.S. Army Air Defense Artillery School, Fort Bliss, Texas, officially designated as the proponent for THEL by the U.S. Army Training and Doctrine Command, will develop a mission need statement and an operational requirements statement for the initial THEL configuration.

Evolving high-energy laser, beam-control and digital battlefield information technologies promise to combine into a highly effective THEL weapon system for Force XXI air defense. For more information, please contact: U.S. Army Space and Strategic Defense Command, Public Affairs Office P.O. Box 1500, Huntsville, AL 35807-3801. Phone: 205-955-3887

ADA Commanders' Conference

Air Defense Artillery leaders will turn their attention to the creation of the 'Army After Next'



Maj. Gen. John Costello, at podium, will weclome Army and ADA leaders to the 1997 ADA Commanders' Conference, June 16 to19, at Fort Bliss, Texas.

Maj. Gen. John Costello, chief of Air Defense Artillery, will host the 1997 ADA Commanders' Conference from June 16 through 19 at Fort Bliss, Texas. This year's conference theme is "Into the 21st Century." A two-day industry symposium on June 13 and 14 will precede the commanders' conference. The two-day industry symposium will focus on far-reaching technology and future initiatives linked to the "Army After Next."

"Since the end of the Gulf War, we have kept our eyes on the ball — the still-to-be-completed transition of Force XXI," said Costello. "The ball is still descending, but now it's time to glance down field — to look into the future — before making the catch. We'll divide our attention between the task at hand the creation of the Army After Next, the future force that will evolve from Force XXI."

The ADA Commanders' Conference will feature formal presentations by senior Department of the Army and ADA leaders on June 17 and 18. On June 19, ADA commanders and command sergeants major will form discussion groups to explore the impact of the changing geopolitical environment on ADA doctrine, organizational structure, leader development, materiel and soldiers as the "First to Fire" branch prepares for the millennium.

This year's ADA Commanders' Conference fee will be $20. The conference festivities will kick off June 16 with a morning golf tournament at the Fort Bliss Golf Club followed by an ice breaker hosted by Major General and Mrs. Costello. The conference agenda includes a formal banquet the night of June 18 at the Fort Bliss Centennial Club. Major defense corporations have been invited to display advanced air defense weapon systems and technologies.

Address questions concerning the 1997 ADA Commanders' Conference and industry symposium to: Capt. Nick Barnhardt and SFC Lori Walsh, ADA Commanders' Conference Project Office, DSN 979-0272/0273 or Commercial 915-568-0274/0273.

Address E-mail to: cdrconf@bliss-idms.army.mill. The project office's FAX number is DSN 978-0274 or Commercial 915-568-0274.

3-6 ADA Restores Last 'Big Gun'

Weighing 32 tons, the 'Stratosphere Gun' was the largest and last antiaircraft artillery piece

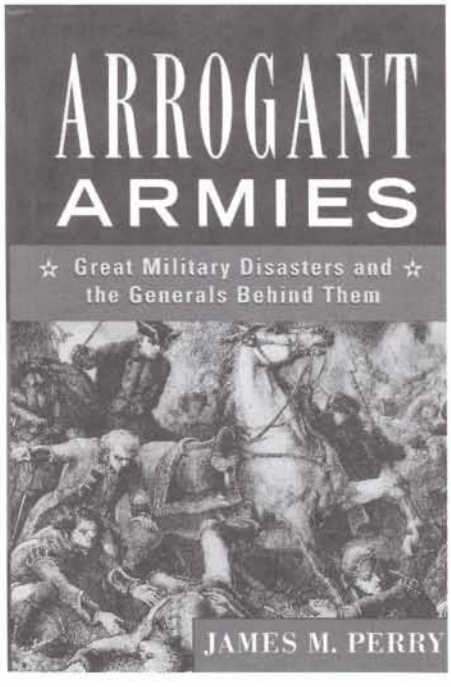
Soldiers of the 3rd Battalion, 6th ADA Brigade, Fort Bliss, Texas, are restoring a 120mm rifle-bore antiaircraft artillery piece nicknamed the "Stratosphere Gun" to combat readiness. The restoration project is the battalion's contribution to Fort Bliss' "Adopt an Artifact" program, a campaign to rescue historic air defense artifacts from oblivion.

Units participating in the Adopt an Artifact program are restoring 14 air defense artifacts stored in sites scattered across Fort Bliss for display in a temporary Air Defense Artillery Museum annex. Fort Bliss hopes to open the annex. (Building 756, a large warehouse at the corner of Carter and Pleasonton) in June. Plans are to eventually move the artifacts into a new, 130,000-square-foot Fort Bliss Museum facility (see "Operation Enlightenment," page 54).

Stratosphere Guns, the largest and last of America's big antiaircraft artillery guns, were replaced by Nike Ajax surface-to-air missiles in 1955. The gun that 3-6 ADA is restoring was found in a warehouse at Rock Island Arsenal, Ill., and moved to Fort Bliss eight years ago. The air defense battalion is looking for veterans who served on, or are familiar with, the system to help in the restoration project and participate in the commemoration ceremony. Veterans wishing to volunteer may call (915) 568-5208.

Spc. Michael Scott
Fort Bliss Montior

Spc. Jason J. Srader, left, and CWO Kenneth L. Lane are among 3-6 ADA soldiers working to restore the "Stratosphere Gun" to fighting trim.



EXCERPTS

A "pattern repeated endlessly" from the French and Indian War (1754-1763) to Somalia (1993)

"These are small wars, what Kipling called the 'savage wars of peace.' And while this kind of war goes back almost to the dawn of recorded history . . . this book will explore eleven different military expeditions launched by a variety of world powers in the imperial age—the eighteenth, nineteenth and twentieth centuries.

Each of these expeditions stands alone as a separate snapshot of history. But they have one thing in common: every one of these arrogant armies meets its match in strange and distant corners of the earth fighting tribesmen and dirty, rumpled soldiers representing those 'inferior' cultures.

The fate of those arrogant imperial armies — the awful defeats they suffered — is a powerful commentary on human folly. Nothing goes wrong quite so dramatically as a disastrous military expendition."

ada digest

Sentinel Fielding on Schedule

Forward area air defense command and control keeps pace with ground-based sensor fielding

Some ADA units are already deploying Sentinel ground-based sensor and forward area command and control nodes in real-life missions and in advanced warfighting execises. For example, the 1st Battalion, 3rd Air Defense Artillery, Fort Stewart, Ga, served as the test-bed unit for the Sentinel ground-based sensor. Last summer, the battalion's Sentinel Platoon successfully deployed its ground-based sensors and forward area air defense command and control sensor nodes to defend the Olympic Games (see "ADA Medals at the Olympics", page 44). And the 1st Battalion, 44th Air Defense Artillery, Fort Hood, Texas, received three initial production Sentinel radars to support the recent Task Force XXI Advanced Warfighting Exercise.

The Sentinel ground-based sensor saga is a procurement and fielding success story.

But most short-range air defense units still eagerly await the arrival of Sentinels and forward area air defense command and control equipment. Fortunately, the wait will not be a long one.

3-4 ADA, 82nd Airborne Division, is the seventh battalion to receive forward area air defense command and control equipment

The Sentinel saga is turning into a procurement, testing and fielding success story. Sentinel Radar Product Verification Testing at White Sands Missile Range, N.M., and Redstone Arsenal, Ala., continues smoothly and on schedule. In June, the 1-44 ADA will be the first unit equipped when new equipment training is completed.

The feedback on Sentinel from air defense soldiers at Fort Hood and those conducting product verification testing at White Sands Missile Range has been extremely positive. They have discovered, for example, that the Sentinel has about 60-percent commnality with Field Artillery's Firefinder Radar. This promises to make Sentinel's logistical support much less expensive than predicted.

1-44 ADA soldiers did complain that the original Sentinel power generator, which is mounted on the high-mobility, multipurpose, wheeled vehicle, or Humvee, was too noisy for tactical operations. Reacting to their concern, the Sentinel program manger redesigned the mount and replaced the power unit with an MEP-813 Tactical Quiet Generator. This generator also powers forward area air defense command and control equipment, but the Sentinel model puts out 400Hz of power instead of 60Hz. The new generator will be fielded during the first quarter, fiscal year 1998.

Short-range air defense battalions will place Sentinels and AN/TSQ-183 sensor nodes in their headquarters and headquarters batteries. Separated batteries will receive a battery command post (AN/TSQ-184) and all authorized hand-held

terminal units. This will permit separated batteries to train on electronic warfare procedures as if a Sentinel were present.

Many air defenders understandably think of Sentinel and interfacing forward area command and control equipment as a composite package — one, after all, would be worthless without the other. However, the Sentinel and forward area air defense command and control are separately funded programs towed by their own procurement locomotives.

In January, the 3rd Battalion, 4th Air Defense Artillery, 82nd Airborne Division, became the seventh battalion to receive forward area air defense command and control equipment and the first unit in the Army equipped with new generation common command and control hardware and software. As always, Air Defense Artillery is leading the way.

Meanwhile, the U.S. Army Training and Doctrine Command System Management Office continues to work closely with the Program Office-Forward Area Air Defense to develop standard installation kits for the enhanced position location reporting systems and single-channel ground and airborne radio systems (SINCGARSs). These standardized installation kits, which will become part of the 3-4 ADA fielding, were demonstrated at Fort Bliss, Texas, in January. A retrofit plan for units already equipped with command and control equipment is in the works.

Re-engineering work required to route electronic warfare data from the SINCGARSs mounted in Avenger turrets to the hand-held terminal units and/ or simplified hand-held terminal units has also been completed. Avenger systems will have to be de-mated while a wiring harness is installed to accommodate the modification. The Army hopes to obtain the funding necessary to make the modification throughout short-range air defense.

Lt. Col. Michael Six
CW3 Gary Hood

Taps

Air Defense Artillery's roll call of living World War II heroes grew one name shorter Feb. 3 when "Taps" sounded over the grave of Col. William Massello Jr.

Massello is best remembered for his courageous actions against Japanese forces on Bataan and Corregidor. As the commander of a 60th Coast Artillery antiaircraft battery on Corregidor during the most desperate hours of the battle for the Philippines. Massello, then a major, earned the Distinguished Service Cross for heroism. Though seriously wounded, Massello refused evacuation for badly needed medical attention. Instead, he directed his men to strap him onto a stretcher from which he continued to direct withering fire on the attacking enemy force. Massello is credited with pulling the lanyard from his stretcher to fire the final artillery round from Corregidor's defiant gun batteries moments before the Japanese overran the beleaguered island in Manila Bay.

In addition to the Distinguished Service Cross, Messello was also awarded two Silver Stars, one Legion of Merit and four Purple Hearts.

Commissioned from the United States Military Academy, West Point, N.Y., in 1932, Messello served in various artillery and antiaircraft artillery units throughout his career. He retired from the Army in 1960. A resident of El Paso, Texas, Massello spent the years following his Army career as a math teacher. He is survived by his wife and four children.

Fort Bliss soldiers provided full military honors as Col. William Massello Jr., a hero of Bataan and Corregidor, was buried at Fort Bliss National Cemetary.

ada digest

35th ADA Brigade Arrives at Fort Bliss

Air defenders applaud Army Reservists of the 134th Transportation Command for herculean labors

No military spouse who's ever packed the family china for a permanent change of station would have blamed Lt. Col. Timothy M. Lund for succumbing to a full-scale anxiety attack the morning the "movers" arrived to move the 35th ADA Brigade from Fort Lewis, Wash., to Fort Bliss, Texas. What if they bust the phased array radar? What if they load the Patriot missile launchers wrong side up? To complicate matters, the last of the brigade's equipment was scheduled to roll into Fort Bliss at about the same time the brigade was scheduled to participate in Exercise Roving Sands '97, the giant exercise that annually turns Fort Bliss's sprawling training ranges into a simulated combat zone.

The 35th ADA Brigade commander claims to have never had anything less than full confidence in the capabilities, expertise and professionalism of the 143rd Transportation Command. He had never worked with an Army Reserve transportation unit before, but the 143rd Transportation came with solid credentials.

As the executive agent for transportation for the U.S. Army Reserve Command, the 143rd Transportation Command, which has about 70 percent of all the Army's transportation assets, is the only unit of its type in the Army Reserve. Last year, the command moved the 3rd Armored Cavalry Regiment from Fort Bliss to Fort Carson, Col. It has also helped transport medical supplies to American Indians in Utah, shipped equipment to and from Saudi Arabia and operated airfields and ports during Operation Joint Endeavor. In moving the 35th ADA Brigade, the 143rd Transportation Command lived up to its well-earned reputation.

"The move verified the whole Army concept," Lund said. "I felt strongly that we had a real solid plan. I felt very good about the upcoming move. My folks have nothing but good things to say about the Reservists."

The movement was momentous for Air Defense Artillery. The 108th ADA Brigade and 31st ADA Brigade had only recently moved to Fort Bliss from Fort Polk, La., and Fort Hood, Texas. The closure of the 35th ADA Brigade on Fort Bliss will complete the relocation of continental-based air defense brigades to Fort Bliss. Today, the three new arrivals, along with Fort Bliss's 11th ADA Brigade and the U.S. Army Air Defense Artillery School's 6th ADA Brigade, form a uniquely powerful power-projection platform for theater missile defense.

The muti-mode move, which got underway in February, occurred in three phases: sea, rail and highway. Nine boats put to sea with about 260 pieces of wheeled equipment, Tractor-trailers, carrying 150 full loads, rumbled down highways leading south, and 250 vehicles and containers made the trip by rail. The mammoth move eventually involved more than 1,000 soldiers from 36 active Army and Army Reserve units working out of four sites: Fort Lewis, Port Hueneme, Calif., Phoenix, Ariz., and Fort Bliss. Regiments of local, state and federal highway and transportation officials also took part.

Having reservists rather than commercial carriers move the 35th ADA Brigade saved the Army money, but Brig. Gen. Michael T. Gaw, commander of the 143rd Transportation Command, explained the Army was more interested in training gained than dollars saved. "The reason for using the U.S. Army Reserve was not to save money but to provide valuable training experience. We are very careful not to infringe on the commercial sector, and training the U.S. Army Reserve is the primary reason for doing exercises such as this one."

Even the decision to use boats, trains and trucks had more to do with training than money, Gaw said. Moving equipment by sea "closely mirrors actual wartime mission requirements that our units are expected to be able to perform upon mobilization deployments," he said.

"I believe that the successful completion of this exercise clearly demonstrates the professional capabilities of the 143rd Transportation Command and adds to its already recognized accomplishments," Gaw said. "Equally important, however, is that the clear example our success demonstrates that the U.S. Army Reserve is clearly part of the Army."

Maj. Gen. John Costello, Chief of Air Defense Artillery, characterized the arrival of the 35th ADA Brigade as an "important milestone" on the branch's journey to Force XXI. "The downsizing of the active force has required us to place tremendous trust in the Army Reserve and the Army National Guard. The magnificent performance of the 134th Transportation Command demonstrates that our trust is well placed."

Soldiers of the 35th ADA Brigade will follow their equipment to Fort Bliss. The relocated brigade is scheduled to "stand up" in mid July.

Ssgt. Gwen Cooley
Headquarters, 143rd Transportation Command
Orlando, Fla.

Test Produces Mixed Results

THAAD radar and guidance system function perfectly but interceptor misses ballistic missile target

The Theater High-Altitude Area Defense (THAAD) system failed for the fourth consecutive time to intercept a tactical ballistic missile target during a March 6 test at White Sands Missile Range, N.M. The March test was the seventh test flight, the fourth intercept attempt and the first test of a fully integrated THAAD system.

Some observers saw the test results as a serious setback that might force the Army to reconfigure THAAD test and evaluation schedules, thus delaying fielding. Others worried that funding for theTHAAD program itself might be in jeopardy. Official Army press releases, however, pointed out positive aspects of the failed intercept attempt.

The Army envisions THAAD as the upper tier of a leakproof tactical ballistic missile

"Analysis of the flight data is continuing to determine the cause of the malfunction," said a tersely worded press release issued the day of the test by the Office, Assistant Secretary of Defense. "Although the THAAD missile missed the target, the test did yield valuable information that will be used to determine what corrections are required. Preliminary indications are that the THAAD Radar and command and control system performed normally in this test."

"Although an intercept was not achieved, the test did yield valuable information that the THAAD segments can operate as a system," said a statement released by the U.S. Army Program Executive Office-Air and Missile Defense, Huntsville, Ala. "Preliminary investigations indicate that the ground elements of the THAAD system performed normally. The radar tracked the theater ballistic target and the interceptor. The BMC^{4}I [battle management command, control, communications, computers and intelligence center] developed a launch solution and commanded the interceptor launch. Early in the interceptor flight it became apparent that the missile was not operating properly. Although the THAAD Radar and BMC^{4}I continued to send course correction information to the interceptor, it did not make the minor corrections necessary for intercept. Analysis of flight data is continuing to determine the cause of the malfunctions.

"This was the first mission in which the entire THAAD system was integrated and tested. The THAAD Radar, BMC^{4}I and launcher appeared to perform as expected," the Huntsville release continued. "This test, the seventh THAAD missile flight, was another in a continuing series to verify the THAAD design and performance of the prototype system components."

The THAAD system is the first air defense system specifically designed to intercept tactical ballistic missiles. The Army envisions THAAD as the upper tier and Patriot as the lower tier of a near-leakproof, multilayered theater air and missile defense. THAAD is designed to intercept and destroy tactical ballistic missiles at higher altitudes and longer ranges than Patriot. Patriot destroys or diverts tactical ballistic missiles by exploding in close proximity and showering them with shrapnel. THAAD relies on sophisticated seeker and flight-control technologies to score direct hits on the warheads of incoming missiles. The THAAD program is managed by the Ballistic Missile Defense Organization and executed by the Army Program Executive Officer for Air and Missile Defense and the Army THAAD Project Manager. Lockheed-Martin is the prime contractor. Raytheon, the Patriot prime contractor, builds the THAAD Radar.

Meeting the Global Missile Challenge

by Lt. Gen. Edward G. Anderson III

Since World War II, when barrages of German V-1 "buzz bombs" and V-2 rockets hit London, commanders have recognized the need to counter missiles through a broad array of tactics. Today, the target may be U.S. forces deployed overseas, host population centers and geopolitical assets or the American homeland. As we approach the millennium, we must find ways to quickly and efficiently field affordable and effective national and theater missile defense systems. Meeting the global missile defense challenge is a top national security priority that demands close cooperation between the military and industry, Army components, the joint services and allied or friendly nations.

In recent years theater missile defense, in particular, has received a lot of emphasis. Our Army and joint doctrine recognizes the value in synergistically applying multiple tactics against theater missile targets. The Army believes strongly in this approach.

Attack operations — destroying theater missiles or missile infrastructure on the ground — is the preferred option. Taking cover or implementing passive defense measures, which reduce freedom of action, is the last option, but we must plan to execute passive defense in an efficient, imaginative and well-planned manner. The core of our joint theater missile defense, however, remains active defense, our capability to intercept and destroy missiles in flight. It is the backbone. Ensuring our ability to deploy, maneuver and sustain our force, while assuring protected populations that they have substantial protection, is critical to force-projection operations. The fourth element of missile defense comprises command, control, communications and intelligence — the battle management element. Advances in this area, including cueing, rapid sensor tasking, impact point prediction, fire distribution, efficient weapon-target pairing and other innovations, can reduce the magnitude of the missile threat and the burden on our active defense. The Army Force-Projection Tactical Operations Center, concluding its second year of tactical demonstrations, has done much to further our understanding of how to fight integrated theater missile defense. Keep in mind the value added by space operations. Since the days of the Redstone rocket and the Explorer 1 satellite, the Army has been a leader in space. Today, systems such as joint tactical ground stations, which are currently operating in two overseas theaters, are major contributors to force protection.

Certainly, we also need to continue to refine all measures designed to counter theater missiles. But above all, we need to press forward in exploiting this decade's major active defense advances. The Patriot Advanced Capabilities-3 and the Theater High-Altitude Area Defense system's progress are significant. Organizations such as the Ballistic Missile Defense Organization and the Army's air and missile defense communities deserve recognition for their successes.

We are seeing major developments in national missile defense as well. During the Cold War, the Army briefly deployed Safeguard, the world's first antiballistic missile system. Only one Safeguard site went operational before treaties that limited antiballistic missile system deployments caused the Army to close down the Safeguard project, but the lessons learned have not been forgotten. The Army's long tradition and rich expertise in antiballistic missile defense will be prominent in further developing our approach to defending the United States should the threat warrant deployment of a national missile defense system.

The Army's successes in strategic-level ballistic missile defense also paved the way for our successful theater missile defense programs. The partnership between industry and the military, which has enabled these successes, has roots extending back into the mid-1950s. In a 1962 test, when the Army's Nike-Zeus intercepted an intercontinental ballistic missile in

space above Kwajalein Atoll, our nation's space and missile defense effort achieved a major milestone. Missile defense has evolved steadily since those days. Hard work by industry, as well as the military, has fueled that evolution. This missile defense legacy makes us well-prepared to cross the threshold into the 21st Century. It is a legacy involving space, national missile defense and theater missile defense.

Our future development of missile defense will have to be efficiently managed. In the future, that process of transition from ideas and concepts into deployed capabilities with ready-to-fire lights illuminated in control vans must be swift and affordable. The hand-offs from scientist to engineer to developer to operator may need to be less sequential and more parallel. We observed such accelerated activity during the Gulf War when Raytheon stepped up production of Patriot Advance Capabilities-2 missiles and sped new generations of target acquisition and tracking software to Patriot batteries in the midst of battle. This partnership between industry and the military will continue to grow in importance. When resources are tight and force structure reduced, a shared plan for the future is absolutely essential. We have to all be in the same staging area, ready to react as new threats emerge.

Our national leadership is providing beacons to guide our missile defense efforts. During 1996, visionary thinking coalesced and emerged in important publications. Undoubtedly, the approach of the 21st century inspires much of this thinking. This visionary thinking is also prompted by other factors. We have had time to assess the meaning of the changing geopolitical environment, time to build up a historical view of the post-Cold War world, and time to develop strategies for coping with that new world order, or lack of order.

Our national leadership has identified terrorism as a threat requiring special attention. Missile attack can be a terrorist tactic, especially when civilian populations are the targets. We experienced this tactic in the Gulf and saw it again this year off the shores of Taiwan as China conducted military exercises to flaunt its arsenal of tactical missiles. We will see more complex forms as land-attack cruise missiles appear in the arsenals of rogue states or those likely to turn adversarial. The deployment of Sentinel ground-based sensor units to watch over the Centennial Olympic Games in Atlanta signaled our awareness that the possibility of foreign or domestic terrorist air attacks within the United States can no longer be ignored.

The future is uncertain and will present complex challenges. The political influence and coercive potential in missile warfare is considerable. Initiatives such as the creation of the Joint Theater Air and Missile Defense Organization and the international Medium Extended Range Air Defense System, commonly called MEADS, program demonstrate the comprehensive approach our nation is taking in a joint sense and international sense.

We also must be ready to deploy an affordable national missile defense. Significant steps have been taken by the national leadership, the Ballistic Missile Defense Organization and the Army to ensure we are ready ahead of the threat. The U.S. Army Space Command is very active in improving missile defense command operations and associated operational requirements. At the U.S. Army Space and Strategic Defense Command, we share Space Command's and the Ballistic Missile Defense Organization's view of the value of command and control simulations. This is especially true

The 'Robot Blitz'

The missile threat made its debut during World War II when Germany launched barrages of V-1 "buzz bombs" and V-2 rockets against London. At right, a V-1 plunges past St. Paul's Cathederal. After an initial period of panic, antiaircraft artillery guns deployed in concentric belts proved effective against V-1s, the forerunners of today's sophisticated cruise missiles. However, London remained defenseless against the supersonic V-2s, the ancestors of today's more lethal theater and intercontinenal ballistic missiles. The V-2s continued to pound the city until the Allies overran their launch sites.

today, when tight budgets demand highly efficient system acquisition.

Leveraging technology is one potentially high-payoff avenue when affordability is an issue and force structure is undergoing reduction. We should raise our concerns with the funding level for research, development and acquisition. The Army has a well-thought-out plan for the ground-based component of the national missile defense system. We will work with our sister services and the Joint Staff to ensure our procedures support the full range of the systems our program executive offices and industry develop.

The Army will continue its essential contribution to a wide spectrum of missions. Missile defense will be needed to enable many of those missions. The comprehensive offensive and defensive national missile defense strategy also characterizes our theater missile defense initiatives. "Jointness" will be the guiding beacon as we work to provide our commanders in chief with tailorable, flexible packages of multi-service capabilities.

Theater missile defense is an essential element of Army XXI. Force XXI information acquisition and sharing techniques are essential to all elements of missile defense: attack operations, active defense, passive defense, as well as the supporting and enabling command, control, communications, computers and intelligence structure. The theater-wide and, in some cases, global situational awareness required to fight missile defense battles is absolutely consistent with Army XXI initiatives.

We have done much to implement the joint theater missile defense doctrine approved three years ago. We have a thorough understanding of options available and how they develop within a joint scenario. We also understand the magnitude of the coordination requirement associated with these options within a joint missile defense architecture. This multi-element approach is essential to providing the force protection required to enable force projection, sustain in-theater operations and facilitate orderly redeployment. Each of us in industry and the military has a role to play in missile defense. The goal is to play these roles as a synergistic team. Synergy is sometimes difficult to define, but it seems to develop in part through frequent, substantial information exchange.

In the missile defense arena, we are on the threshold of major phases in system procurement. That always brings a need to confront the tough funding decisions. How much of which system to procure? How good do our defenses really have to be? How do we assess trade-offs between protection and risk? We need to be cautious as the Cold War dread of intercontinental ballistic missile subsides and the images of Iraqi Scuds impacting in Saudi Arabia and Tel Aviv grow dim. Time has a healing but blurring effect. It can cause us to forget the terror of nuclear war or the devastation created by a warhead that we might refer to as a "leaker" in a war game or in a computer simulation.

In the Army we know the practical and symbolic value of active defenses. Their value is well known in Korea, where Patriot units are on station. Active defense systems continue to be valued in the Gulf region, a sign of American resolve. When funding is an issue, some would say we can afford to take risks, that we can build systems that provide a "reasonable" level of protection. We should be extremely cautious in such discussions. While we must face fiscal reality, we cannot afford to cede to our future adversaries the long-range delivery of weapons of mass destruction.

I believe strongly in taking advantage of the current winds of opportunity. The Army will continue to advocate the development and fielding of robust and reliable defense. Patriot Advanced Capabilities-3, the Theater High-Altitude Area Defense system, the Medium Extended Air Defense System and national missile defense program are headed on the right course. We are committed to advocating them strongly and will continue to do so in Washington and elsewhere.

Space is an important aspect of missile defense. Our space architecture must keep us a step ahead of our adversaries. Spaced-based sensors to detect and track missile targets; downlinks and processors responsible to the needs of tactical commanders; algorithms, terminals and communications to provide localized missile attack warning all contribute to the global nature of missile defense.

Our missile defense command and control capabilities have developed substantially. The Force-Projection Tactical Operations Center is now a highly efficient theater missile defense integrating capability. It is tailored specifically for the needs of a land-component commander. We routinely deploy the Force-Projection Tactical Operations Center and its crew —collectively, the Army Theater Missile Defense Element— in support of joint exercises. Through these exercises, the tactical operations center and its crew are improving our understanding of how to conduct integrated, joint theater missile defense. We will continue to build on that effort.

Roving Sands '97 has just been completed. Some portrayed the theater missile defense portion of the exercise as a theater missile defense shoot off in which Army and Air Force theater missile defense doctrinal concepts would be assessed. While a shoot off may be a vivid image, embracing that term too easily could lead to unwise decisions. We will make sure the assessment keeps the warfighters' best interests in the forefront. Our joint theater missile defense doctrine and operations are sound. We need to preserve the existing emphasis on theater missile defense as a unique and joint mission area. We must remember that protecting the soldier in the foxhole, the airman on a foreign tarmac or an allied family huddled in a bomb shelter is the objective. Our existing theater missile defense doctrine is well focused on that mission.

On the theme of jointness and its global challenges, we should keep Gen. John M. Shalikashvili's *Joint Vision 2010*

in mind. In his vision, the chairman of the Joint Chiefs of Staff, has described the joint force of 2010 as a full-spectrum force. This force must prepare to conduct dominant maneuver and precision engagement, but also to deploy and conduct less violent but equally tense peacemaking, peacekeeping or reassurance operations. Gen. Dennis J. Reimer, Army chief of staff, has further embraced and defined these concepts in *Army Vision 2010*. Our enabling force in Bosina is an example of such operations as is our surveillance and reassurance operations in Kuwait. In any scenarios such as those, there will be a need for missile defense and space capabilities.

Our forces will be sustained through focused logistics, the detailed, efficient tracking, managing and delivery of tailored logistic packages. Enabling this vision depends greatly on information dominance, which will mature with Force XXI capabilities. Space-based systems will become increasingly important in this role. Achieving this vision will require a global missile defense capability. Just as information dominance is a force enabler, so is the full-dimension protection called for in *Joint Vision 2010*. Force protection provides freedom to maneuver, strategically and tactically.

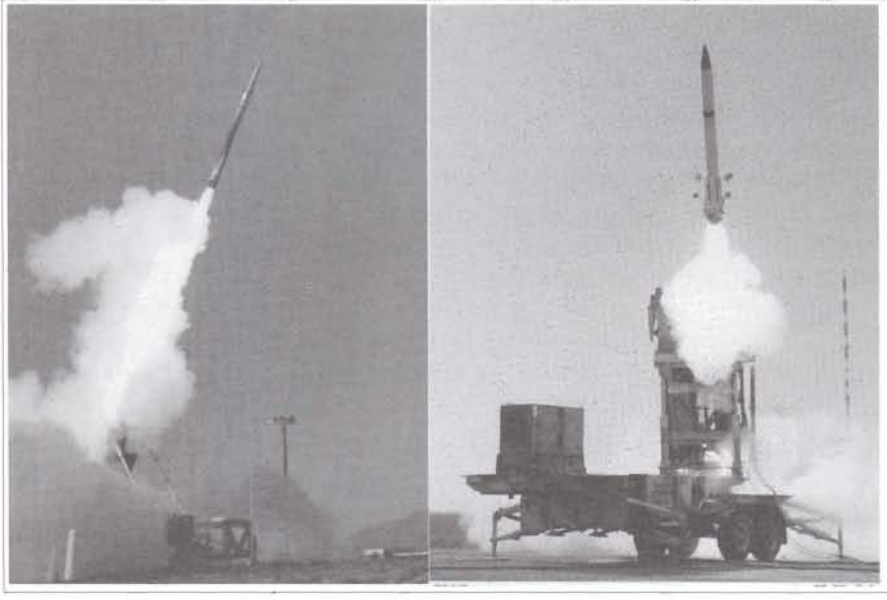
The Army has been a leader in this respect. In the missile defense arena, 2010 is, in many cases, here today. Patriot has reduced the theater missile options available to potential adversaries. When Patriot Advanced Capabilities-3 and the Theater High-Altitude Area Defense system are fielded, a commander in chief will know, with a high degree of confidence, he can protect the force, population centers and selected geopolitical as well as military assets. This means our friends will be reassured, our soldiers protected and the joint force able to deploy and operate.

Space and missile defense soldiers are deployed around the world, operating 24 hours a day. In Southwest Asia and Northeast Asia, Patriot batteries remain on station. In Europe and Korea, joint tactical ground station detachments receive data on missile launches, which are detected by Defense Support Program satellites. In regions such as Bosnia, Army Space Support Team soldiers bring spaced-based products to joint commanders. The Army Space Command's 1st Satellite Control Battalion operates and maintains nine Defense Support Communications Satellite control facilities around the world. And let's not forget our Army astronauts, soldiers, scientists and engineers who may be the prototype of the 21st century warrior, actually operating from what we often call the "high ground of space."

So, while we are not at war, we have warriors deployed. It's important to remember their contributions because they are the ones who depend on the systems we provide. These systems will continue to evolve as we shake down Force XXI and head toward *Joint* and *Army Vision 2010*, but this generation's space and missile defense systems are on the line today, powered up and supporting commanders in chief worldwide.

The global challenges of missile defense are not yet solved, but we have made tremendous headway. The Army is committed to solving the challenges, in the context of protecting forces deployed overseas and the national homeland.

This article incorporates comments made by Lt. Gen. Edward G. Anderson III, commander of the U.S. Army Space and Strategic Defense Command, Washington, D.C., at the Association of the U.S. Army's 1996 Missile Defense Symposium.



Two-Tiered Defense

Operation Desert Storm's barrage of Scud missiles illustrated the need for theater missile defense systems that can intercept and destroy tactical ballistic missiles before they penetrate target areas. The Patriot Advanced Capabilities-3 system, right, will serve Force XXI as the lower tier of a two-tiered, near-leakproof defense against theater ballistic missiles. The Army envisions the Theater High-Altitude Area Defense system, left, as the upper-tier system.

National Missile Defense

by Gen. Dennis J. Reimer

The national missile defense mission gives us a great opportunity to take care of our nation. It gives us a chance to lay a brick or two on the path to the future for the defense of the American homeland. Since 1775 the Army's most important mission — and still our reason for existence — is to "provide for the common defense."

The Army today is very mindful of this legacy; the defense of the American homeland is not something we take for granted. It conjures in my mind images of Americans in their homes, in schools, in churches, at work and at play, secure and free from fear of attack beyond our borders. This is not just a sentimental view. Americans have a real, rational and uncompromising expectation that their armed forces provide for their security, not just around the world, but also at home. We have met these demands for more than 200 years. Our armed forces' record of success justifiably reinforces these expectations.

I say armed forces for a simple and unequivocal reason: defense of the homeland has been and will always be an inherently joint mission. No other way ensures continued success. From our earliest days as a nation well into this century, an Army-Navy team guarded our shores. Just as the Navy and Coast Guard patrolled our national waters, on land the Costal Artillery, from which our Air Defense Artillery takes its proud heritage, stood guard at the seaward approaches to our maritime cities. During World War II the Army Air Corps added a new, powerful dimension to the defense of the homeland with land-based aircraft controlling the air approaches along our thousands of miles of coastlines.

At the conclusion of World War II technological advancements in the hands of potential adversaries posed threats of air bombers and ballistic missiles carrying devastating nuclear weapons. It was a real and serious threat. America required a comprehensive strategy for protection in a new and dangerous era. Beginning with the 1948 Key West Agreement and evolving into the 1950s, the services each contributed to the continued security of the homeland. The Air Force was given the lead for overall defense of the nation from air attack. The Navy assisted in early warning and antisubmarine warfare. The Army, true to its historic role, provided ground-based defense against manned bombers and, pursuant to the Department of Defense memoranda and directives, took on the critical mission of air defense against intercontinental ballistic missiles through the Cold War.

The U.S. Army Air Defense Command worked in conjunction with the Air Force to protect our industrial base, population centers and second-strike nuclear capability with weapons such as Skysweeper, Nike-Ajax, Nike Hercules and the Safeguard antiballistic missile system. These names are, perhaps, unfamiliar to many young soldiers today, but they were household words — reassuring words — during the darkest days of the Cold War.

Ground-based air defense was and continues to be a key mission for our Army National Guard, which at its high point, had 809 separate units with more than 70,000 soldiers deployed in 27 states, Puerto Rico and Washington, D.C. More recently, the Army has participated fully in the work of the Ballistic Missile Defense Organization (BMDO) by developing and testing evolving ground-based interceptor systems and technologies for defense against ballistic missiles. Our historical role in defense of the homeland is central to the Army's purpose and has been for 221 years.

The reality remains that since intercontinental ballistic missiles became a threat 38 years ago, the ground-based active defense portion of national missile defense has been an Army mission, as indicated by our participation in Safeguard, the Strategic Defense Initiative and today's efforts. Yet we all recognize that we live in a time when strong forces for change are reshaping the world around us. We face new challenges and new threats. Geopolitical changes rearrange political boundaries and alliances. The collapse of the Soviet Empire, fragmentation of former states and ethnic cleavages promote instability in a variety of forms and in a number of different regions.

Technological advances provide opportunities for friend and foe alike. As we try to leverage the information revolution and precision-engagement technologies to sustain our military dominance and project it into the future, our potential adversaries will eventually find technologies to counter our advantages, even though they may never match us. This has been the history of warfare.

Today the United States has no defense against long-range ballistic missile attacks aimed at our homeland. The prolif-

eration of weapons of mass destruction and ballistic missile technologies leaves us uncertain of the sophistication and emergence of such threats.

We are, however, certain of one thing. An attack or the threat of an attack in the absence of an adequate defense is unacceptable. Meeting this challenge is complicated by changing national priorities that strain our resources, challenge us to achieve greater and greater efficiency and put additional pressure on our balanced equation of conventional readiness, modernization and quality of life.

We do have a strategy to meet these threats and challenges, now and in the future. The Chairman of the Joint Chiefs of Staff, General John Shalikashvili, has been decisively involved with many of these issues and has been working on defining our future warfighting requirements. The chairman has published and distributed a document called *Joint Vision 2010.* This document provides a coherent view of the future and outlines that future's implications for joint forces and joint operations. The view expressed in terms of emerging operational concepts such as joint maneuver, precision strike, focused logistics and full-dimensional protection is supported by all the services. We have met on this, we have talked about it, and we all agree that *Joint Vision 2010* should be our guidepost to the future.

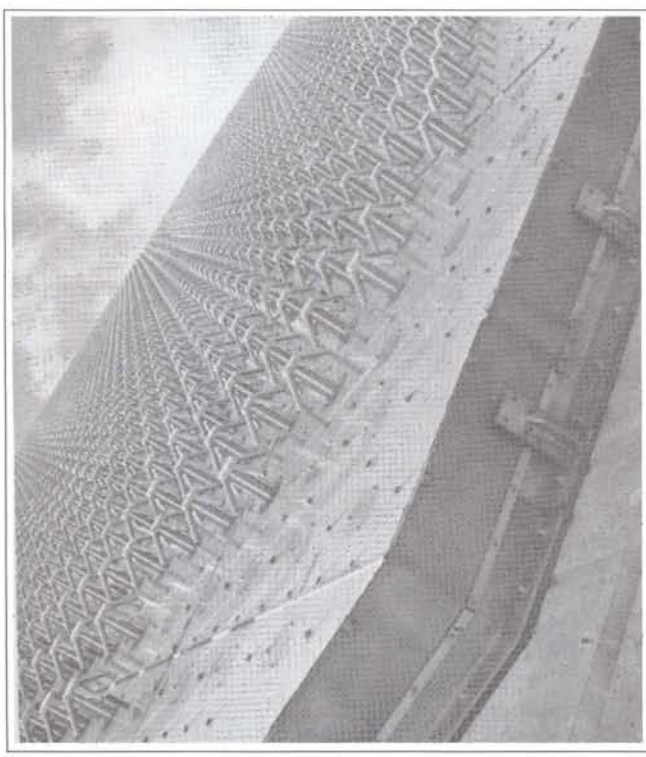
Full-dimensional protection means protection from the array of technologies that threaten our political and military freedom of action. Politically, ballistic missiles in the hands of state or non-state adversaries could threaten our homeland and thus, perhaps, our will to act. Militarily, these systems could threaten our capability to project power from the United States around the world.

Our national missile defense strategy is fundamental to full-dimensional protection. It is part of the proactive, defensive and offensive actions necessary to control battlespace, to ensure freedom of action and provide multilayered defenses for our nation, our forces and our facilities at all levels.

Recently, the Army published our supporting document to *Joint Vision 2010. Army Vision 2010* is the conceptual template of the U.S. Army that will channel the vitality and innovation of its soldiers and leverage technological opportunities to achieve new levels of effectiveness as the land-component member of the joint warfighting team. Army *Vision 2010* assesses that, first and foremost, we must have an Army to fight and win the nation's wars (since 1775 we always have and always will).

Additionally, the Army, because of its versatility, makes contributions in a sustained and measured way across the broadest array of operations other than war to satisfy national requirements. The Army is the true full-spectrum force, from peacekeeping to national missile defense to high-intensity warfare.

Army Vision 2010 provides an azimuth assisting in sizing, organizing and equipping the Army, and the development of doctrine for land forces in support of *Joint Vision 2010.* It describes in detail how the Army will leverage emerging technologies and concepts to enhance its capabilities and integrate them with joint partners to achieve success across the full mission spectrum.



'Vigilant and Invincible'

Air defenders who wore the U.S. Army Air Defense Command's "Vigilant and Invincible" patch defended the United States from air attack during the Cold War. The command stayed on alert status around the clock, maintaining a constant vigil that was critical in the ideological struggle between East and West. For a quarter of a century, the command's antiaircraft guns, and later surface-to-air missiles, protected metroplitan areas across the nation. They also defended Strategic Air Command bases and Minuteman missile silos that, in case of attack, would have supplied America's retaliatory response.

The command also developed and briefly deployed the Safeguard system, which relied on the short-range Sprint and long-range Spartan interceptors to intercept and destroy intercontinental ballistic missiles. But treatly limitations prevented Safeguard's deployment in numbers necessary for an effective defense. The House of Representatives, voted to inactivate the system on Oct. 2, 1975, one day after Safeguard became operational.

In this regard the Army is already moving out in support of the development of a treaty-compliant national missile defense system. Consistent with our proud history and current national and Department of Defense policies, and in cooperation with other services and agencies, the Department of the Army will serve as "lead service" for national missile defense activities with the ultimate goal of providing a comprehensive ground-based defense against accidental, unauthorized, or intentional launches against the territory of the United States, including Hawaii and Alaska.

The U.S. Army Space and Strategic Defense Command and the Program Executive Office for Air and Missile Defense are the Army's major executing agents for the ground-components of the National Missile Defense Program. The Space and Strategic Defense Command, the Air Defense Artillery School and the Army Staff have been leading development of the National Missile Defense Operational Requirements Document. The Army has development contracts for critical components of the ground-based national missile defense system, and is working with the Ballistic Missile Defense Organization and the Air Force to ensure a fair and rigorous consideration of all reasonable booster alternatives for the ground-based interceptor.

A ground-based interceptor that consists of an exoastmospheric kill vehicle will intercept attack missiles at long range. We are on track for an interceptor "fly off" in FY98. A ground-based radar will acquire, track and discriminate strategic reentry vehicles in their mid-course phases of flight, as well as provide fire control for the interceptor. This radar will heavily leverage Theater High-Altitude Area Defense system technology. The final critical component, battle management, command, control and communications, will provide connectivity between engagement planning, the elements and the operator. It will also interface with external systems, such as the integrated tactical warning assessment systems, Defense Support Program satellites, space-based infrared system and early warning radars.

All this is "doable" now. Nothing magic here. The challenge is to fund the $5-billion price tag, but it is still the most cost-effective system we have.

The U.S. Army Space Command and the Army National Guard Bureau are aggressively working the manning requirements and concepts of operations in support of the U.S. Commander-in-Chief Space execution of the national missile defense mission. This is an exciting and potentially rewarding return of the Army National Guard to its proud historical role in defense of the homeland and its extensive air defense role as in the days of Skysweeper, Nike Ajax and Nike Hercules. As part of the U.S. Army Air Defense Command, it established a distinguished record.

Clearly, national missile defense is within the scope of the Army's contribution to joint, full-dimension protection. Our comprehensive approach applies technological, organizational and procedural solutions to the challenge of protecting our nation's people and cities, our forces, our equipment, our information and our power-projection facilities across the full spectrum of operational environments.

I have said, and I will say again, defense of the homeland is inherently joint. We have no greater responsibility to the people than to ensure that we put in place, when required, a joint national missile defense system that meets our citizen's security expectation. This requires a joint effort that is comprehensive and proactive, incorporating offensive and defensive capabilities. It requires a joint effort that is responsive and ensures an overmatch to threats as they are identified and before they emerge. It requires a joint effort that is efficient and economical to avoid trading away or delaying other necessary capabilities, the loss of which might undermine our full-spectrum dominance. Finally, it requires a joint effort that is treaty compliant to avoid delays in development, if so directed and funded.

This must be a joint effort, but make no mistake, the Army will play a key role. We have successfully discharged this mission ever since the threat of missiles emerged. Our workforce at Huntsville, Ala., and throughout the Army, with their considerable experience in this area, is a national treasure.

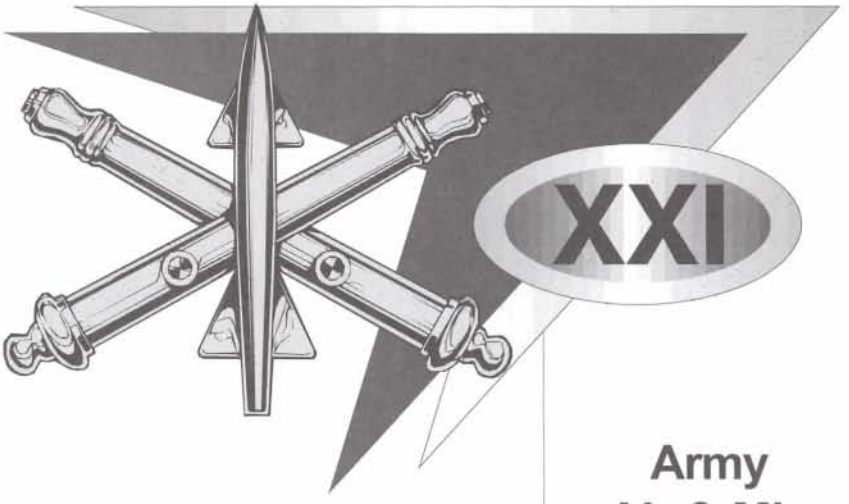
For 221 years, America's soldiers have stood at the gates and defended the homeland from attack. In the earliest days, the Army sentinel's gaze was out to sea, sure in the knowledge that American sailors were on watch and ready. For the last 50 years our soldier's gaze has been skyward and beyond, sure in the knowledge that American airmen were also alert and ready for any threat. So it has always been, and so it must be today and tomorrow. We share a tremendous responsibility and great opportunity.

The motto of the U.S. Army Air Defense Command — "Vigilant and Invincible" — has been etched in our history through the hard work and sacrifice of countless soldiers and civilians. They have stood as freedom's guardians with their eyes on the sky. Their success can be measured by the number of attacks on our territory by our adversary. It is a perfect record so far.

Now as a more sophisticated threat continues to develop, we must use their expertise, their experience to remain Vigilant and Invincible.

This article incorporates Army Chief of Staff Gen. Dennis J. Reimer's keynote address delivered at the Association of the U.S. Army's 1996 Missile Defense Symposium

FORCE



The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow.
John M. Shalikashvili
Chairman of the Joint Chiefs of Staff
Army Vision 2010

The articles that appear in the following section, and similar ones that will appear in subsequent issues of *ADA* magazine, are excerpted, virtually intact, from the *Army Air and Missile Defense Master Plan.* They describe the central part Air Defense Artillery will play in protecting Force XXI from air and missile attack, but ours will not be a solo performance. Defeating the air and missile threat of the 21st century is a **joint** mission that will require the "seamless integration" of joint service and multinational capabilities.

The imperative of "jointness" is the unifying theme of *Joint Vision 2010* and *Army Vision 2010,* the conceptual templates that serve as our guideposts for the 21st century. The *Army Air and Missile Defense Master Plan* aligns with *Joint Vision 2010* and *Army Vision 2010*. It serves as the foundation for *ADA Vision 2010*, which is scheduled for distribution at this year's ADA Commanders' Conference. The spirit of jointness permeates all four of these capstone publications. It will weld combat arms closer together, erode distinctions between joint services and become the determinant factor in force modernization decisions.

We must become fully joint: institutionally, organizationally, intellectually and technically. Only in this way can we offset the adverse affects of flat modernization budgets and shrinking force structures. In this way alone can we harness emerging technologies to protect the force as it achieves full-spectrum dominance on battlefields of the 21st century.

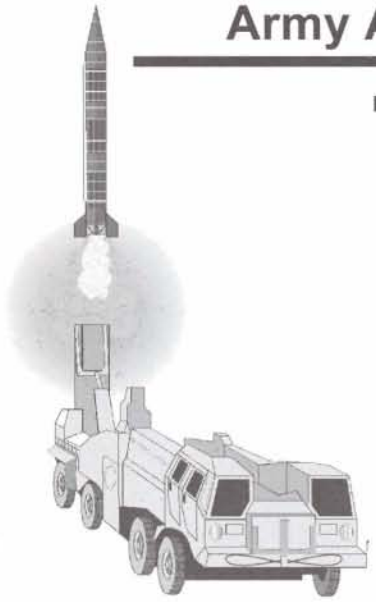
Brig. Gen. Dennis D. Cavin
Deputy Commanding General
U.S. Army Air Defense Artillery
School and Fort Bliss

Army Air & Missile Defense Master Plan

The Threat
Evolution & Future Trends
Page 18

Warfighting Concepts
Required Capabilities
Page 27

Army Air & Missile Defense
Initiatives
Page 33



THE THREAT

EVOLUTION AND FUTURE TRENDS

For 50 years the United States endured sustained conflict with a single, monolithic foe. The Soviet Union and its client states provided an all-encompassing threat model based on Soviet objectives, doctrine and materiel. This simplified U.S. threat assessments and intelligence efforts because the development and proliferation of Soviet doctrine and materiel was extremely predictable. Analysts watched new doctrine and materiel trickle from Soviet research and development centers to Soviet forces in Germany, to Warsaw Pact allies, and then on to other client states such as Angola, Cuba, Egypt, India, North Korea, Syria and Vietnam. The U.S. threat philosophy was that military forces of all Soviet client states would resemble Soviet military forces. Thus, by concentrating on the Soviet threat, the high end of the threat could be found. The collapse of the Soviet empire ended the validity of this simplistic approach, presenting a new, chaotic view of threats around the world. From this chaos, three key threat-organizing themes have emerged.

• The relative order of the bipolar conflict has been replaced by disorder arising from numerous regional rivalries that have become, or may escalate into, regional conflicts.

• The end of the Cold War has caused huge quantities of weaponry and military expertise to become excess to national security requirements throughout the world and available to almost any country with little lead time.

• The end of the bipolar conflict has opened international boundaries to the unbridled proliferation of technology and materiel. Any country in the world can acquire the most advanced military equipment.

REGIONAL CONFLICTS

The demise of the Soviet Union as a superpower has freed the nations of the world from their Cold War alignments to return to the pursuit of their individual regional interests. Regional rivalries, previously restrained by the superpower conflict, have erupted (or may erupt into) regional political and possible armed conflicts. Regional rivalries and their potential for escalating into armed conflicts are the primary reason countries develop and maintain military capabilities. These military capabilities generally focus on countering internal or regional rivals, not on the United States. The military development strategies of China, Iran, Iraq and North Korea, however, include countering U.S. forces since we have entered regional Asian conflicts that affect them.

COLD WAR WEAPONRY AND MILITARY EXPERTISE

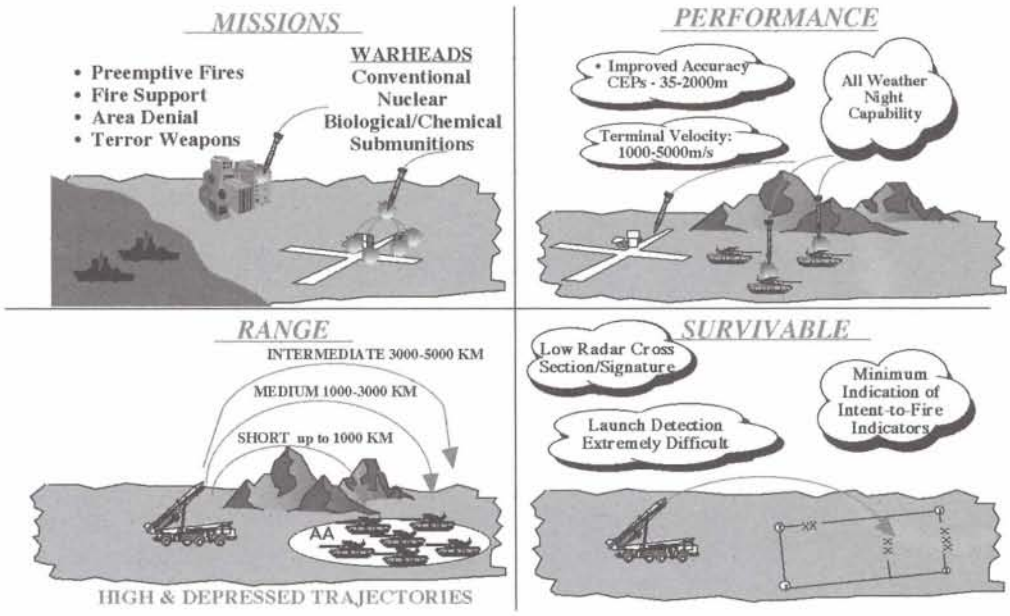
National alignment and participation in the bipolar era determined the source, type and quantity of military capabilities acquired by countries worldwide. Decisions were based upon a country's role in a global conflict rather than its regional security needs and the ability of allies to facilitate sustainment of the capability. Many countries have emerged from the Cold War with mountains of excess or unsupportable equipment and personnel. Some of the hardware is being demilitarized under the Conventional Forces Europe agreement. Other materiel is being cascaded to modernize allies. As a result, there are large quantities of idle military equipment and personnel stand ready to quickly augment the military forces of countries whose regional rivalries are evolving into regional conflicts. U.S. planning and resource allocation must prepare U.S. forces to defeat countries employing large quantities of Western and Soviet Cold War weaponry and military expertise.

PROLIFERATION

For a wide variety of reasons, advanced military technology and equipment are available to all countries. Acquisition of advanced technology will be driven by two factors: to replace Cold War weaponry on a cost-effectiveness basis (for example, replacing several MiG-21 Fishbeds with one MiG-29 Fulcrum) and as a "just-in-time" force upgrade to prepare for the

initiation of a regional conflict. U.S. planning and resource allocation must anticipate that our forces will encounter some of the world's most capable equipment in regional conflicts, and that threat countries will acquire these capabilities (tailored to match or overmatch the capabilities of their rivals) immediately prior to the initiation of hostilities.

The Tactical Ballistic Missile Threat



THEATER AIR AND MISSILE THREAT

During the Cold War, Air Defense Artillery's primary focus was on massive Soviet fixed-wing and helicopter threats. During the Gulf War, military planners and intelligence analysts realized that the air and missile threat to the force was changing in complexity and focus. While fixed- and rotary-wing threats are still formidable, the trend is toward unmanned threats: ballistic and cruise missiles and unmanned aerial vehicles. This trend is driven by cost, training and operational factors. A country can obtain a significant number of unmanned aerial vehicles or cruise missiles for the price of one or two highly sophisticated aircraft and avoid the attendant costs of training, maintaining, basing and sustaining a manned aircraft fleet. The employment of these threat platforms, together with tactical air-to-surface missiles, large-caliber rockets and satellites, virtually throughout the battlefield may jeopardize friendly operations. Each platform possesses inherent capabilities that may stress the defense of the force and each is increasingly available on the world market.

Tactical Ballistic Missiles. Tactical ballistic missiles include short- and medium-range ballistic missiles. These are surface-launched, free-flight missiles that can carry nuclear, biological and chemical weapons. Current state-of-the-art tactical ballistic missiles generally are solid fuel and single stage. Circular error probable averages 10 percent of the range, with the exception of the SS-21, which can have a circular error probable of 35 to 50 meters. Tactical ballistic missiles can be launched from highly mobile, difficult-to-detect transporter erector launchers.

The Air and Missile Defense Master Plan groups large-caliber rockets with tactical ballistic missiles. While technically not a missile, their size, trajectory, warheads and battlefield targets are similar to those of the shorter-range short-range ballistic missiles.

What Makes Tactical Ballistic Missiles Threatening? Tactical ballistic missiles are inherently difficult to defend against. Characteristics that increase tactical ballistic missile effectiveness include a reduced radar cross section, all-weather capability, terminal velocity, reduced notification time for defending forces and a variety of difficult-to-kill warheads. Warheads, particularly nuclear, biological and chemical warheads, require high-velocity impact kills to assure destruction of the warhead and the agent.

Tactical Ballistic Missile Trends. The tactical ballistic missile trend is toward increased range and accuracy (able to hit within 100 meters of the designated target). Terminal guidance will improve accuracy. Other improvements are increasing payload and range through the use of solid fuels and multiple staging. In the near future, the Army will face tactical ballistic missiles that, while mostly inaccurate, will target large concentrations of troops and materials and population centers. With the use of weapons of mass destruction or submunitions, their lack of accuracy will be mitigated by larger dispersion areas. As accuracy, range and physical capacity improve, tactical ballistic missiles will become more tactically effective. Improved tactical ballistic missiles will target command and control nodes, route chokepoints, air defense sites, fire-support sites and logistics concentrations.

Large-Caliber Rockets. Large-caliber rockets have trajectories, signatures, payloads and target sets similar to short-range ballistic missiles. The ability to deliver high volumes of fire and a variety of warheads make large-caliber rockets an ideal weapon system for fire support missions. Launchers are highly mobile and ideal for supporting forward artillery requirements. This mo-

bility and the rockets' short flight time provide little warning to maneuver forces, and their relatively short range precludes engagement from current missile defense systems.

What Makes Large-Caliber Rockets Threatening? Rockets are widespread, and their prevalence and use will probably not diminish in the future. The high volume of fire and multiple warhead option of multiple launch rocket systems make them a very appealing weapon system for threat nations.

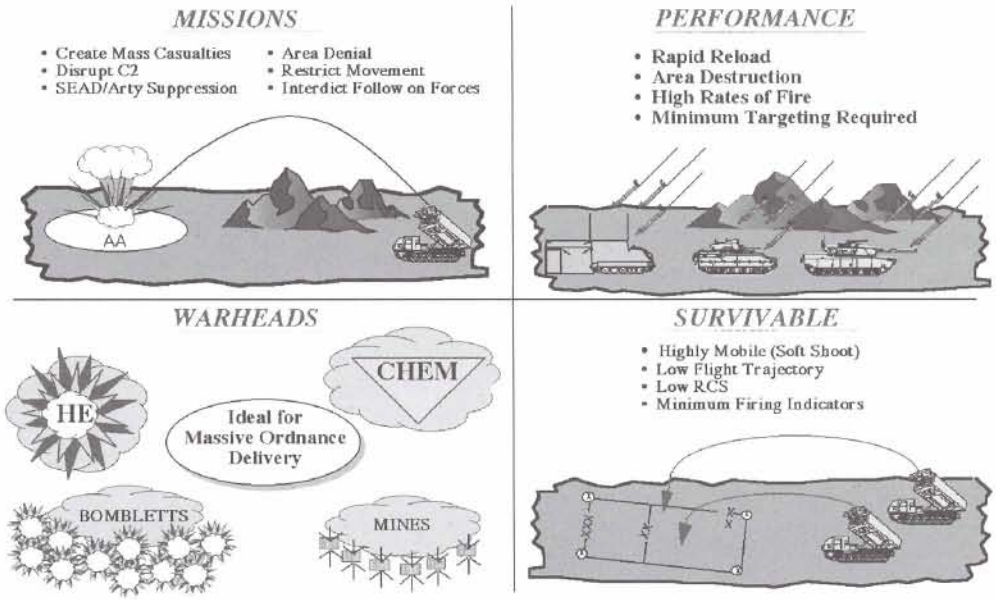
Rocket Trends. In the future, threat nations will deploy infrared- and antiradiation-seeking warheads to these missile systems, improving their use against armor systems, command and control nodes and battlefield radars.

Cruise Missiles. Land attack cruise missiles appear attractive to many countries because of the excellent combat record they achieved in Desert Storm. They can accurately deliver conventional, nuclear or chemical warheads over long distances against key enemy targets.

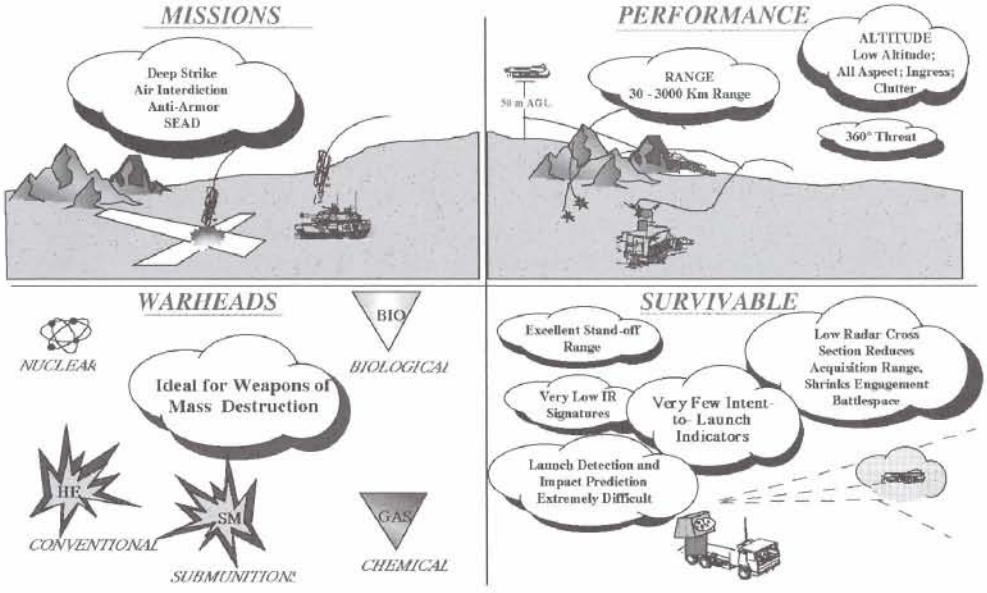
What Makes Cruise Missiles Threatening? Cruise missiles have low infrared and radar signatures, making them difficult to detect. This characteristic, along with use of terrain masking and effective countermeasures, makes them extremely difficult to defeat. Like tactical ballistic missiles, cruise missiles can carry a variety of warheads, including weapons of mass destruction. Nonconventional warheads require decisive kills to ensure that neither the warhead, agents nor effects reach the ground.

Land attack cruise missiles come in a wide assortment of sizes and shapes with varied payloads, ranges and capabilities, and can be air-, ship- or ground-launched. New navigation systems, such as the global positioning system, allow cruise missiles to fly unpredictable ingress attack routes and strike targets from any direction. Fighter-bomber aircraft, such as a Fencer, can launch today's smaller land attack cruise missiles. Composite materials, radar-absorbing materials and stealth construction techniques have contributed to a smaller radar cross section. Low altitude, a small radar cross section and excellent stand-off ranges all contribute to the Fencer fighter-bomber's much-improved combat survivability.

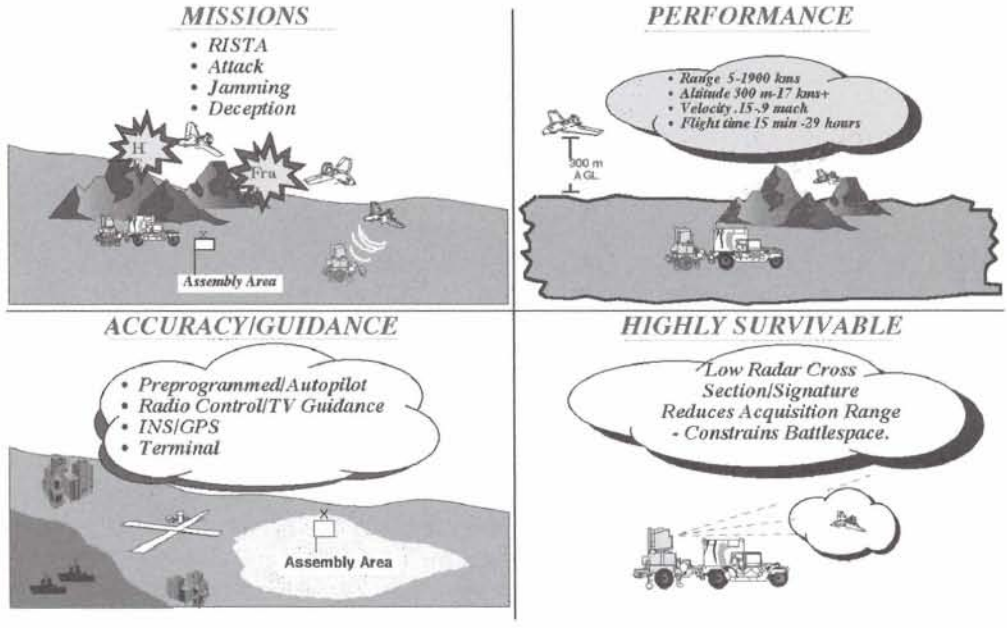
The Large-Caliber Rocket Threat



The Cruise Missile Threat



The Unmanned Aerial Vehicle Threat



Land Attack Cruise Missile Trends. Cheap, available technology easily converts existing air platforms into cruise missiles. Worldwide developments are expected to double the number of cruise missiles in 10 years. The less-sophisticated short-range systems are more likely to proliferate. Cruise missiles require very accurate guidance systems. Only a low-cost guidance system is necessary for these missiles to proliferate. Here, the most important new development is the linkage of the global positioning system or global navigational satellite system to inertial navigation. Coupled with a terminal homing seeker (infrared or radiation homing seeker), this makes a highly accurate guidance system. Countries that cannot afford or support the more sophisticated guidance systems can employ cruise missiles using the global positioning system or the global navigational satellite system. This could expand the roles of traditionally antiship cruise missiles to land attack. The synergistic use of tactical ballistic and cruise missiles is also a concern. While coordinated attacks are difficult and risky with manned aircraft, a simple timing plan would allow cruise missiles to ingress on a target during a tactical ballistic missile attack, thereby increasing the possibility of approaching undetected. Combining tactical ballistic and cruise missiles with decoy unmanned aerial vehicles would severely complicate the defense of forces and assets.

Unmanned Aerial Vehicles. Unmanned aerial vehicles include drones (whose flight paths or patterns are preprogrammed) and remotely piloted vehicles (which are remotely flown by ground-based controllers).

What Makes Unmanned Aerial Vehicles Threatening? Unmanned aerial vehicles provide reconnaissance, intelligence, surveillance and target acquisition platforms for target detection, identification and location; weapon targeting; target designation; and battle damage assessment. State-of-the-art sensors and data links provide real-time or near-real-time information to ground commanders, fire support systems, maneuver forces and aircraft, allowing up-to-the-minute target servicing. Equipped with laser designators, unmanned aerial vehicles can target assets for attack by smart munitions. A low radar cross section and terrain masking make unmanned aerial vehicles difficult to detect and engage. Mission-dictated flight profiles increase system survivability and optimize coverage, taking full advantage of terrain, normally at altitudes of 300 to 3,000 meters. Unmanned aerial vehicles conducting a reconnaissance, intelligence, surveillance and target acquisition mission will normally fly at an altitude safe from small arms fire (around 3,000 meters).

Payloads usually consist of video cameras, film cameras and daylight or night infrared for reconnaissance missions. Other payloads include signal intelligence, electronic warfare and attack warheads. Unmanned aerial vehicles can provide ample prime power for electronic warfare systems. The low-observable properties inherent in most unmanned aerial vehicle designs enable these small aircraft to get close to targets where high jamming power levels are not required.

Several nations are developing and fielding antiradiation-homing unmanned aerial vehicles with the primary mission of attacking battlefield emitters (such as radars and communications). These platforms have a wide variety of launch options and are usually fire-and-forget systems. They can fill a multipurpose role, but their primary function will be to attack enemy radars. Other unmanned aerial vehicle attack systems countries are considering are infrared attack systems designed to kill tanks or fighting vehicles and systems that can deliver ordnance similar to attack aircraft.

Unmanned Aerial Vehicle Trends. Drones and remotely piloted vehicles constitute an increasingly important aerodynamic vehicle class. Proliferation of unmanned aerial vehicle technology is increasing rapidly. Today there are 31 developer and more than 50 user countries of more than 950 different unmanned aerial vehicle systems. After

2005, experts project that there will be 50 developers and more than 75 user countries. The primary roles of unmanned aerial vehicles, to date, have been as reconnaissance or targeting vehicles. However, their roles will expand as a result of improved guidance capabilities and small, efficient turbine engines. New roles for unmanned aerial vehicles may include electronic combat, decoy, ground attack and suppression of enemy air defenses. A significant capability that some nations deploy involves a reconnaissance unmanned aerial vehicle directly linked to an artillery unit's fire direction center. This complex will provide a real-time reconnaissance information link, followed by immediate fire and damage assessment. Unmanned aerial vehicles are good candidates for the application of stealth technology and spin-off technology from cruise missiles. Unmanned aerial vehicles will provide improved reconnaissance, intelligence, surveillance, target acquisition and interdiction capabilities that many countries now lack. As integral parts of reconnaissance-strike complexes, or used as actual attack weapons, unmanned aerial vehicles will enhance combat capabilities and are a significant threat to our future Army.

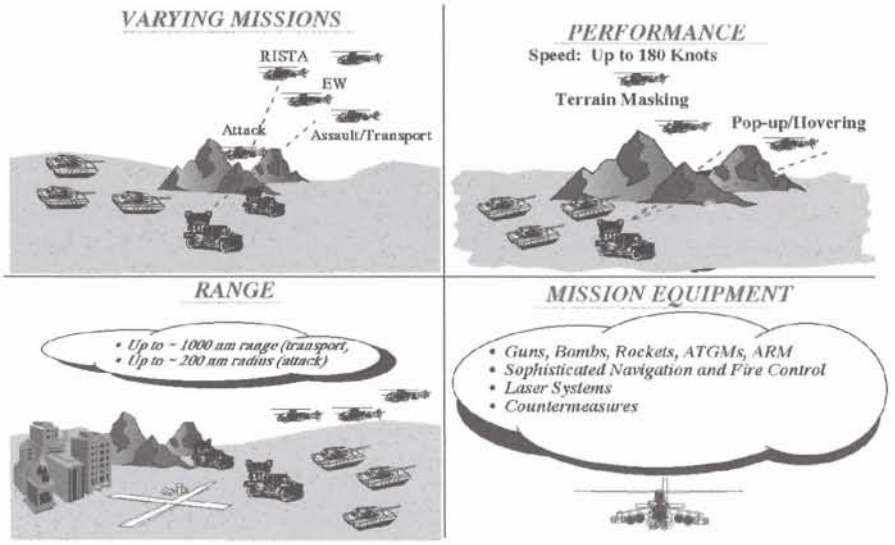
Helicopters. Almost every country in the world maintains helicopters to support military requirements. Most are utility systems that are (or can be) armed to perform a wide variety of roles, thus offering most nations a cheap and effective substitute to the more expensive attack helicopter. The versatility and survivability of helicopters make them ideal for use in division and corps areas. There is a great potential for their use in certain regions of the world (for example, helicopters were among the first platforms used by Iraq in its invasion of Kuwait).

What Makes Helicopters Threatening? Low-flying helicopters taking full advantage of terrain masking are difficult to acquire and target. Most threat ground force commanders rely primarily on helicopters to fill their air support requirements. Helicopters can perform a variety of missions, and the combat capability of newer systems is significant. As better fire control and weapon capabilities are introduced, systems will be able to search, acquire and fire at ground targets from longer stand-off ranges, contributing to their greater survivability.

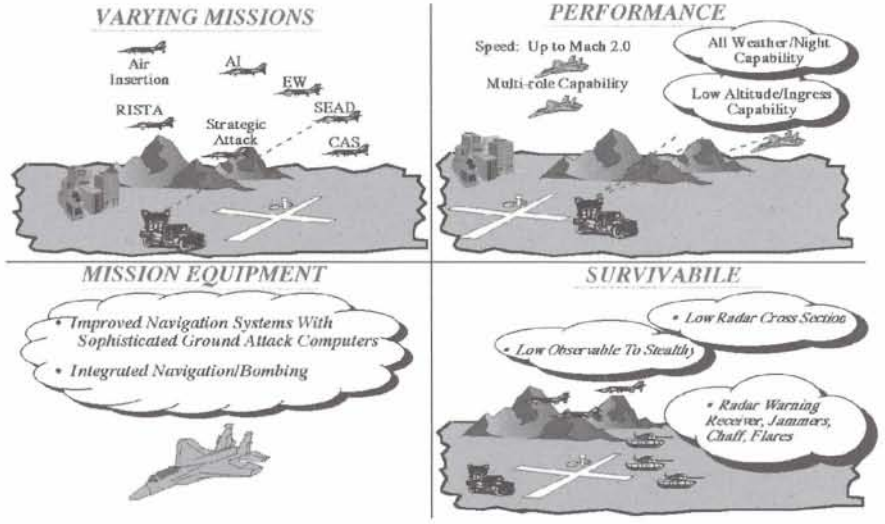
Helicopter Trends. Improved technical capabilities inherent in the typical attack and armed helicopter will focus on ground attack capabilities, most notably with respect to fire control and survivability. The best technology can offer will be found in dedicated attack helicopters. Four trends stand out:

- Modular equipment (electro-optic sensors, weapons and countermeasure equipment) that facilitates maintenance and reduces cost.
- Expanded night and adverse weather capabilities.

The Helicopter Threat



The Fixed-Wing Aircraft Threat



• Improved engagement capability (stand-off hovering attacks at greater distances with much-improved accuracy).

• Improved infrared countermeasures against infrared-seeking missiles.

Fixed-Wing Aircraft. The fixed-wing threat has not gone away. There are numerous producers of combat fixed-wing aircraft. The former Soviet Union had been the major developer and leading exporter of combat aircraft, and today many countries still operate a large number of Soviet-produced aircraft. Countries are purchasing new aircraft, upgrading older aircraft, or both.

What Makes Fixed-Wing Aircraft Threatening? Allied air power during Operation Desert Storm provided the world with a remarkable demonstration of what well-employed fixed-wing aircraft can do. Despite the rise of the smart missile, Desert Storm demonstrated that manned combat aircraft still play an important role. Fixed-wing combat aircraft can perform a variety of missions. Mission equipment, such as integrated navigation and bombing computers, provide new combat aircraft with a precision-strike capability day or night and in bad weather.

New aircraft also incorporate many survivability features, such as radar warning receivers, on-board jammers, chaff and flares. A lower radar cross section makes aircraft more difficult to detect, contributing to improved survivability and higher mission success rates. Fixed-wing aircraft can employ a variety of munitions including highly accurate tactical air-to-surface missiles.

Fixed-Wing Aircraft Trends. The premier current operational threat aircraft is the F-117A stealth fighter, a fifth-generation jet aircraft. This generation is marked mainly by stealth technology, composite material construction and highly advanced avionics and navigation features. Most of the world's current advanced aircraft are fourth-generation jet airplanes (for example, F-14s, F-15s, F-16s, MiG-29s, MiG-31s and Su-27s). Many older generation aircraft can approach fourth-generation capabilities if upgraded with state-of-the-art avionics and weapon systems. As aircraft are upgraded, so also are the lethality and delivery accuracy of munitions they can carry. The tactical air-to-surface

Threat Capability Trends

	97 98 99	00 01 02 03 04 05	06 07 08 09 10 11 12 13
TBM	• Varied trajectories • 30-1200 km range • 35-50m CEP • Highly survivable TELs • Limited launch indicators	• 10-2,000 km range • Expanded use of WMD • Wider proliferation • Growing use of solid propellants	• 3-5,000 km range • Improved C3I • Specialized payloads • Low RCS
Rocket	• 30-70 km range • 12 rockets/1.6 sec firing rate • Limited launch indicators	• 30-70 km range • 12 rockets/1.6 sec firing rate • Limited launch indicators	• Smart sub-munitions
Land Attack Cruise Missile	• Low-altitude (to 50m AGL) • All aspect flight profile • 30-3000 km range • CEP of 2-3m • Land attack vs individual tanks	• Improved guidance / propulsion • Altitude down to 30m AGL • CEP of 1m • Dual mode seekers	• Smaller RCS • Greater accuracy • Smart munitions
UAV	• Real/near-real time recon • Decoy capabilities • Anti-radar	• More sophisticated payload/ guidance system • Night & multimission systems • RCS down to 0.01m-sq • Antitank	• Longer ranges • Smaller RCS / airframes • Laser designators / range finders
Helicopter	• 7-10 km standoff • Hovering • Low-light daytime attack	• Multi-mission systems • 8-12 km standoff distances • Limited all-weather/night time	• All weather / night time • Better avionics / weapons suites • Improved laser designator • Improved IR countermeasures
Fixed-wing	• Precision guided munitions • Improved laser/electro optical systems • Improved IR systems • TASM: 10-100 km range; multi-frequency attack	• Reduced RCS • Increased payload • All weather capabilities • Multi-missile capability • TASM: 110 km range; speed Mach 3-4	• Limited low observable / stealth technology • Integrated electronic warfare suites • TASM: 200 km range

missile is of special interest because of its stand-off range, high velocity and small radar cross section.

Tactical Air-to-Surface Missiles. Currently, state-of-the-art tactical air-to-surface missiles have millimeter wave radar seekers that allow them to function day or night through a smoke-filled, imaging-obscured atmosphere. Warhead designs include shaped charges, self-forging fragments, reactive materials, smart mines, smart submunitions, or rocket-boosted kinetic energy penetrators. Antiradiation missiles, a member of the tactical air-to-surface missile class of munitions, will continue to evolve improved capabilities to defeat radar countermeasures. Tactical air-to-surface missile technology evolves to keep pace with changes in the intended battlefield targets and to allow the missiles to penetrate defense systems and counter the effects of countermeasures. Future development trends are —

- advanced propulsion and propellants to increase launch range prior to seeker engagement;
- improved optics and electronics to decrease the circular error probable, allow for optimum attack and select the high-value targets;
- technologies to lower launch altitude;
- electronic countermeasures; and
- terminal homing improvements to allow attacks against mobile targets.

Threat Capability Trends. Threat trends can be summarized by two characteristics: increasingly capable and increasingly diverse. With the change in system proliferation comes a

Aerial Threat to Projection and Entry Operations

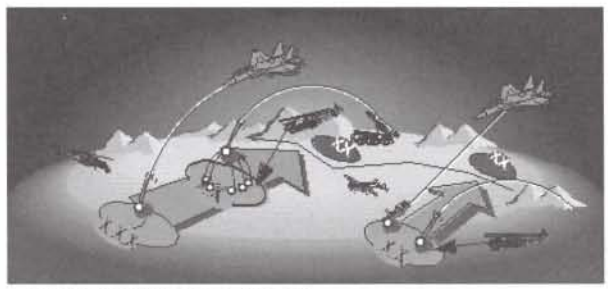
ENEMY INTENT AND MEANS

√ UAV
- Gather real time intelligence to support targeting of the force
- Maintain surveillance of maneuver units

√ Rotary-Wing
- Destroy armor and infantry units
- RISTA
- Troop insertions

√ Fixed-Wing
- Destroy combat support/logistical assets
- Precision strikes
- RISTA
- Troop insertions

√ TBM/Cruise Missile
- Induce choke points
- Disrupt and confuse ground forces
- Inflict heavy casualties in the rear area



IMPACT ON THE FORCE

√ Element of surprise at risk
√ C2 disruption
√ Loss of momentum/tempo reduced
√ Restriction of maneuver/movement
√ Destruction of high value division assets
√ Heavy casualties

Aerial Threat During Expansion Operations

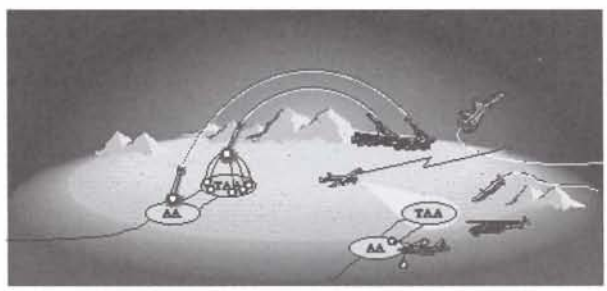
ENEMY INTENT AND MEANS

√ UAV
- Gather real time intelligence on moving forces/assembly areas
- Conduct electronic and anti-radiation attacks

√ TBM/Cruise Missiles
- Destroy logistic bases, AA/TAA, corps and division trains, C2 centers, lines of communication (LOC)

√ Fixed-wing
- Destroy lines of communications
- Attack convoys and C2 centers

√ Rotary-wing
- Insert SOF
- RISTA



IMPACT ON THE FORCE

√ Element of surprise at risk -- enemy watches "our plan"
√ Disrupts C2
√ Maneuver/movements restricted, momentum slowed
√ LOCs interdicted -- sustainment strained
√ Divisional/corps critical assets at risk

Aerial Threat to Decisive Operations

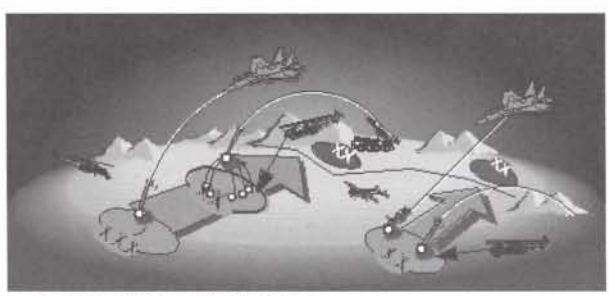
ENEMY INTENT AND MEANS

√ UAV
- Gather real time intelligence to support targeting of the force
- Maintain surveillance of maneuver units

√ Rotary-Wing
- Destroy armor and infantry units
- RISTA
- Troop insertions

√ Fixed-Wing
- Destroy combat support/logistical assets
- Precision strikes
- RISTA
- Troop insertions

√ TBM/Cruise Missile
- Induce choke points
- Disrupt and confuse ground forces
- Inflict heavy casualties in the rear area



IMPACT ON THE FORCE

√ Element of surprise at risk
√ C2 disruption
√ Loss of momentum/tempo reduced
√ Restriction of maneuver/movement
√ Destruction of high value division assets
√ Heavy casualties

corresponding change in capabilities. Though older systems will remain in national inventories longer, new systems will incorporate capabilities that will make them more stressing to ground force commanders. These new air and missile threats can provide potential enemy nations a variety of employment options that can affect each stage or phase of U.S. operations. The next 20 years will bring significant changes in threat air, missile and reconnaissance, intelligence, surveillance and target acquisition capabilities.

THREAT TO FORCE OPERATIONS

Air employment will vary from country to country and by operation, driven by threat equipment, capabilities, organizational structure and military-political goals. By understanding air threat proliferation and equipment, experts can predict how a threat may employ air assets to interdict U.S. operations.

Projection and Entry Operations. During entry operations, threat forces will conduct reconnaissance operations to monitor U.S. force buildup and conduct target planning, which enemies will use to launch a pre-emptive strike against arriving forces. The threat's primary objectives will be to slow the flow of U.S. personnel and equipment into the area of operations and to cause enough casualties to influence U.S. public opinion. Tactical ballistic missiles, cruise missiles and fixed-wing aircraft will attack known high-value targets. In an opposed entry or landing on enemy soil, U.S. forces will also face helicopters and large-caliber rockets.

Tactical ballistic missiles will likely be the weapon of choice. High survivability, range, penetration capability and warhead options make them ideal during entry operations. Cruise missiles will also attack ground targets.

Fixed-wing operations will peak during this phase, especially if threat forces launch a pre-emptive strike. Although the joint forces will protect the lodgment from air attack, it remains likely that some fixed-wing aircraft will continue to threaten the force throughout entry operations. Aircraft will attempt to suppress friendly air defenses with antiradiation missiles. ADA suppression will increase the mission success of other air threat assets such as tactical ballistic missiles. The versatility and survivability of helicopters make them ideal for air insertion. The placement of special purpose forces can provide valuable reconnaissance, intelligence, surveillance and target acquisition and disrupt friendly operations.

Coordinated use of these air and missile threats, with decoy unmanned aerial vehicles, could be devastating. The synchronization of multiple air attack assets requires intricate planning and nearly perfect communications, but is possible and must be countered.

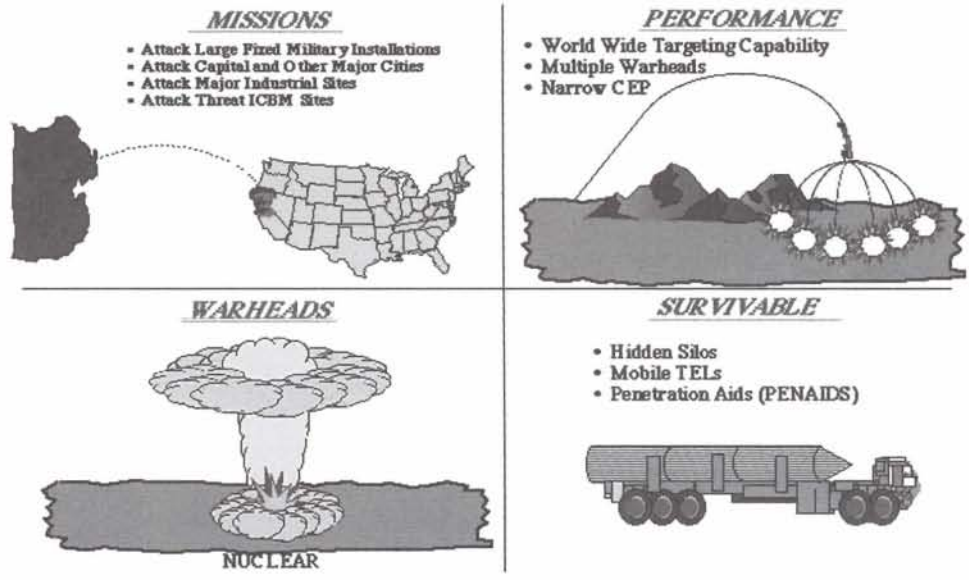
Expansion Operations. The threat weapons used during initial entry will also be used during expansion and buildup, but with expanded target types. Threat forces will attempt to determine U.S. intentions and use the information gathered by sensors to interdict U.S. operations. Threat reconnaissance, intelligence, surveillance and target acquisition will be primarily targeted against forward divisions and corps to support threat counter-maneuver and targeting.

Air power and theater missiles can deliver massive payloads accurately throughout the operational depth. Heliborne troops can help convert tactical success into operational success; similarly, airborne forces, possessing increased firepower and ground mobility, inserted deep into the enemy's rear can help convert operational success into strategic success.

Decisive Operations. Threat operations during this phase will continue as in the earlier phases. The helicopters' role will expand, making them the primary close air support weapon, with emphasis on attacking forward armor. Unmanned aerial vehicles will operate primarily in division and corps areas to support counter-maneuver planning to direct artillery fire.

Helicopters with antitank guided missiles will attack armored or mechanized forces. They can also block a major penetration or supplement mobile obstacle detachments by laying mines along threatened flanks and gaps.

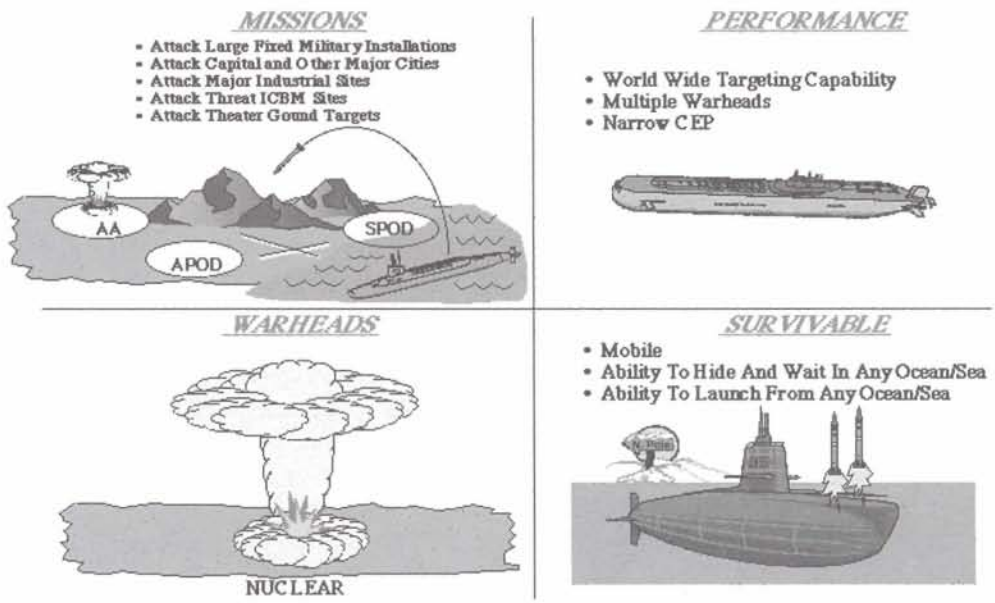
The Intercontinental Ballistic Missile Threat



Helicopters will attack flanks of U.S. forces using terrain or smoke to conceal their approach.

Unmanned aerial vehicles can gather real-time battlefield intelligence, provide target acquisition for fire support, and serve as communications relays. Ideally, an unmanned aerial will reconnoiter targets just before a strike and flash changes in targets or defenses to ground or airborne control centers where analysts will interpret imagery, select targets and transmit the information to strike assets. Unmanned aerial vehicles can also isolate weaknesses in sus-tainment resources and identify combat resources and follow-on forces.

The Submarine-Launched Missile Threat



MISSILE AND SPACE THREAT TO THE CONTINENTAL UNITED STATES

Space is the new high for operations — its value is critical to the tactical, operational and (eventually) strategic levels of warfighting. Despite the end of the Cold War, the threat of accidental, unauthorized or limited strategic strikes against the United States still exists. Intercontinental ballistic missiles and submarine-launched ballistic missiles are a threat to the continental United States — they can carry nuclear, biological, chemical or high-explosive warheads; they employ a variety of penetration aids; and their long ranges make them hard to defeat.

Intercontinental Ballistic Missiles. The only producers are the United States, Russia and China. Ukraine, Belarus and Kazakhstan — former Soviet Union states — have intercontinental ballistic missiles that they could incorporate into their arsenals or make available to others. Fixed launch facilities are easy to target but hard to destroy. Once launched, intercontinental ballistic missiles are difficult to defeat. Their targets will be strategic political, civilian or military, most likely using weapons of mass destruction in multiple re-entry vehicles.

Submarine-Launched Ballistic Missiles. The United States, United Kingdom, France, Russia and China currently produce submarine-launched ballistic missiles. Submarine mobility provides launch location options that are unavailable to intercontinental ballistic missile forces and makes detection difficult. Targeting priority will be the same as for intercontinental ballistic missiles. Submarine-launched ballistic missiles provide threat nations the same capabilities as intercontinental ballistic missiles with the added advantage of a better hide capability.

Satellites. Satellites have become a major combat multiplier for any potential threat that has such systems. Satellites provide reconnaissance, surveillance and worldwide communication capabilities. Many countries already have well-established space programs to support their military forces, and several have taken steps to sell or share military and civil satellite capabilities to others. Thus, many threat nations will have organic space assets to support operations or may acquire intelligence information from satellites or buy satellite time. Satellites will normally support threat theater- and strategic-level planning and operations.

SUMMARY

Regional powers continue to emerge throughout the world to threaten nations friendly to the United States and adversely affect U.S. interests. Regional air and missile capabilities, while neither qualitatively nor quantitatively the equal of the former Soviet Union, are real and threatening. Tactical ballistic missiles, cruise missiles, unmanned aerial vehicles, helicopters, fixed-wing aircraft and rockets, employed singularly or collectively, can severely impact the successful execution of U.S. forces operations across the full operations spectrum — from operations other than war through the national military strategy. Intercontinental missile and space platform exploitation further exacerbates the situation. With technology explosions and continued proliferation, promises to grow rather than diminish.

WARFIGHTING CONCEPT

REQUIRED CAPABILITIES

The changing world situation, the changing nature of the threat and changes to the national security strategy, the national military strategy and Army doctrine have redefined the operational environment for future conflicts. To execute U.S. global strategies in this redefined environment, the 21st-century Army must rapidly project its forces and achieve victory with minimum casualties. ADA units are integral members of Force XXI and function in synergy with other joint and multinational air defense forces to provide continuous protection against the array of air and missile threat platforms that may confront Force XXI.

This article addresses Air Defense Artillery's role and focus during patterns of operation described in *Army Vision 2010*, the framework within which Force XXI will conceptually fight 21st-century force-projection operations. It identifies the required operational capabilities that Air Defense Artillery must possess to fulfill its mission. Air Defense Artillery's role in theater missile defense is a major determinant of these required capabilities.

THEATER MISSILE DEFENSE

Theater missile defense includes all means and methods to negate the effects of hostile theater missiles (tactical ballistic missiles, cruise missiles and tactical air-to-surface missiles) prior to or after launch. Theater missile defense is a joint mission performed by joint and multinational forces (air, land, sea, space and special operations), their weapon systems and with their supporting command, control, communications, computers and intelligence (C^4I) equipment and theater and strategic intelligence apparatus. It involves the identification, integration and employment of forces to detect, identify, locate, track, minimize the effects of and destroy enemy theater missiles. We will accomplish theater missile defense through the integration of a mix of mutually supportive operations elements: attack options, active defense, passive defense and related C^4I architecture.

Attack Operations. Attack operations are offensive actions initiated to destroy, disrupt and or neutralize air, land and sea theater missile launch platforms, their supporting infrastructure and reconnaissance, intelligence, surveillance and target acquisition (RISTA) platforms. Air Defense Artillery contributes to attack operations by destroying threat RISTA platforms and tactical surface-to-air missile and cruise missile host platforms in flight. It also provides estimated launch-point information on in-flight theater ballistic missiles to cue attack operations systems.

Active Defense. Active defense is defensive operations that destroy, disrupt and or neutralize theater missiles and their warheads in flight. Active defense involves detection, identification and classification, tracking and attack of theater missiles. Although active defense measures include multitiered defense in depth via multiple engagements using all capable joint assets, Air Defense Artillery is the land component commander's primary active defense means.

Passive Defense. Passive defense consists of measures to reduce vulnerability to, and minimize the effects of, theater missile attack. Measures include warning of theater ballistic missile launch and predicted impact point and reducing targeting effectiveness through signature reduction. They also include camouflage and concealment, deception, dispersion and mobility; the hardening of assets and positions; and nuclear, biological and chemical safeguards. Air Defense Artillery also contributes to passive defense through timely warning and distribution of theater ballistic missile launch and predicted impact point information, and by denying or negating hostile aerial RISTA.

Theater Missile Defense C^4I. Theater missile defense C^4I provides the information and means to plan, apportion, monitor, synchronize and report theater missile defense operations. It also provides the means to acquire and

disseminate missile warning and cueing information, and fully integrates theater missile defense systems with the supported force and theater command and control architectures. ADA C^4I is fully integrated with theater Army air and missile defense C^4I and with the supported forces.

ADA FORCE XXI

Air Defense Artillery's mission will change little in the 21st century. It will still operate as part of an integrated joint force and protect forces and assets from air and missile threats, including theater ballistic missiles, cruise missiles, unmanned aerial vehicles, helicopters, fixed-wing aircraft armed with tactical air-to-surface missiles, and rockets.

ADA Force XXI consists of a combination of integrated capabilities provided by multiple systems. It is a tactical and strategic force tied together by C^4I architecture. It is strategically deployable, highly mobile, tailorable to mission needs, lethal against multiple threats, operationally agile in support of the force and sustainable. These characteristics will provide the Force XXI Army with a qualitative edge in any operational environment.

ADA Force XXI will evolve through the implementation of six enablers. These enablers, articulated in the midst of the Army's post-Cold War downsizing, are stabilize, reorganize, standardize, modernize, modularize and rightsize the ADA force.

Stabilizing the force involves alleviating turbulence in the ADA force by recruiting, training and retaining quality soldiers.

Reorganizing the force involves restructuring ADA organizations to allow them to function more effectively on the Force XXI battlefield.

Standardizing the force involves standardizing organizations, systems and operations throughout the branch to achieve compatibility and interoperability within Air Defense Artillery and within Army, joint and multinational forces. It includes standardizing battle elements so they can be readily tailored to a wide range of task force applications.

Modernizing the force involves enhancing the capability of ADA systems and organizations by leveraging the latest technology and guiding future technology for system upgrades and new developments.

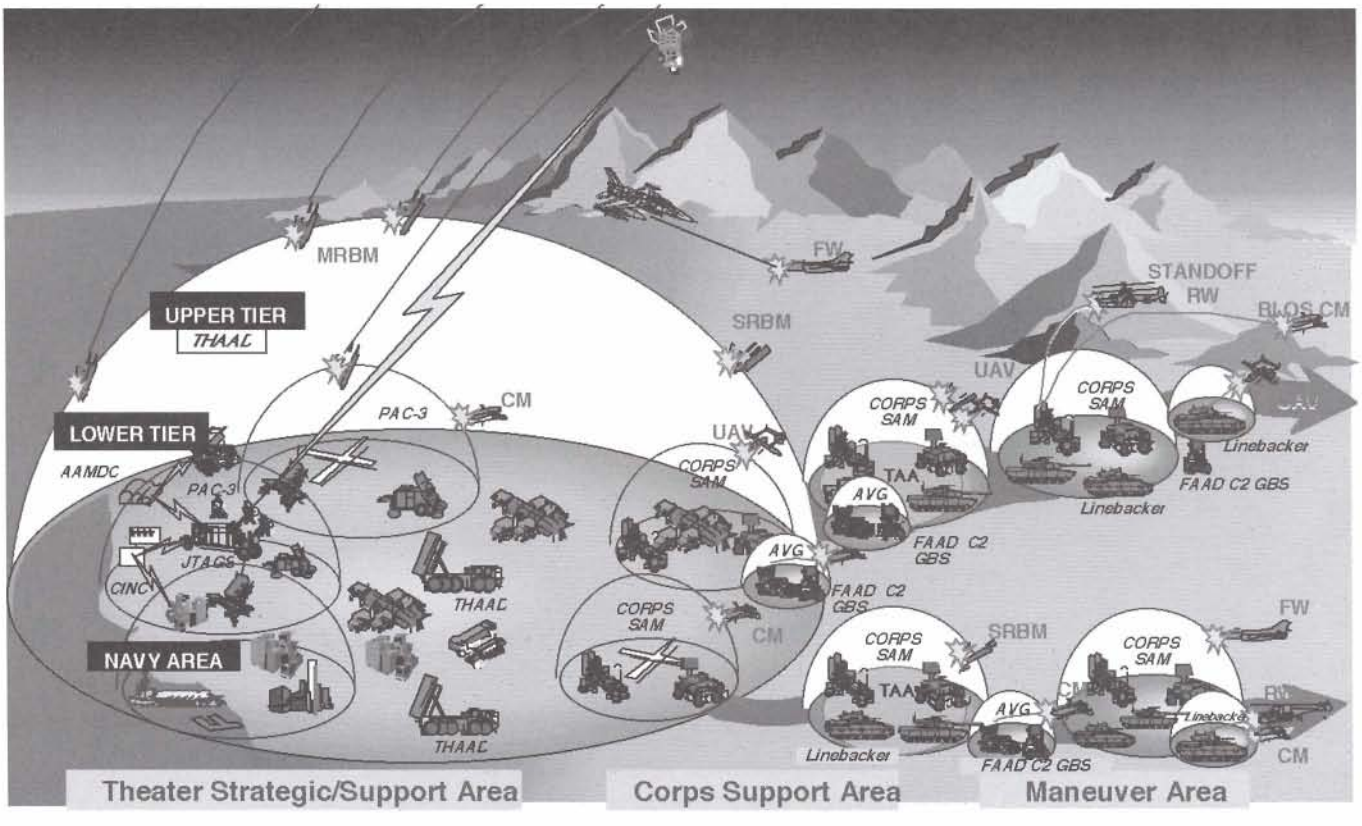
Modularizing the force involves making ADA organizations and systems modular to facilitate task force packaging for force projection and force protection operations.

Rightsizing the force involves optimally sizing ADA systems and organizations to balance affordability, effectiveness and operational risk.

ADA OPERATIONS IN FORCE XXI

The force-projection Army, together with forces of other services and na-

Army Air and Missile Defense Operations



tions, must rapidly deploy from the continental United States (or elsewhere) and dominate any battlespace, region or situation through the conduct of simultaneous and continuous operations in all dimensions. The Army will be prepared to succeed in operations across the spectrum of conflict.

Force XXI operations are subdivided into six patterns of operations: project the force, protect the force, gain information dominance, shape the battlespace, conduct decisive operations and sustain the force. These patterns may not be distinct, and one or more may occur simultaneously.

The ADA force will support Force XXI in each of the patterns of operations. The ADA operational considerations described below are representative of those that might be generated in a given scenario. Specific, "real world" considerations depend on mission, enemy, troops, terrain, weather and time available.

Project the Force. The operation begins with the deployment of forces from the continental United States or a forward area. The force is tailored to meet mission requirements. The initial Army force is most likely deployed by air. The force commander strives to maximize firepower, lethality and survivability of this force while minimizing its lift requirements.

In deployments where the threat of air and missile strikes exist, ADA units deploy with the initial force. The ADA deployment consists of a mix of ADA systems tailored to meet mission and threat considerations. With airlift requirements at a premium, the lighter, multi-threat capable systems (such as the Medium Extended Air Defense System [MEADS] and Avenger) are attractive deployment options. However, where a significant theater ballistic missile threat exists, the more airlift-intensive Theater High-Altitude Area Defense (THAAD) and Patriot Advanced Capabilities-3 (PAC-3) systems assume high movement priority by strategic airlift. The theater missile defense systems provide a two-tiered defense for the lodgment (aerial port or seaport of debarkation) and the initial force concentrations located under their protective envelope. Integrating short-range air defense assets with the theater missile defense systems provides composite and complementary defense against cruise missiles, unmanned aerial vehicles, helicopters and fixed-wing platforms. Additionally, ADA systems provide aerial situational awareness to the force, thus enhancing its agility and passive defense.

Early in the force-projection pattern, an element of the Army Air and Missile Defense Command will deploy if the air or missile threat requires employment of theater and or corps air defense. As the capstone Army air defense command, the Army Air and Missile Defense Command provides centralized planning, coordination, integration, synchronization and employment of ground-based Army air and active mis-

Project the Force

- Protect the power-projection base.
- Automate and integrate the intelligence preparation of the battlefield, defense design and mission planning.
- Rapidly deploy systems and or modular components tailored to mission needs and force requirements.
- Defend early entry forces against threat air and missile attacks.
- Interoperate with ADA, joint and or multinational air defense and air control elements.
- Limit or deny aerial surveillance of the force.
- Provide three-dimensional situational awareness, warning and cueing.

Protect the Force

- Detect, classify, identify and engage tactical ballistic missiles.
- Provide tactical ballistic missile defense to widely dispersed assets over large areas.
- Detect, classify and engage rockets.
- Detect, classify, identify and engage cruise missiles, rotary-wing aircraft, lethal unmanned aerial vehicles, fixed-wing aircraft and low-observable air platforms.
- Maintain integrated C^4I with supported forces at all echelons.
- Integrate with ADA, joint and or multinational air defense and air control elements.
- Provide cueing for attack operations elements and provide warning for passive defense systems.

Gain Information Dominance

- Alert the force of aerial threat presence and location.
- Maintain horizontal, integrated C^3I with supported force at all echelons.
- Provide near real-time data generation, fusion and distribution.
- Limit or deny surveillance (unmanned aerial observation) of the force.
- Interoperate automatically and fully within Air Defense Artillery and with joint and or multinational air defense and or air control elements.
- Protect friendly information nodes (command and control centers, information sources and other critical assets) from aerial threats.

Shape the Battlespace

- Promote freedom of action by denying enemy use of the third dimension.
- Detect, classify, identify and engage tactical ballistic missiles.
- Limit or deny surveillance of the force by unmanned aerial vehicles.
- Integrate fires within Air Defense Artillery and with joint and or multinational air defense and or air control elements.
- Provide timely back-tell of theater missile launch point data to attack operations forces (sensor to shooter).

sile defense theater assets in conjunction with joint and or other services' air and missile defense forces. It is the focus for coordinated employment and integration of Air Defense Artillery into theater air and missile defense, including corps Air Defense Artillery with theater and or joint counterair and theater missile defense plans and C^4I architectures.

If a tactical missile threat exists in theater, the Army may also deploy an Army theater missile defense element to support the joint force land component commander. When deployed, this element integrates, synchronizes and sometimes controls theater missile defense operations to protect forward-deployed, contingency and reinforcing forces as well as designated theater operational and strategic assets from theater missiles.

Protect the Force. Survivability of the force is the paramount consideration from the onset of deployment through redeployment. Multidimensional air defense operations are key to that survivability.

The positioning of theater missile defense units can optimize defense of selected assets according to the joint force commander's priorities. Lower-tier systems, such as PAC-3 or MEADS, generally deploy close to defended areas. The THAAD unit is normally attached to the lower-tier battalion. The upper-tier THAAD system protects defended assets against attack by medium-range tactical ballistic missiles and longer-range short-range ballistic missiles. Overlapping tactical ballistic missile coverage of all assets thickens the defense. Deployed joint tactical ground stations interface with theater communications networks to transmit warning, alerting and, where possible, cueing information on launched tactical ballistic missiles. This supports theater missile defense active and passive operations in addition to active defense measures.

Decisive Operations

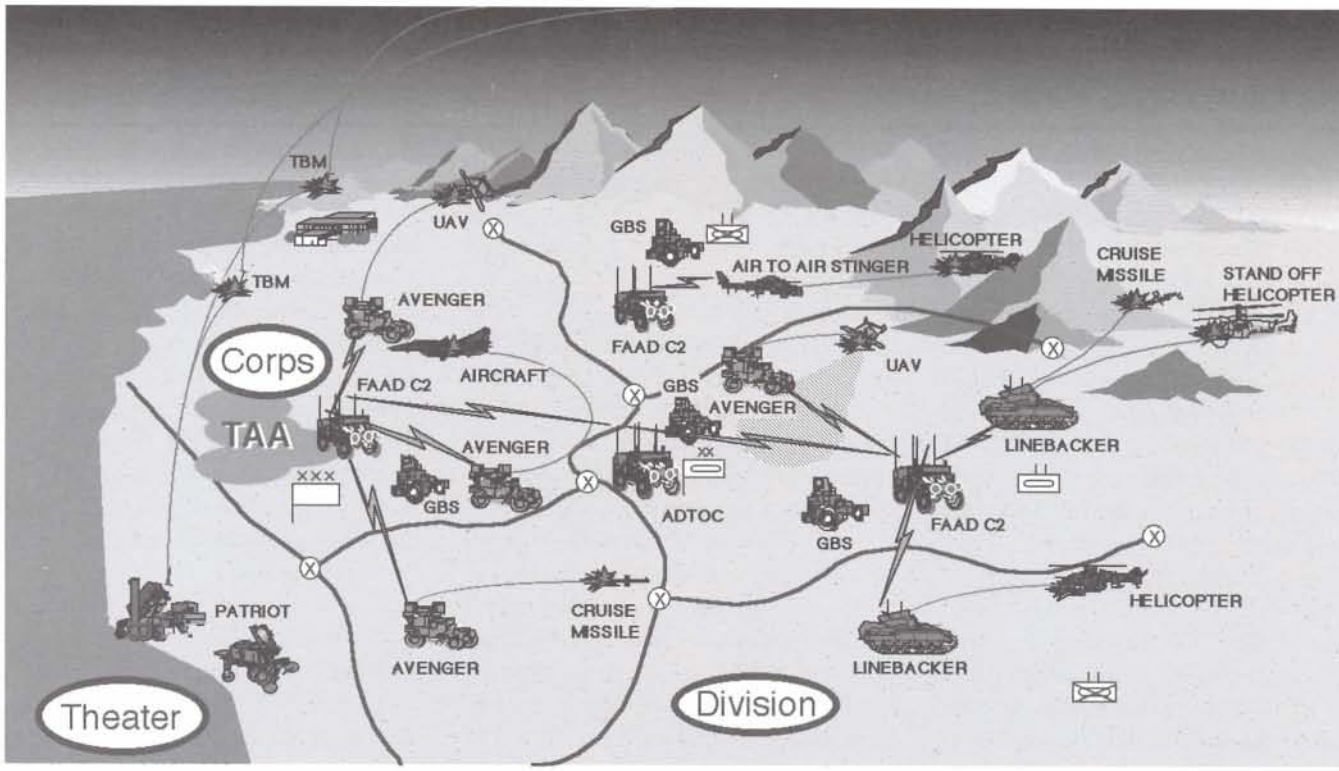
- Detect, classify, identify and engage cruise missiles, rotary-wing aircraft, lethal unmanned aerial vehicles, fixed-wing aircraft and low-observable aircraft.
- Detect, classify, identify and engage rockets and very short-range ballistic missiles.
- Maintain operational tempo commensurate with the supported force.
- Provide survivable air defense in close battle area.
- Maintain integrated C^3I with supported force.
- Alert the force of aerial threat presence and location.

During entry operations, short-range air defense assets integrate with theater missile defense assets to defend against cruise missiles, unmanned aerial vehicles, helicopters and fixed-wing platforms. Short-range air defense systems position forward of defended assets and orient toward the anticipated direction of approach. Integrated into the overall surveillance plan, the Sentinel ground-based sensor positions well forward of defended assets to provide increased detection and to extend engagement ranges against low-altitude threats.

As the force continues to build up and expand in the theater, more PAC-3s and MEADSs arrive to augment the initial theater missile defense, extending ADA coverage to provide protection of maneuvering forces. Arriving PAC-3 battalions replace MEADS elements that may have been employed on lower-tiered missions. THAAD and PAC-3 continue to defend aerial ports of debarkation, seaports of debarkation and selected geopolitical assets designated by the joint force commander. MEADS units switch to protection of maneuver forces moving to or within assembly areas in conjunction with short-range units. Divisional short-range air defense units generally defend their organic divisions in staging and assembly areas. The corps short-range air defense battalions task-organize with MEADS elements to leverage the synergy provided by combining individual systems and surveillance capabilities.

Sustain the Force

- Provide tailored forces and or modular components to facilitate logistical commonality and synchronize support activities.
- Horizontally integrate with the supported force and supporting combat service support elements to facilitate and expedite logistics requirements.
- Provide defense of reconstituting and redeploying forces against threat air and missile attacks.
- Automate soldier training, both stand-alone and netted, to exercise all essential warfighting activities in a fully virtual, integrated and embedded battlespace environment.



Short-Range Air Defense System Concept

Gain Information Dominance. Information is an element of combat power on a par with firepower and maneuver. Winning on the information battlefield means "out-knowing" and "out-reaching" the threat. Air Defense Artillery is a key contributor to all facets of information operations: seeing the battlespace, protecting the means to see and decide, and denying those means to the enemy.

Air Defense Artillery's sensor datalink network, with input from joint tactical ground stations, theater missile defense radars and short-range air defense Sentinel nodes, provides a real-time or near-real-time air picture of the air defense battlespace to the force commander. In addition, the Army Air and Missile Defense Command, in conjunction with an air and theater missile defense element, establishes an integrated air, sea and ground picture and shares this picture with deploying forces. Together, they refine and update the intelligence preparation of the battlefield, monitor friendly and threat air operations and recommend defense designs and theater missile defense priorities in coordination with maneuver plans.

Air Defense Artillery protects critical command, control, communications and intelligence assets from aerial attack and conducts counter-RISTA operations. Throughout the operation, when the situation permits, short-range air defense systems position well forward of defended assets to limit or deny observation by unmanned aerial vehicles. Short-range weapons and sensor capabilities are further enhanced when they are integrated with MEADS units.

Shape the Battlespace. The deployed force must sustain the tempo of operations, setting the conditions for decisive operations and posturing threat forces for failure. Fundamental considerations are precise third-dimension intelligence preparation of the battlefield and the denial of enemy aerial attacks on maneuvering forces, critical command and control assets, deep attack assets and support elements.

ADA shaping of the battlespace focuses on protecting the force and denying or limiting the threat's understanding of friendly intentions. Short-range air defense systems protect maneuver forces while they are on the move or in assembly areas. They protect critical assets against RISTA unmanned aerial vehicles and attack by cruise missiles, fixed-wing aircraft and helicopters. Short-range systems are generally positioned in depth out from the defended route of movement or asset and are usually oriented toward likely directions of approach. MEADS units complement short-range air defense systems. They provide protection against short-range tactical ballistic missiles and extend the defense against threat aerial platforms that attempt to overfly or stand-off from short-range air defense systems. The Sentinel, employed in conjunction with the MEADS sensor, orients on low-

altitude targets, covers gaps and extends MEADS coverage forward. PAC-3 and THAAD units continue to protect critical commander in chief assets, generally in rear areas.

The Army Air and Missile Defense Command and brigade and or battalion air defense tactical operations centers review and process intelligence data provided via space-based, aerial and ground sensor platforms and reassess threat situations based upon that data. Sensor data from joint tactical ground stations, PAC-3, THAAD and MEADS helps to determine tactical ballistic missile launch points and may be transmitted to deep attack systems for engagement.

Decisive Operations. The objective of the force commander during decisive operations is to achieve decisive victory, quickly and with minimum casualties. In pursuit of this goal, the commander seeks to combine surprise, concentration of effects, rapid tempo and audacity to overwhelm the enemy. Maintaining freedom of maneuver for the force is imperative.

Air Defense Artillery's mission focus is to protect the force, defeating threat air and missile strikes against maneuver forces and theater assets and denying threat unmanned aerial vehicle RISTA efforts. PAC-3 and THAAD maintain their defense of aerial ports and seaports of debarkation and priority geopolitical assets throughout the theater. Short-range air defense and MEADS elements provide air defense coverage of the corps maneuvering units and such critical assets as forward refueling and ammunition points, aviation forward operating bases and potential choke points. PAC-3 units may also be brought forward and positioned to augment coverage of the corps logistical concentrations.

Short-range air defense systems are positioned both in the maneuvering force formations and along routes of advance. Bradley Linebackers accompany the maneuver units as they advance to counter the threat's close battle air support platforms — helicopters and lethal unmanned aerial vehicles. The Bradley Linebackers are generally positioned immediately behind the lead maneuvering elements and weighted toward the flanks of the formations. Avengers are deployed farther back along the routes of advance to counter helicopters, lethal unmanned aerial vehicles and RISTA unmanned aerial vehicles, and to enhance survivability. Sentinel data is integrated with MEADS sensors and other ADA and joint service sensors to enhance the forward air picture.

MEADSs are employed forward to provide overwatch protection of maneuvering forces against tactical ballistic missiles, cruise missiles and, in conjunction with short-range air defense units, low-altitude air-breathing threats. Sensors are positioned to extend surveillance forward of the close combat area, permitting engagement of fixed-wing aircraft, stand-off helicopters and unmanned aerial vehicles deployed beyond short-range air defense capabilities.

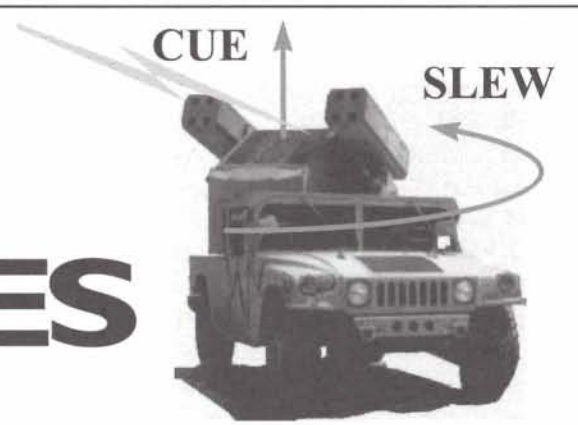
Sustain the Force. Sustainment focuses on enhancing logistics from the start of an operation to its completion. As such, sustainment is an inherent consideration in each pattern of operation. Modular components, tailorable organizations, commonality of logistical items and integrated combat service support automation systems facilitate "anticipatory" logistical flow and synchronization. In addition, sustainment encompasses individual and unit training. Training devices and enhancers ensure soldiers remain proficient.

ADA units are tailored to meet mission requirements. Appropriate theater missile defense units and short-range air defense systems, integrated via modularized air defense tactical operations centers, contribute to uninterrupted sustainment operations by protecting the logistical facilities and reconstituting forces. While the most significant air attack capabilities may have been eliminated, friendly forces must be prepared to counter "last-ditch" air and missile attacks. Short-range air defense systems are primarily RISTA unmanned aerial vehicles, thereby preventing surprise attacks and enhancing force security. MEADS adds capabilities against latent tactical ballistic missile attacks and complements short-range air defense counter-RISTA efforts. PAC-3 and THAAD continue to protect the air and seaports and the redeployment staging areas against tactical ballistic missiles. The integration of these capabilities provides unimpeded operations for the force.

SUMMARY

In the 21st century, Air Defense Artillery will protect forces and key assets from air and missile threats, including tactical ballistic missiles, cruise missiles, unmanned aerial vehicles, helicopters, fixed-wing aircraft with tactical air-to-surface missiles, and rockets. To accomplish this mission, Air Defense Artillery must field the systems to satisfy the required operational capabilities described above. These ADA systems, together with improvements in doctrine, training, leader development and organization, will allow ADA soldiers to execute Force XXI operations and achieve the ADA vision, a stabilized, reorganized, standardized, modernized, modularized and rightsized force that can fight and win on the Force XXI battlefield.

AIR & MISSILE DEFENSE INITIATIVES



The Army hasn't always been quick to envision future mission requirements or adopt new technology to create operational capabilities it would need on future battlefields. In the 1830s, for example, the Army, content with its one-shot sidearms, scoffed at Samuel Colt's five-shot pistol (the term "revolver" had not yet been coined). A foreign nation, the "Lone Star" Republic of Texas, saved Colt from bankruptcy. Texas Ranger Captain Jack Hays had discovered the hard way, rather than by simulation and experimentation, that Comanche warriors could launch half a dozen arrows in the time it took a Ranger to break down and reload a single-shot pistol. Hearing that Colt had gone out of business, Hays took a train from Texas to New York City, where he looked up Sam Colt and persuaded the inventor to resume manufacture.

"There's no market," said Colt.

"You supply the pistols," Hays answered, "and the Texas Rangers will supply the market."

With modifications — today we'd probably call them Colt Advanced Capabilities-2 — Colt's five-shot pistol became the six-shooter, the Gun That Won The West.

Today, the Army has institutionalized a visionary approach to the battlefield. Dozens of organizations and hundreds of soldiers, federal civilian employees and contractor personnel are at work not just on Force XXI but also its successor, the "Army After Next." Once labeled — and not without justification — a "slow learner," the Army is leading our country's armed forces into the 21st century, and Air Defense Artillery is in the vanguard of change.

We attain future operational capabilities through a process of devising employment concepts, defining requirements and determining solutions across the doctrine, training, leader development, organization, materiel and soldiers spectrum. Experiments, exercises, modeling and simulation are key to gaining insights, refining requirements, assessing technological applications and verifying solutions.

Numerous experiment-based initiatives currently underway address issues related to air and missile defense modernization and its horizontal and vertical integration into Army and theater architectures. The U.S. Army Space and Strategic Defense Command and the Ballistic Missile Defense Organization, for example, are driving key technical aspects of theater missile defense capabilities development. The U.S. Army Air Defense Artillery School is driving the operational aspects of Army air and missile defense and, in close collaboration with the Program Executive Office, Air and Missile Defense, and others in the materiel developments community, is leading the ADA "force modernization through experimentation" process. This article focuses on those experimental and analytical initiatives under the auspices of the Air Defense Artillery School and the Program Executive Office, Air and Missile Defense. As such, it is representative, rather than inclusive, but does show the bridging role of experimentation and analysis between required capabilities and the research, development and acquisition process that produces the materiel solutions and focuses, guides and applies technology toward those solutions.

Technology is being linked to the ADA requirements of tomorrow through —

- ADA participation in Army Force XXI advanced warfighting experiments;
- experiments with concepts, technologies and innovative thinking by the Air Defense Lab, conceptualizing a 21st century Army enhanced by superior information and technology and fully integrated battle command;
- integration of theater missile defense systems, command and control and architectures by the Program Executive Office, Air and Missile Defense;
- implementation of the organizational and structuring aspects of the ADA vision;
- development by the U.S. Army Space and Strategic Defense Command of unparalleled analysis and experimentation capabilities;
- planning for the supporting simulation and analysis to guide ADA capabilities into the future; and

• identifying tomorrow's focus areas for technological applications.

FORCE XXI

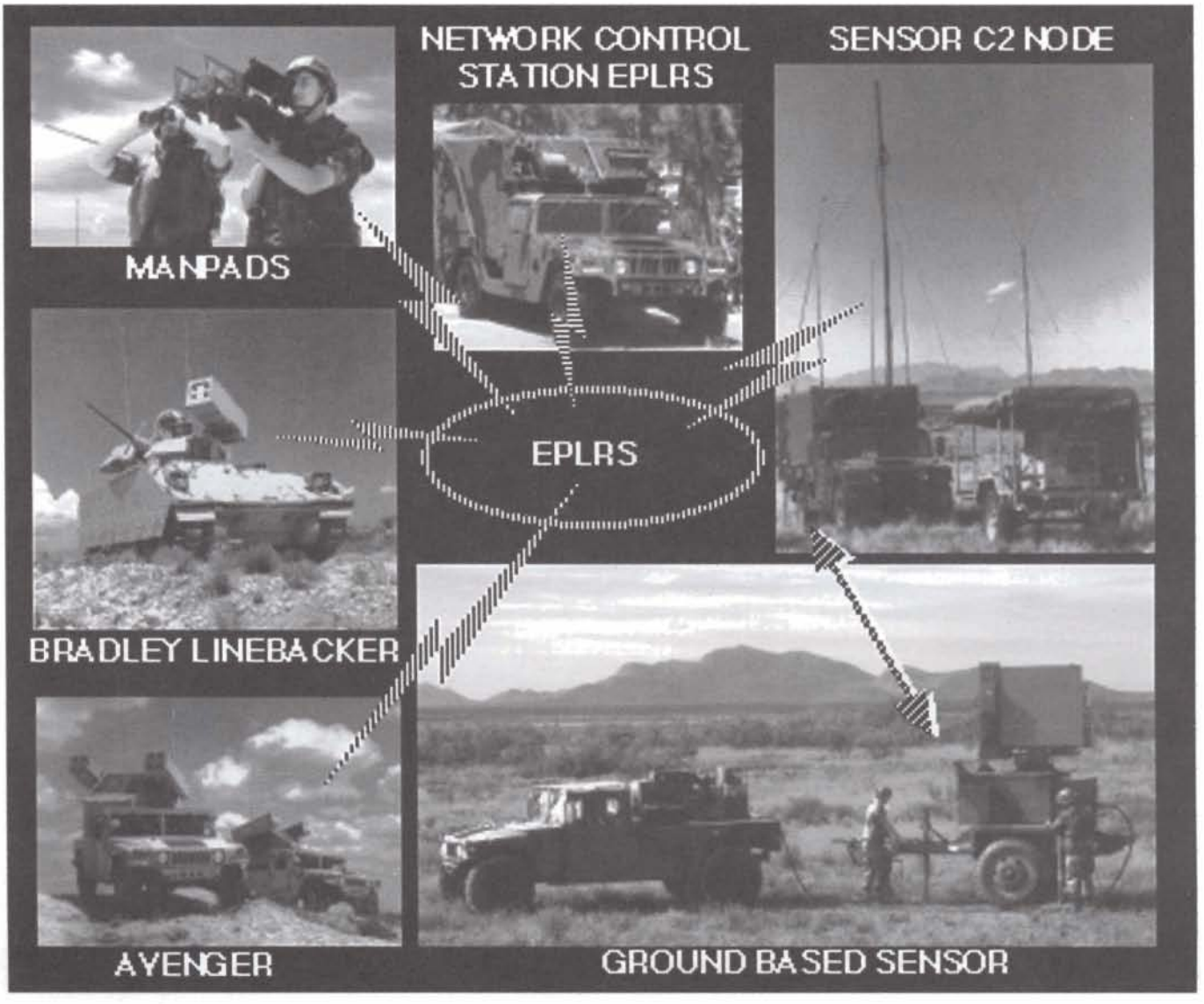
Joint Venture is the U.S. Army Training and Doctrine Command-led process to define the future force — Force XXI. Beginning with maneuver brigade redesign and proceeding through division, corps and echelons above corps, this process will ultimately result in the total redesign of the operational Army. The foundation for this redesign is U.S. Army Training and Doctrine Command Pamphlet 525-5, *Force XXI Operations*, a living document that conceptualizes a 21st-century Army enhanced by superior information, technology and battle command. The Air Defense Lab has the lead for the branch's participation in this Army redesign process and its associated advanced warfighting experiments. Key components of Force XXI are described below.

Task Force XXI. A digital brigade-level experiment conducted at the National Training Center in March 1997. Air Defense Artillery demonstrated digital horizontal and vertical integration and validated brigade and below organizational requirements.

Division XXI. A combination live and simulation exercise (October 1997) will focus on Force XXI division design, operational concepts, battle command and information operations. Air Defense Artillery will validate divisional ADA battalion design, weapons and command and control contributions to protect the force.

Corps XXI. A combination live and simulation exercise (fiscal year 1995) that focused on Force XXI corps de-

Cruise Missile Defense Experiment



sign, operational concepts, battle command and information operations. Air Defense Artillery examined the integration of organic and supporting theater missile defense systems with corps forces and validated the ADA corps brigade's organizational design, operational requirements and its contributions to protect, screen, inform and sustain the force.

Prairie Warrior. A series of annual Command and General Staff College exercises will validate division design principles. Air Defense Artillery's focus in the fiscal year 1997 exercise is how to fight divisional ADA 2010, demonstrate the Army Air and Missile Defense Command and how to conduct Medium Extended Air Defense System operations in a mobile strike force.

Theater Missile Defense Experiment. These experiments range from advanced warfighting experiments that encompass all battlefield operating systems to smaller scale experiments under the proponent of a battle lab or a support element (conducted in intervening years). Each theater missile defense experiment examines and experiments with varying aspects of theater missile defense, such as active and passive defense, attack operations and command, control, communications and intelligence integration. The exercises are overlaid on the annual Roving Sands joint training exercise. The fiscal year 1995 advanced warfighting experiment (first in the biannual series) examined all aspects of theater missile defense integration and information exchange. The fiscal year 1996 experiment focus was on identifying key cruise missile defense requirements and refining the Army Air and Missile Defense Command concept.

AIR DEFENSE LAB EXERCISES AND EXPERIMENTS

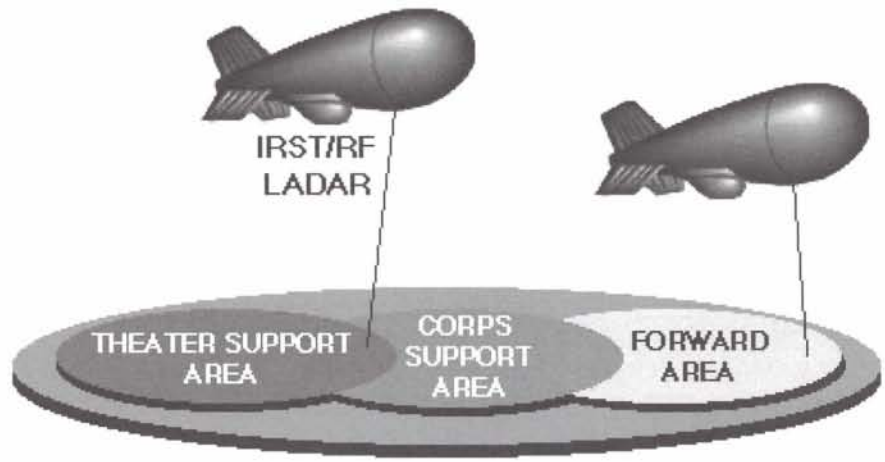
In addition to its Force XXI exercises and experiments, the Air Defense Lab conducts and participates in other live exercises and experiments. Collectively, these serve as a springboard to examine promising technologies, future operational capabilities and requirements, systems' materiel improvements, systems' integration and current and emerging concepts, doctrine and tactics, techniques and procedures for tomorrow's battlefield.

Cruise Missile Defense Experiment. A cruise missile defense experiment conducted during the Roving Sands live-fire exercise in June 1996 used fielded and prototype short-range air defense equipment. An Avenger made history by being the first short-range air defense weapon system to successfully destroy a realistic, state-of-the-art cruise missile surrogate. The Bradley Linebacker also accomplished this feat later during the firing exercise. Stinger teams performed simulated engagements, but they did not have live missiles. The scenario had three firsts: a live fire via a forward area air defense command and control network, with its associated Sentinel ground-based sensor detecting a cruise missile; passing of target data via the network to the Avenger, Linebacker (both equipped with slew-to-cue capabilities) and Stinger teams; and engagement of a target with a Stinger Block I missile. All fire units were equipped with the enhanced position location and reporting system, which linked them with forward area air defense command and control and the Sentinel.

Aerostat Masked Target Sensor Program. Detection of low-flying platforms, particularly cruise missiles and unmanned aerial vehicles, is difficult for surface-based sensors that have inherent limits imposed by terrain and radar line-of-sight. Airborne sensors can both complement the surveillance and detection provided by the surface-based sensors and extend defensive weapon system capabilities to the kinematic limits of their missiles. While large fixed-wing aircraft could fulfill this role, they are prohibitively expensive to build and operate in the quantities required for cruise missile defense.

The Aerostat, a proven technology, offers a lower cost alternative to host surveillance and fire control quality sensors. In late 1995, the Undersecretary of Defense (Acquisition and Technology) and the Vice Chairman of the Joint Chiefs of Staff, responding to the recommendations of the Defense Science Board, made the Aerostat a near-term cruise missile defense priority and directed the establishment of a Joint Project Office. Subsequently, the U.S. Army Air Defense Artillery School, Fort Bliss, Texas, was designated as the services' Aerostat proponent for cruise missile defense.

Aerostat Masked Target Sensor Experiment



The current Aerostat program has two aspects: research, development and acquisition activities leading to deployable systems and experiments evaluating aerial sensors to provide over-the-horizon surveillance and fire control quality data to permit target engagements beyond ground-based radar line-of-sight.

For cruise missile defense, the Aerostat offers a cost-effective airborne sensor platform that significantly extends over-the-horizon cruise missile detection and warning range and defended area footprints with air defense systems such as Patriot, the Medium-Extended Air Defense System and the Navy's Aegis/SM-2 missile. The Aerostat's roles in cruise missile defense involve over-the-horizon detection and tracking of targets, sending positional information to surface systems, continuing target track after missile launch and initiating missile track to acquire and intercept. Operationally, we will employ Aerostats in a "two-unit stationing" concept for theater operations and electronically link them to all key theater air defense and theater missile defense networks (such as the Joint Data Net and Joint Composite Tracking Net). Aerostats, in combination with fixed-wing platforms such as the airborne warning and control system and the joint surveillance and target attack radar system, will provide cost- and operationally effective integrated detection, warning and engagement.

The Joint Project Office's near-term focus is on acquisition of Aerostats and demonstrations of the Aerostat concept using existing equipment (an initial demonstration took place during Roving Sands '96). The Joint Project Office plans to establish an Aerostat testbed at McGregor Range, N.M. Deployable systems are currently being developed and procured and will be demonstrated and experimented with in future exercises to assess the operational value for overall situational awareness and improved air defense systems' detection times and engagement ranges.

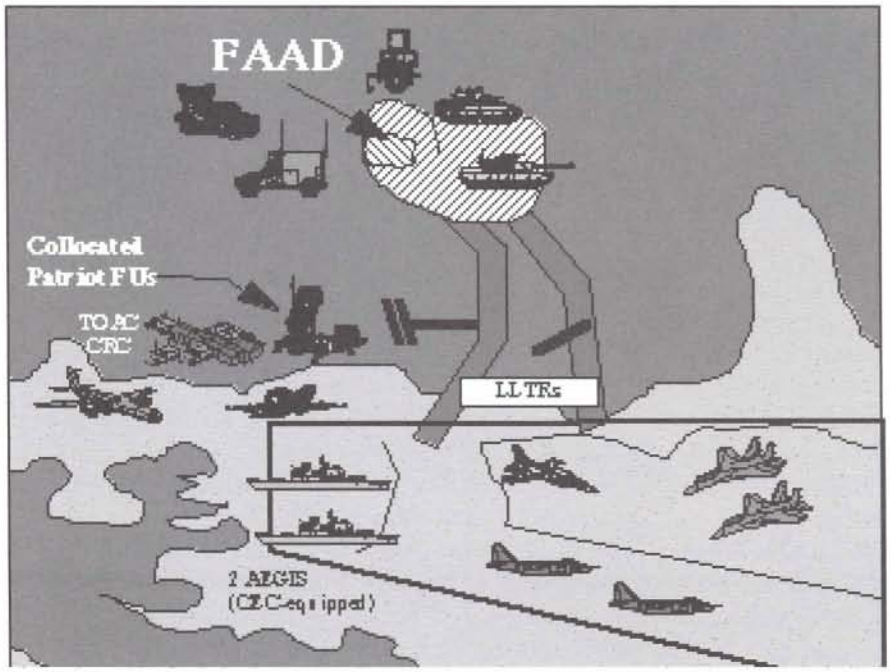
Nautilus/Tactical High-Energy Laser. The Nautilus is a joint U.S.-Israeli test effort to evaluate the effectiveness of high-energy lasers to counter low-flying air threats that are of concern to Israel and the United States in theater-level engagements. In February 1996, a rocket was successfully intercepted at the High-Energy Laser Test Facility, White Sands Missile Range, N.M., during testing to evaluate high-energy laser effectiveness. This led to an agreement between the Department of Defense and the Israeli Ministry of Defense to evaluate the effectiveness of a tactical high-energy laser in negating a rocket threat. One of Nautilus' major tasks is to provide technical and detailed planning support as risk reduction for an eventual joint development effort for a tactical high-energy laser system.

The Air Defense Artillery School is the proponent for, and is developing a mission needs statement for, the objective tactical high-energy laser system. The long-range plan for the tactical high-energy laser is to use a phased approach by developing an initial fieldable prototype, followed by an interim four-fire-unit tactical high-energy laser configuration leading to an objective configuration.

The tactical high-energy laser potentially provides an innovative, low-cost solution to the acquisition and close-in engagement limitations of current systems and technologies to counter cruise missiles and other existing and future stressing threats.

The tactical high-energy laser concept is a mobile, high-energy laser weapon that uses proven laser-beam generation and beam-pointing technologies and existing sensors and communications networks to provide 21st-century forces with a bold new active defense capability in counterair missions. Missions include soft kills of sensors and hard kills or mission aborts against unmanned aerial vehicles, short-range rockets, cruise missiles, antiradiation missiles, helicopters and fixed-wing aircraft. The initial fieldable system is currently envisioned as a palletized or truck-mounted system that can be C-130 or

ASCIET Exercise



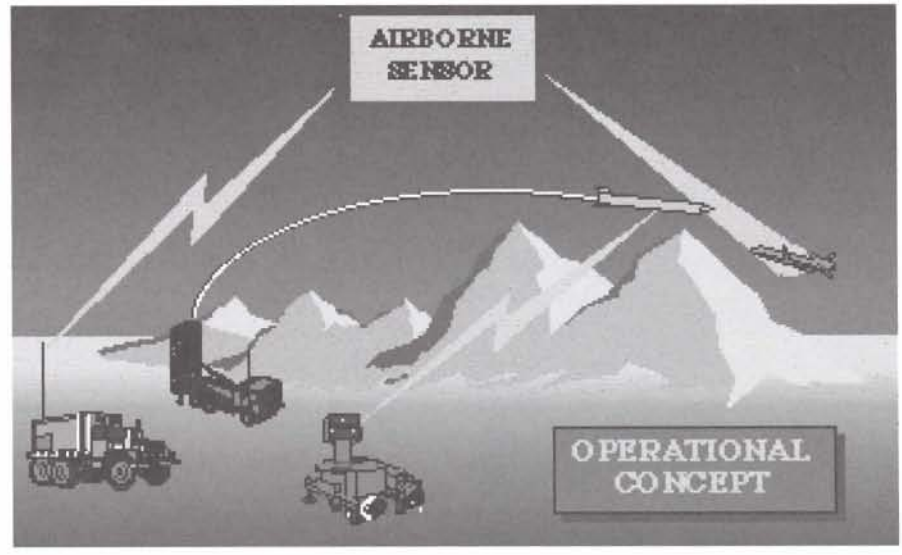
CH-47 transportable to meet rapid deployment requirements.

Conceptually, the tactical high-energy laser will integrate into the short- to medium-range air defense architecture to provide near-leakproof defensive coverage to combat forces by complementing surface-to-air missile systems. Typical tactical high-energy laser engagement ranges will exceed 10 kilometers. The tactical high-energy laser's rapid kill rate and "deep magazine" enable air defenders to repel highly concentrated attacks and retain the ability to continue to battle after an attack. The tactical high- energy laser's low cost per kill (a few thousand dollars per kill) will return the cost balance to favor the defense.

An 18-month tactical high-energy laser advanced concept technology demonstration is being formed to build a one-unit demonstrator system that will be available for integration and testing starting in fiscal year 1998. (An option to build a second demonstrator will be decided at that time.) The U.S. Army Space and Strategic Defense Command is leading U.S. tactical high-energy laser efforts. The objective of the test program is to demonstrate high-energy laser weapon effectiveness for air defense missions. A mid-infrared advanced chemical laser will illuminate the rocket warheads to assess kill mechanisms. Illuminating multiple unmanned aerial vehicles and other targets during a single laser firing will demonstrate the high-energy laser weapon system's resistance to saturation attacks. The test program also calls for dynamic tests on simulated high-explosive, chemical and biological warheads and submunitions.

All-Service Combat Identification Evaluation Team Exercises. The All-Service Combat Identification Evaluation Team Program is a Joint Chiefs of Staff-sponsored joint exercise and evaluation that includes integrated air defense and focuses on all aspects of combat identification. First conducted in 1995, its surface-to-air and air-to-air evaluations are the successor to the joint air defense operations and joint engagement zone exercises conducted during 1987 and 1993. The All-Service Combat Identification Evaluation Team '96 was conducted in the Gulfport, Miss., area in August and September of 1996. Air Defense Artillery is an active participant in these annual exercises. ADA participants included a brigade tactical operations center, Patriot battalion (-), elements of a short-range air defense battalion (forward area air defense command and control, Sentinels and Avengers) and candidate positive identification devices and techniques.

Army Mountain Top Experiment



PROGRAM EXECUTIVE OFFICE, AIR AND MISSILE DEFENSE, INITIATIVES

The following initiatives are underway within the Program Executive Office, Air and Missile Defense.

Army Mountain Top Experiment. The Army Mountain Top Experiment was the Army portion of the Navy-led Cruise Missile Defense Advanced Concept Technology Demonstration, Phase I, a joint effort involving the Army, Navy and the Advanced Research Projects Agency. The Army's objective was to demonstrate that we can use track data generated from an airborne sensor to acquire, track and engage low-altitude cruise missiles beyond the line-of-sight of a ground-based air defense system. The operational concept demonstrated the value added of elevating surveillance and fire control radars by extending detection range and enabling beyond-line-of-sight engagement of surrogate cruise missiles. During the Army Mountain Top Experiment, a mountain ridge served as the surrogate airborne sensor or platform. In follow-up experiments (such as the Navy-proposed Phase 2 of the advanced concept technology demonstration) the Aerostat, or a similar airborne platform, will provide the elevated surveillance data to ground elements.

Theater Missile Defense System Integration Tests. We will employ ADA theater missile defense-capable systems in task organizations (such as Patriot and the Theater High-Altitude Area Defense system) to provide near-leakproof defense of designated theater-critical assets. We must integrate theater missile defense systems within a task force — both technically and functionally — to optimize defense effectiveness. Task forces, in turn, must

be fully integrated into the joint and Army theater missile defense architectures. System integration tests (conducted under the auspices of the Ballistic Missile Defense Organization as the Department of Defense's theater missile defense proponent and the Program Executive Office, Air and Missile Defense as the Army theater missile defense active defense systems and technical integration proponent) are a series of demonstrations that operationally and technically measure the integration of ADA theater missile defense systems (such as Patriot and the Theater High-Altitude Area Defense system) and the interoperability of ADA theater missile defense systems with other Army and joint theater missile defense systems. System integration tests will attempt to "piggy-back" on other exercises and demonstrations (on a noninterference basis) to optimize participation.

OTHER KEY INITIATIVES

Several other key initiatives are underway within the U.S. Army Space and Strategic Defense Command and the Air Defense Artillery School.

U.S. Army Space and Strategic Defense Command Missile Defense Battle Integration Center. While the U.S. Army Space and Strategic Defense Command is a major contributor to nearly all aspects of air and missile defense development, particularly from the technology applications perspective, the development of a missile defense battle integration center is particularly germane for air and missile defense experimentation and analytical insights — it is demonstrating how we can use modeling and simulation for integrated analysis of complex missile defense and space operations issues. The missile defense battle integration center gives the Army a computerized simulation capability to facilitate integration and evaluation of theater missile defense and national missile defense functions, capabilities and architectures, and it enables modeling and analysis of space assets by the U.S. Army Space and Strategic Defense Command's Army Space Command.

The missile defense battle integration center has developed and is implementing (for the Army and others) a synthetic battlefield context for integrating missile defense and space assets supporting required activities, materiel developers and users with distributed, netted computing resources, models and simulation efforts for warfighter exercise, analytical and virtual prototyping activities. During exercises and deployments, it provides the warfighter with a distributed synthetic battlefield training and planning environment and with a near-real-time after-action review capability.

Additionally, the missile defense battle integration center supports the Army and the Department of Defense in cost and operational effectiveness analyses and requirements analysis through the development and operation of an analytical modern battlefield. It also enhances materiel developments through virtual prototyping and user interface development.

The missile defense battle integration center has developed a synthetic battlefield environment to provide weapons developers, battle planners and warfighting commanders an interactive way to simulate precise operational scenarios. The modular synthetic battlefield environment will permit replacement of a simulated element with the actual hardware, providing the capability for hardware-in-the-loop as well as human-in-the-loop testing.

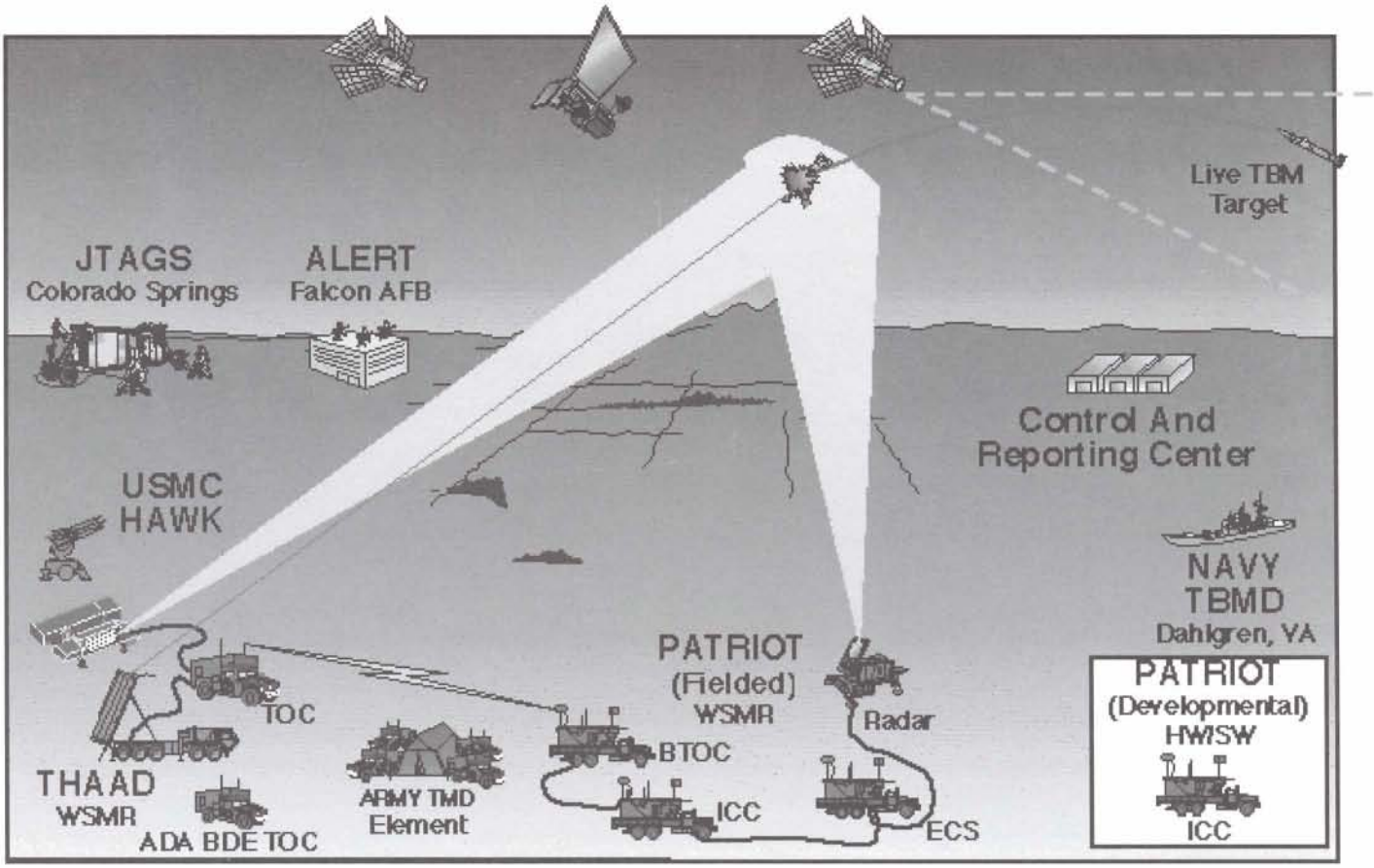
The missile defense battle integration center is working closely with the Training and Doctrine Command to develop ways to integrate its battle lab locations throughout the United States (and supporting labs such as the Air Defense Lab) into a single, comprehensive battlefield simulation for the Force XXI campaign. Through the missile defense battle integration center, the Space and Strategic Defense Command will be inserting missile defense capabilities into the activities of the battle labs, the Louisiana Maneuvers Program, advanced warfighting experiments and other Force XXI exercises.

The missile defense battle integration center is using this synthetic battlefield environment to provide a virtual environment to train and prepare tactical operations center crews for the split-second decision making required in the missile defense battle. This synthetic environment allows soldiers to train and rehearse on doctrine and tactics, techniques and procedures, creating a force of virtual-combat veterans who can, when called upon, use the available technology, interpret the information and make the critical decisions that protect U.S. forces and allies by waging a winning theater missile defense battle.

Future plans include developing the flexibility to use both the extended air defense simulation and testbed in an interchangeable role within the synthetic battlefield environment architecture. Also, the synthetic battlefield environment will participate in exercises such as Roving Sands and Prairie Warrior.

Army Air and Missile Defense Command. The Army Air and Missile Defense Command is a new, theater-level organization that is the capstone command for Army theater active air and missile defense. A U.S. Army ADA School initiative, this organization is being established provisionally in fiscal year 1997 as a prelude to formal establishment in fiscal year 1998. It will provide centralized planning, coordination, integration and employment of ground-based air defense and active missile defense theater assets in conjunction with the other services' air and missile forces. The Army Air and Missile Defense Command air defense tactical operations center will provide automated functionality. The Army Air and Missile Defense Command is the focus

System Integration Tests



for coordinated employment of ground-based surface-to-air missiles and their integration into theater air and missile defense. It is also the theater Army air defense coordinator and integrator for Army air and missile defense operations, including corps air and missile defense requirements into joint counterair and theater missile defense plans.

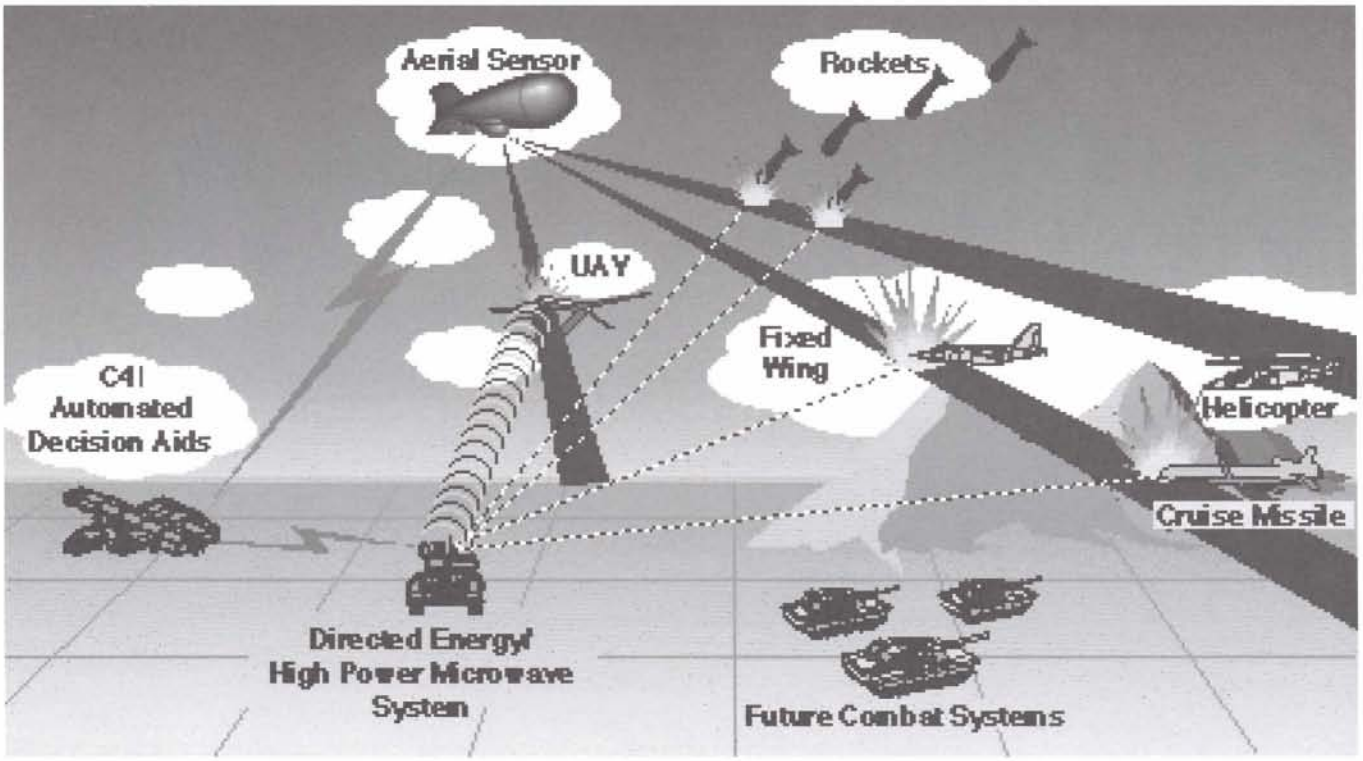
Patriot Standardization. Under auspices of the Air Defense Artillery School, Patriot is being standardized into five-battery battalions. This reorganization enables the establishment of a tenth Patriot battalion to alleviate the stress imposed by overseas commitments of Patriot in various theaters.

Formalized Plans and Strategies. The Air Defense Artillery School is defining operational capabilities and analytical strategies for evolution to Army XXI. These strategies are set forth in master plans that articulate modernization objectives, means and schedules for classification, discrimination and identification materiel across air defense; structure air and missile defense analysis programs; and guide the development and upgrade of simulation and simulator equipment. The following plans are currently under development.

The ADA Classification, Discrimination and Identification Master Plan. The ability to classify airborne objects by type, discriminate between real and decoy, and positively identify airborne objects as friend, hostile or neutral is key to effective operational employment of Air Defense Artillery in both air and missile defense. The initial Classification, Discrimination and Identification Master Plan is an "across-the-fleet" approach to a pressing ADA capability need. It defines, prioritizes and rationalizes the classification, discrimination and identification strategy for the future; compares classification, discrimination and identification technology capabilities with ADA weapon system roles and requirements; recommends technology applications for each; and presents all-service classification, discrimination and identification concept and recommendations for implementation of the concept.

The U.S. Army ADA School Analysis Master Plan. This draft plan encompasses the school's vision for analytical studies. It lists the projects forecasted for fiscal years 1997 to 2002, specifying manpower requirements, study durations and analysis methodologies. It bases these projects on the

Air and Missile Defense Iniatives



recognized need for future concepts and user operational requirements relative to changing operational capabilities, technologies, emerging and projected threat, and force structure.

Fort Bliss Model and Simulation Master Plan. This draft plan guides efforts to acquire and maintain the required integrated and complementary tools for analytical, training and experimentation support of the Fort Bliss community. The tools will enable Fort Bliss' participation in large-scale, distributed interactive simulation activities locally and/or with remote sites (such as the missile defense battle integration center). The plan describes the objective Fort Bliss Model and Simulation Environment consisting of constructive simulations; virtual simulations; instrumented weapons and command, control, communications and intelligence systems; and corresponding data bases. These are linked via gateways and software modules that implement the distributed interactive simulation protocol, allowing the simulations to share information. The Fort Bliss Model and Simulation Environment will provide the requisite support to address a wide variety of situations and scenarios from individual soldier, through battalion, to theater-level in single-service and joint settings.

FUTURE TECHNOLOGY ENHANCEMENTS

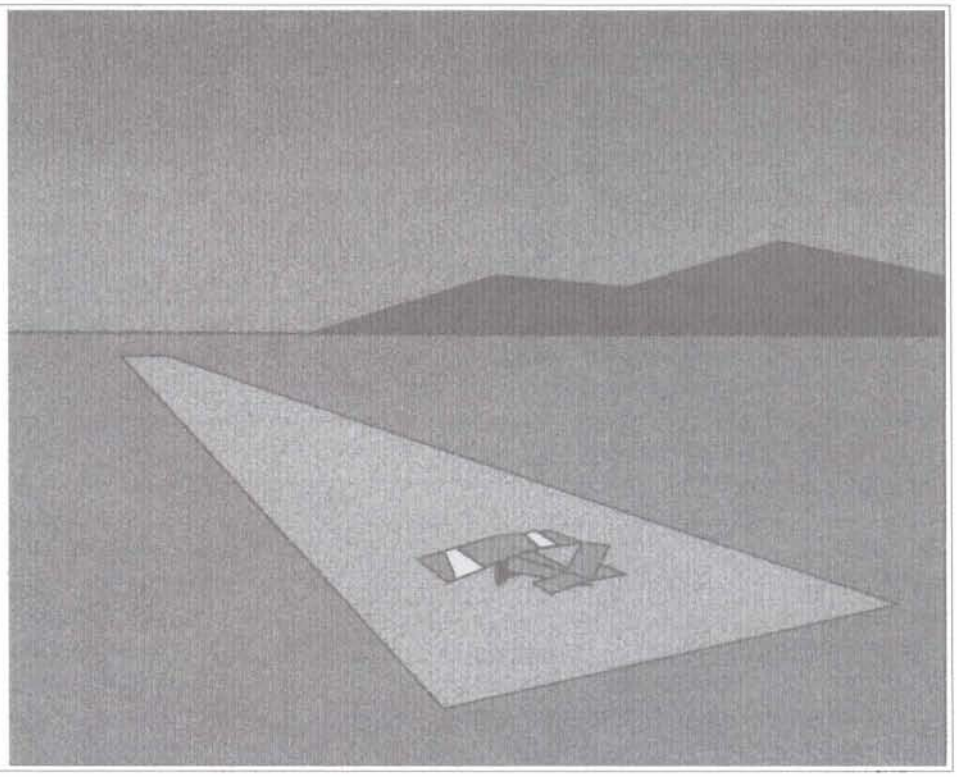
Exercises and experiments, with their conceptual underpinnings and demonstrations of "new" capabilities, will unveil a series of enhancement areas to evolve today's needs into tomorrow's systems through the application of focused technological enhancements. Enhancement needs, while not all-encompassing, are the foundation for technology.

SUMMARY

In the new Army modernization process, experimentation is key to gaining insights; identifying and refining requirements across the doctrine, training, leader development, organization, materiel and soldiers spectrum; and determining how to leverage and focus technology to realize needed operational capabilities. Numerous experiments and analysis-based initiatives are underway within the ADA community to gain the necessary insights and evaluate potential solutions required for Air Defense Artillery to attain its Army XXI capabilities.

Many of the initiatives are interrelated. Each, however, is a stepping stone toward the Army XXI goal, providing unique conclusions, reinforcing and refining observations of preceding events, evolving hypotheses and objectives for follow-on activities, and applying the "art of the possible" to provide an ADA azimuth to guide materiel developments and science and technology communities in meeting ADA needs on the future battlefield.

RCMAT Pilots 'Keep 'em Flying'



by SSgt. Dexter Griffin and Sgt. Agustin Solazayas

Press reports depict the once formidable Red Army as a demoralized rabble on the verge of collapse, but at Fort Bliss, Texas, a squadron of Soviet MiG-27s continues its mission as though the Cold War never ended. The MiG-27s that soar over Fort Bliss' desert training ranges, however, are one-ninth scale, styrofoam models. Their pilots, soldiers of the Radio-Controlled Miniature Aerial Target (RCMAT) Section, 2nd Battalion, 6th Air Defense Artillery Brigade, never leave the ground. Their mission is to help train air defense units in aircraft identification, tracking and engagement.

The RCMAT Section consist of one civilian technician and six soldiers, who are attached rather than assigned, since the section has had no table of distribution and allowance allocations since 1987. Jose Torres, a civilian technician and RCMAT pilot, who was assigned to the RCMAT section in 1993, provides the section with its institutional continuity.

The section flies about 50 missions a month in support of diverse training at various locations on Fort Bliss's McGregor Range, the vast desert training area that sprawls westward from Fort Bliss across the southeastern corner of New Mexico. The section supports Bradley Stinger Fighting Vehicle and Avenger (M3P Machine Gun) training exercises at the Short-Range Air Defense Test Site near the Orogrande National Forest — two stunted but revered Mexican elders that cling to a precarious existence in the heart of what passes for downtown Orogrande, N.M.

The RCMAT Section supports training for every U.S.-based short-range air defense battalion and U.S. Air Force and U.S. Marine Corps personnel. It also sends its MiG-27 replicants aloft in support of Air Defense Artillery Officer Basic Course and Air Defense Artillery Noncommissioned Officer Basic Course field training exercises. In addition, the section supports U.S. Army Air Defense Artillery Test Directorate tests and evaluations and Air Defense Lab experimentations.

Night Flying Capabilities

Shrinking training budgets have made RCMAT Section soldiers masters of innovation. Last summer, the section received tasking to support Florida Army National Guard air defenders about to make the transition to Avenger. Since none of the training brigade's Avengers were available during the day, the Army National Guard tracking training would have to be conducted at night. This presented a problem. The RCMATs had only flown in daylight. They had never flown at night and were not equipped with running lights to make them visible to Avenger M3P machine gunners.

The section's NCOs met the challenge with equipment modifications and innovative techniques that turned the MiG-27's into night fighters. Several variants were tested, before SFC Roberto Miranda of Headquarters, A Battery, 2nd Battalion, 6th Air Defense Artillery, came up the winning design.

Miranda's solution relies on nine chem lights. First drill a hole through each wing tip and slip rubber bands through the holes to hold the chem lights — mounted one on top and one on bottom — in place. Next, mount four chem lights on the

fuselage: one on bottom and one on top both fore and aft. You can drive the chem lights into the styrofoam or stretch rubber bands around the fuselage to hold the chem light firmly in place. The last chem light goes on the tail. Drill a hole into the tail and drive the chem light into place. Use chem lights all of one color on top and chem lights all of another color on bottom. Rigging a RCMAT with chem lights takes about 10 minutes. It's economical because you can take chem lights off one RCMAT and put them on others. Chem lights put out maximum illumination for two hours. Since RCMATs are serviced after each flight, a new aircraft can fly with chem lights used in the pervious mission. Assembling the night fighters doesn't require mechanical genius; anyone can do it.

The RCMAT Section successfully flew RCMATs for a total of 40 hours during total darkness in support of Florida Army National Guard Avenger tracking training. In their after-action review, the section's noncommissioned officers grouped lessons learned in four categories: Preparation, Flying and Safety.

Preparation. The nighttime presents a challenging, new training environment. Even experienced RCMAT pilot needs four to five hours of night flying practice prior to flying the first mission.

Flying. The aircraft performs differently with the increased payload required for night flying. A RCMAT rigged with chem lights needs maximum lift to get airborne. This also makes night launches more difficult than day launches, and getting it right requires some practice. The flyer's assistant has to take a running start with the aircraft facing into the wind in order to launch successfully. A wind sock mounted on a radio antennae will help pilots and their assistants determine wind direction. Pilots accustomed to daytime flying will discover that RCMATs rigged when chem lights climb slower and respond more sluggishly to controls.

Once the RCMAT is aloft, the pilot should maintain flight patterns that keep the RCMAT within 500 to 800 meters to maintain good visibility and control. Because the increased payload increases fuel consumption, the pilot should plan a night flight to last no more than 15 minutes as compared to a 23-minute daytime flight.

Safety. The RCMAT Section initially thought its first night flight would be a first for air defense training; not so. Darryl Cooley, a retiree with more than 40 years of combined military and federal service revealed that the 1st Army Training Command flew RCMATs at night in support of field training at McGregor Range nearly a decade ago.

"You have to be very careful in flying aircraft at night around ground troops," he warned. "The one-ninth scale model RCMAT has a hard maple prop that turns at approximately 11,500 revolutions per minute. This can present a significant danger to troops in night operations when a pilot's depth perception is not 100 percent." He added, "It's best to position the RCMAT team between the supported troops on the ground and the aircraft in flight."

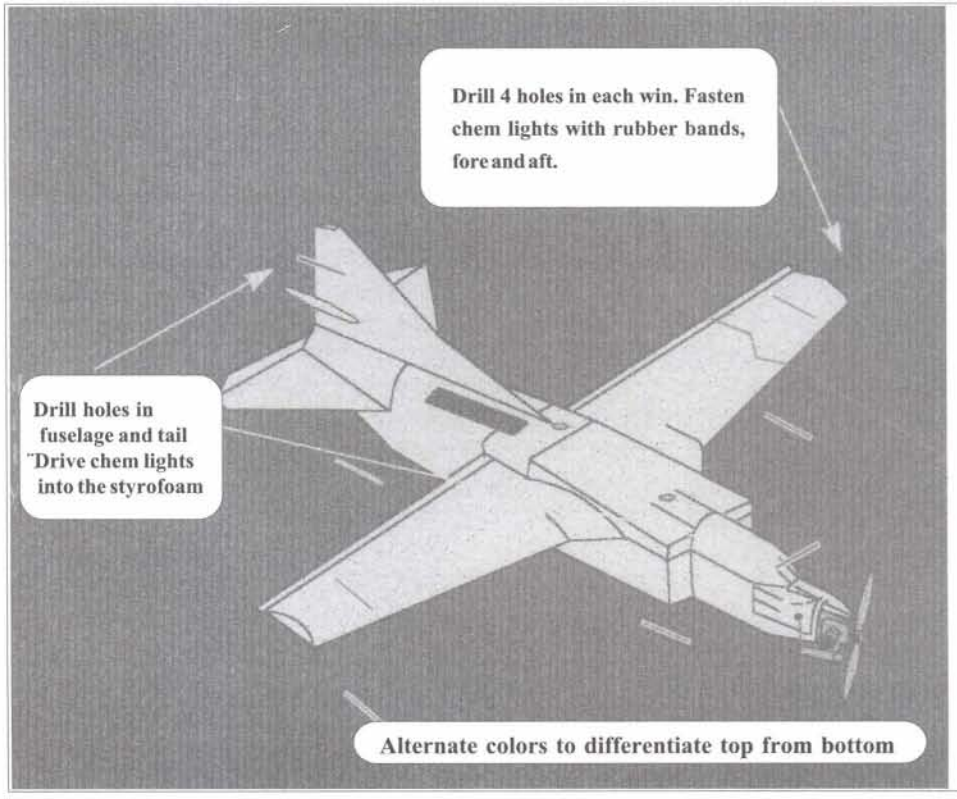
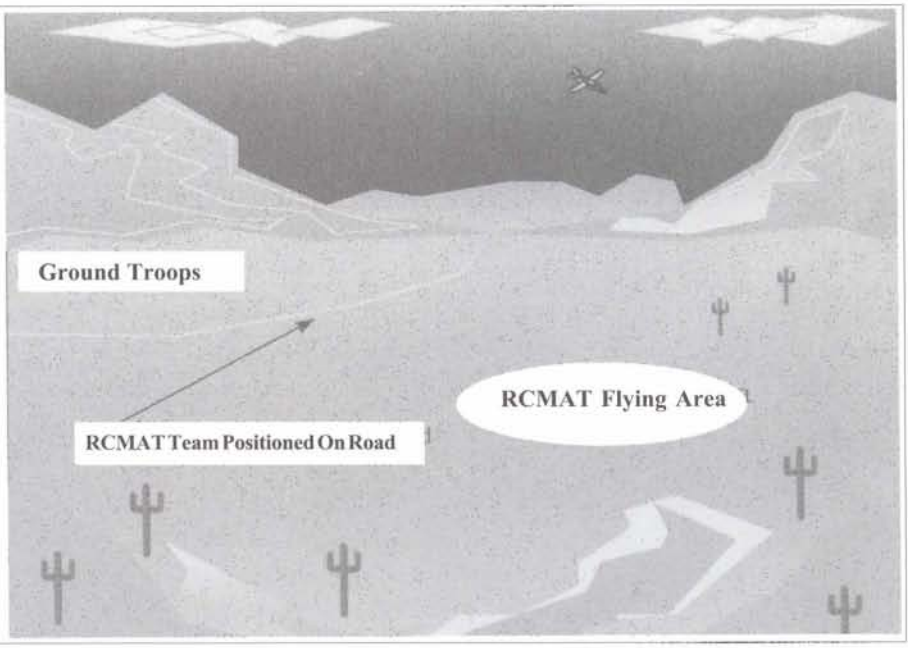


Diagram shows how to rig a RCMAT "night fighter" with chem lights for night training flights.

Diagram shows RCMAT team and supported short-range air defense ground troops safely positioned for a nightime target tracking exercise.



Other RCMAT Training Innovations

Maintaining training quality in an era of increased operating tempo and shrinking resources demands that we train smarter and more efficiently. Since the budget axe fell early on the RCMAT Section, its soldiers have become veterans at doing more with less.

RCMAT pilots once took a formal six-week course before earning their additional skill identifyer. Budget constraints killed the program in 1987; however, a requirement for proficient RCMAT pilots remained. Short-range air defense battalions had to make do with instruction at their locations — at times with a 2-6 ADA mobile training team on hand — or an informal resident class at Fort Bliss.

Today RCMAT pilots training at Fort Bliss receive a two-week block of instruction that covers all the basics, including flight fundamentals, aircraft assembly, maintenance procedures and flying skills. "Teaching new soldiers to fly RCMAT aircraft is by far the hardest aspect of the job," says SSgt. Dexter Griffin, the RCMAT Section's chief pilot.

Training RCMAT pilots was once a costly enterprise. The average soldier destroyed 12 to 15 aircraft in the process of developing basic aircraft handling skills. Working on his own initiative, Torres procured a computer software program that permits soldiers to train on computer screens. "The new system allows the trainee to develop basic proficiency with a control box at a computer before ever handling and risking an aircraft," explained Torres. "What's more, a level of proficiency can be maintained without using aircraft when resources are limited."

The skill required to fly a RCMAT is complex and perishable. Manipulating the controls while viewing the aircraft often requires actions that are counter-intuitive. Formerly, pilots learned at the expense of destroying a large number of model aircraft. The average soldier using the computer training simulator loses only four to five RCMATSs before attaining proficiency. This translates to considerable savings.

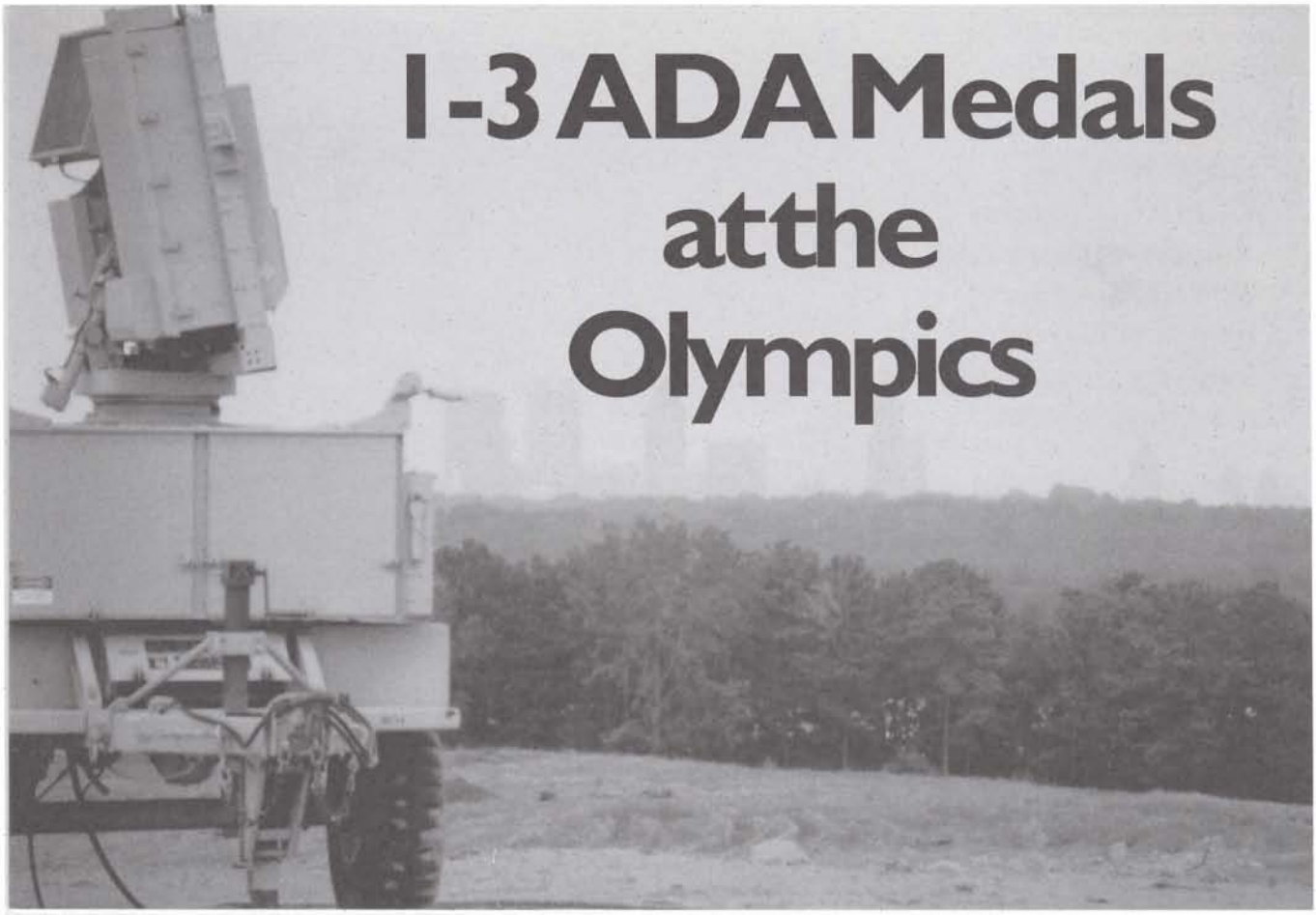
Dave Brown Products, Hamilton, Ohio, makes the off-the-shelf software program used at Fort Bliss. The program, which requires a 286 CPU with 720 KB of RAM and 2MB available hard disk memory, is available at most hobby stores. The software comes with a control box game card. The program provides sequential and progressive training.

"Trainees perform different flying maneuvers while controlling an aircraft's trim," said Torres. "The program is interactive in that it provides a real-time display of an aircraft in animation. It also shows altitude, airspeed and distance and presents an evaluation of the pilots' performance at the conclusion of an exercise. Instructors can select a variety of aircraft and weather conditions to increases difficulty. Soldiers spend up to 20 hours in simulation prior to actually flying."

ADA soldiers expect to shoot aircraft down, not "keep 'em flying," but the soldiers of the RCMAT Section are, nevertheless, making important contributions to Air Defense Artillery. They have demonstrated the resourcefulness that must characterize "First to Fire" training as we march toward the 21st century. Call DSN 978-1234 for more information on the Fort Bliss RCMAT training program.

SSgt. Dexter Griffin and Sgt. Agustin Solazayas are assigned to the 2-6 ADA's RCMAT Section, Fort Bliss, Texas.

1-3 ADA Medals at the Olympics



Atlanta's skyline looms in the background as a 1-3 ADA Sentinel radar guards the Centennial Olympic Games against terrorist aerial attacks.

Article by Maj. Dave Bagnati
Photos by 1st Lt. Steve Thornton

Their mission was to assist in controlling all of the temporary flight restriction areas during the summer games. The Sentinel ground-based sensors detected more than 25 unauthorized aircraft and passed this information to U.S. Customs. The soldiers from 1-3 ADA only had three days to prepare, set up and execute this mission, which was performed in an outstanding manner. Job well done!

— Maj. Gen. John Costello
Chief of Air Defense Artillery

The combat readiness of 1-3 ADA "I Strike" soldiers created the flexibility to accomplish the Olympic mission on extremely short notice. 3ID (Mech) will always prepare for war and maintain the ability to rapidly respond to our nation's call.

— Maj. Gen. John W. Hendrix
3rd Infantry Division (Mech)

The Oklahoma City and World Trade Center bombings should have awakened Americans from their dream of immunity to terrorist attack, but when a pipe bomb concealed in a green knapsack detonated at the Centennial Olympics in Atlanta, horrified spectators repeated the same refrain: "I didn't think it could happen here." Afterward, *Time* magazine ran a headline that read "The Dream Turns to Nightmare," above an article about the pipe bomb explosion, which killed one woman and injured more than 100 people who had gathered for a rock concert in Centennial Olympic Park.

The death of even one person at an event meant to promote international good will may justifiably be described as tragic, but for soldiers of the 1st Battalion, 3rd Air Defense Artillery, the event fell short of nightmare proportions. They were fully aware of the truly nightmarish effects that a terrorist aerial attack — the most often overlooked but potentially most devastating form of terrorism — could have inflicted on crowds within the "Centennial Olympic Ring," the "downtown" portion of Atlanta, which was the site of most Olympic venues. The Munich games in 1972 had been marred when the Palestine Liberation Organization murdered 11 Israeli athletes, but as the 100th Olympiad approached, there was growing concern that, rather than targeting athletes from specific nations, terrorists, foreign or domestic, might target Olympic crowds. There was also a growing awareness that a terrorist attack might come from the air. It was 1-3 ADA's job to prevent "it" from "happening here."

Mention the term "terrorist attack" and images of exploding truck bombs, car bombs and satchel charges immediately spring to mind while the threat of terrorist attack from the third dimension is usually ignored. To date, terrorist aerial attacks have, for the most part, existed only in works of fiction. In the movie *Black Sunday*, for example, an explosive-laden terrorist blimp hovers menacingly over the Super Bowl. But real-life terrorists have employed aerial platforms within the United States. In 1969 campus radicals at the University of Wisconsin launched an aerial attack against a Madison power plant, but their homemade bombs failed to explode. The escapade, as a result, made headlines only in the "underground" newspapers that were popular on college campuses during the 1960s, and the general public remained blissfully unaware that the threat of terrorist air attack is very real. However, terrorism experts have always known that a wide variety of lucrative terrorist targets are extremely vulnerable to air attack. Concern over the vulnerability of Olympic venues to low-level air attack increased as relay runners carrying the Olympic torch across America neared Atlanta.

On July 15, 43 soldiers from Headquarters Battery, 1-3 ADA, and 14 soldiers from the 123rd Signal Battalion, which comprised Task Force Hub, deployed from Fort Stewart, Ga., to Atlanta to provide airspace overwatch for the "Centennial Olympic Ring." Their mission was to provide airspace overwatch for 11 Olympic venues, a worldwide contingent of athletes, spectators and the Olympic workforce. Working hand-in-hand with military, federal and local law enforcement agencies, these 3rd Infantry Division (Mechanized) soldiers conducted joint coordination and detection of hostile aircraft with a multitude of other radar platforms. Operating under the tactical control of U.S. Customs, the officers and soldiers involved in this assignment executed a unique, challenging and realistic mission.

The primary aerial threat to the Olympic games was an unauthorized airframe carrying explosive or nuclear, biological or chemical devices flying at low altitude. The likelihood of such attacks are not as remote as those who have never considered the problem might suspect. Aircraft are easily chartered, and just about any type of airframe can deliver ordnance. How difficult would it be, for example, to fuel a crop duster with a lethal chemical spray rather than insecticides? As narcotic smugglers have discovered there's no shortage of licensed or unlicensed pilots willing to take extraordinary risks for the right amount of money.

U.S. Customs minimized the air threat by using two-dimensional Doppler radars located at Dobbins Air Force Base and P-3 surveillance planes operating out of Jacksonville, Fla. Although these are capable systems, their ability to detect aircraft at low altitudes is limited. Therefore, the National Command Authority called on the highly trained and motivated soldiers of 1-3 ADA's Sentinel and Enhanced Position Location Reporting System (EPLRS) Platoon to cover the the dead space and to operate during extended hours. Commanded by Capt. Kenneth D. Hubbard, Task Force Hub was to provide low-altitude (zero to 7,000 feet above ground level) radar coverage for the Olympic Ring no later than 0700 on July 17.

The platoon had served as the Sentinel test bed unit, and its soldiers had a high degree of confidence in the ground-based sensor system's capability. The Sentinel can detect rotary-

TASK ORGANIZATION

TASK FORCE HUB

Headquarters & Headquarters Battery (-) 1-3 ADA

Sentinel Platoon 1-3 ADA

Air Battle Management Operations Center

Army Airspace Command & Control

EPLRS Platoon 123rd Signal Company (Attached)

Guards

Sgt. Jerry Myers, Capt. Kenneth Hubbard, 1st Lt. Steven Thornton and Lt. Col. Harry Bloomer, 1-3 ADA commander, observe as Sgt. Todd Grieco performs maintenance on a Sentinel radar.

THREAT

- **Low-altitude aircraft violating FAA and U.S. Customs airspace for the purpose of conducting unauthorized observation or terrorist activity directed at the Olympic Games.**
- **Potential threats may use low-altitude aircraft, including unmanned aerial vehicles to avoid Federal Aviation Administration and P-3 surveillance.**
- **Aerial terrorist threats are possible and may be directed against highly attended events.**

Sgt. Andrew Cox, SFC Jeffery Robinson, SFC James Williams, Lt. Col. Harry Bloomer, SFC William Reyes and Sgt. William Kennison of 1-3 ADA take a break outside the ABMOC, which was collocated with the Air Security Operations Center at Dobbins Air Force Base, Ga.

and fixed-wing aircraft, low-flying aircraft, unmanned aerial vehicles and ultralites during all weather conditions, 24 hours a day.

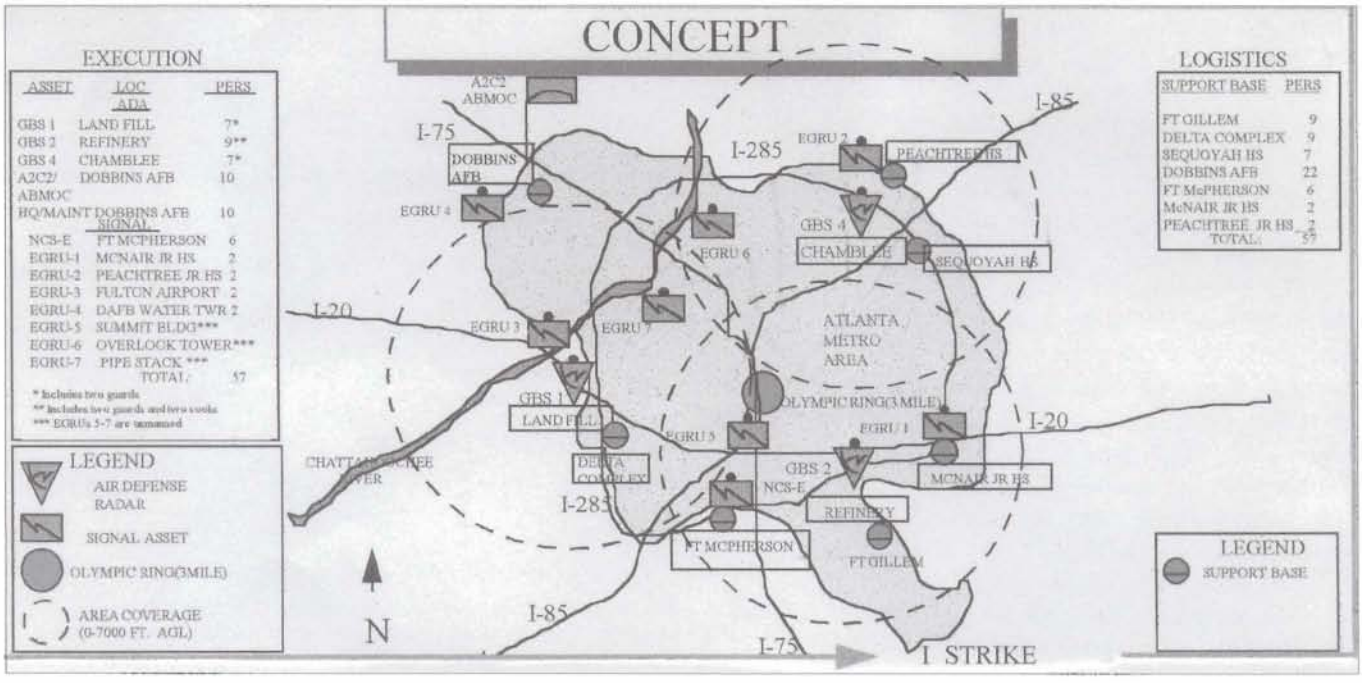
The forward area air defense command, control, communications and intelligence (FAAD C^3I) system linked to the Sentinel would enable the 1-3 ADA air battle management operation center (ABMOC) to provide a three-dimensional air picture to the U.S. Custom's operation center via 123rd Signal Battalion's EPLRS. The battalion's ability to effectively integrate the overall air picture from three remote sensor sites would enable U.S. Customs to vector aircraft to interdict potentially hostile aerial platforms that penetrated the restricted area.

The urban Atlanta Basin terrain posed several obstacles to Task Force Hub. First, the hilly, built-up terrain limited line of sight, which is necessary for the effective operation of the Sentinel and EPLRSs. To minimize dead space created by terrain masking, the Sentinel platoon, under the control of 1st Lt. Steven M. Thornton, emplaced three Sentinels with overlapping coverage around the Atlanta Basin. To enhance data transfer from the EPLRS-based FAAD C^3I system, the EPLRS Platoon, under 2nd Lt. Delbert J. Bancroft, emplaced seven enhanced grid reference units (EGRUs) throughout the Atlanta Basin. Second, few sites in the Atlanta Basin are suited for radar emplacement (obstacles such as trees and buildings limit the Sentinel's line of sight). Therefore, the Sentinel Platoon emplaced one Sentinel at a local airport and two Sentinels at two different landfill sites. Third, there is a great deal of electromagnetic interference in an urban area. Task Force Hub coordinated with the Federal Communica-

1-3 ADA Sentinel ground-based sensors can detect rotary- and fixed-wing aircraft, low-flying aircraft, unmanned aerial vehicles and ultralites in all weather conditions, 24-hours a day.

MISSION

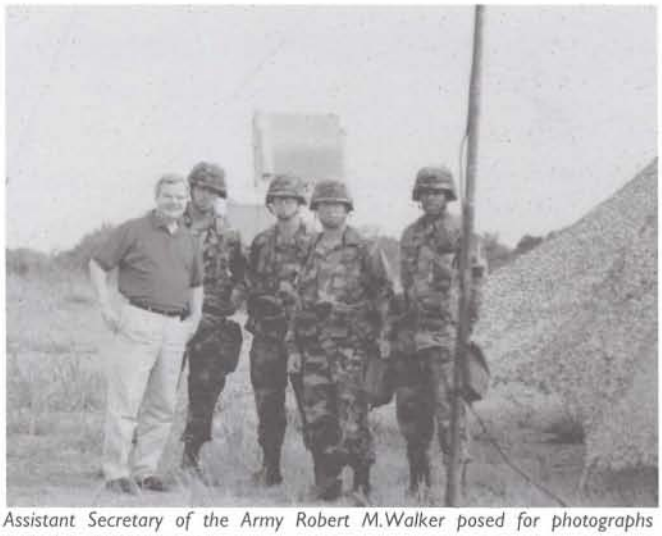
"Task Force Hub deploys to the Atlanta Metro Area to provide low-altitude (0-7000 FT AGL) radar coverage for the Olympic Ring NLT 170700 JUL 96 in order to assist U.S. Customs in detecting aerial threats."



Safeguarding the Olympic Ring

tions Commission to ensure the Sentinel and EPLRS frequency bands were clear of interference, thus ensuring the systems' optimal operation.

Operation Torch Overwatch, the code name for the Olympic security operation, fell into the operations other than war (OOTW) category. The operation required Task Force Hub to coordinate with civilian, military and government agencies. Task Force Hub coordinated closely with Department of Defense special events officials, who contracted sites for Sentinel and EGRU emplacement. The Joint Task Force Olympics (JTF-O) and 24th Combat Support Group from Fort Stewart provided billeting and logistical support to Task Force Hub. Soldiers integrated into the existing JTF-O logistics system at the Delta Complex in southwest Atlanta and at schools throughout the Alanta Metro area.



Assistant Secretary of the Army Robert M.Walker posed for photographs with 1-3 ADA soldiers.

The rules of engagement were extremely important for this operation. Sensor and EGRU sites were located on private and government property throughout the Atlanta Metro area. The possibility of larceny, vandalism or other criminal acts against the personnel and equipment of Task Force Hub were clearly present. However, neither the guards nor the early warning system operators on the Sentinels carried ammunition or weapons. They were permitted to use force only in self-defense. Otherwise, they were to use cellular phones to dial 911. Unlike citizens of other countries, Americans are still relatively unused to dealing with the military in security situations. This added a degree of unpredictability to the operation. Fortunately, Task Force Hub experienced no problems with civilians, nor did it become the target of criminal acts during the operation.

The 1996 Centennial Olympic Games in Atlanta concluded on Aug. 4. Operation Torch Overwatch concluded two days later with the safe redeployment of Task Force Hub to Fort Stewart. These soldiers can be proud of their accomplishments. The Sentinel Platoon covered a nearly 360-square mile area around Atlanta and detected 48 aircraft penetrating restricted airspace. Twenty-seven of these aircraft were unauthorized to enter the restricted airspace. U.S. Customs Blackhawks intercepted 26 of the 27 aircraft and

escorted them to local airports, where the FAA detained the pilots and suspended their licenses. One aircraft was able to fly into other air traffic before it could be positively identified by U.S. Customs Blackhawks and be properly detained.

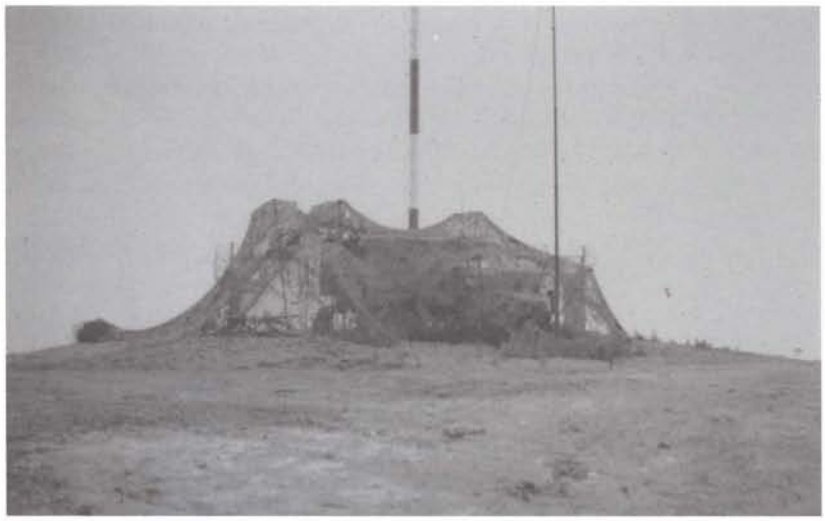
The soldiers of the Sentinel and EPLRS Platoons are among the division's most frequently deployed soldiers. However, they clearly faced new challenges and overcame all problems. Leaders and soldiers completed the operation safely and successfully. Furthermore, they learned many lessons about operating in an urban environment during an OOTW.

Non-duty hours for 1-3 ADA were miniscule, as were Task Force Hub's beach and volley ball court.

First, urban terrain poses several unique challenges not associated with other terrrain. Second, the issue of frequency management becomes even more critical in urban terrain. Third, leaders must be capable of coordinating with civilian and government agencies during OOTW. Fourth, clearly understood rules of engagement are as critical during OOTW as they are during war, because the lives of civilians are involved. Fifth, the Sentinel and EPLRS, although originally developed for a battlefield environment, are very capable of operating in an urban environment.

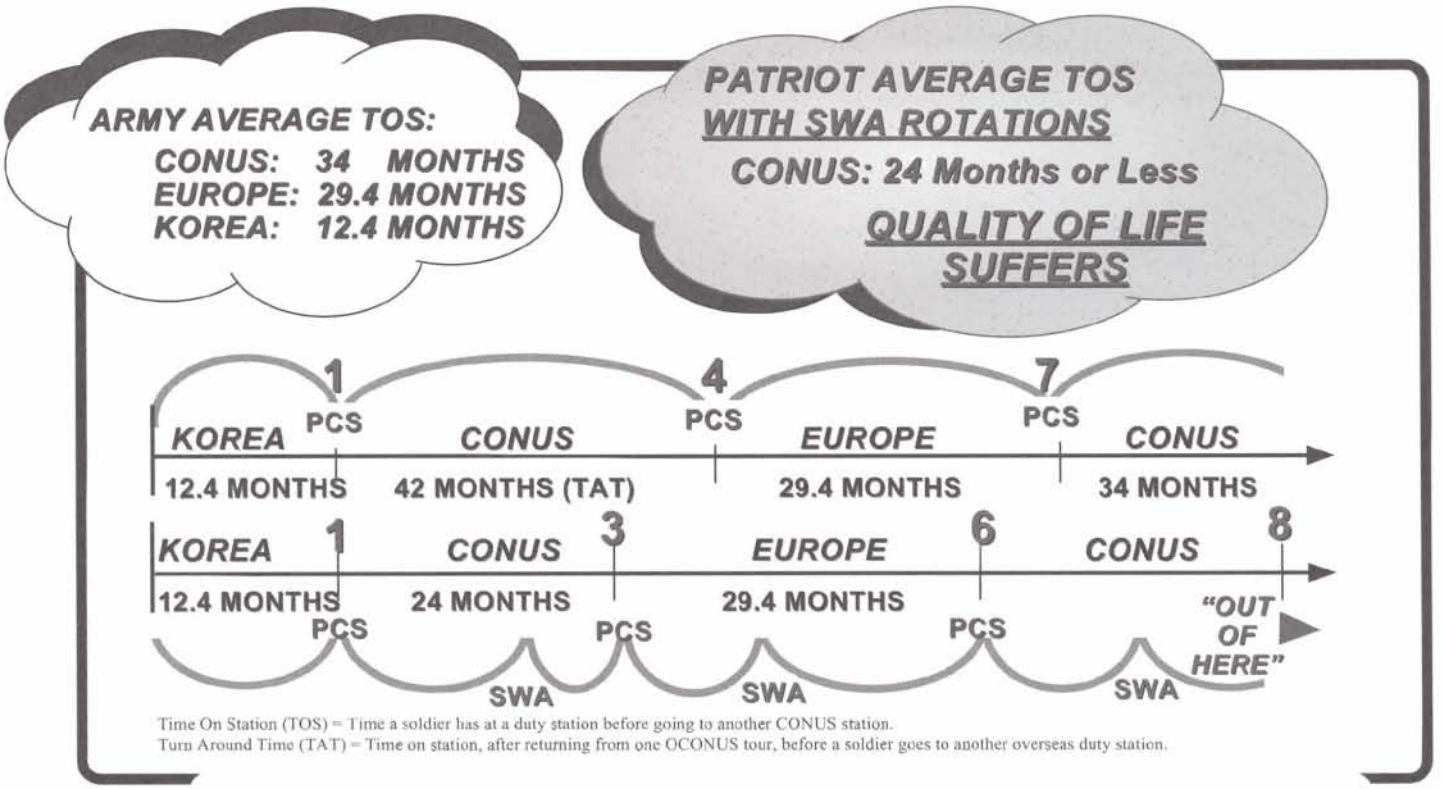
Due to the efforts of 1-3 ADA and 123rd Signal Battalion soldiers and the advanced equipment they operate, the skies remained safe over Atlanta during the Olympics. They established an effective joint defense against terrorist aerial attack that will serve as an archetype for future operations. They demonstrated the flexability of ADA soldiers and the operational effectiveness of an inportant new air defense system, the Sentinel ground-based sensor, in a real-world environment. And air defense soldiers recommended for awards for their part in Operation Torch Overwatch will be able to tell their grandchildren that they "medaled" at the Centennial Olympic Games.

Maj. Dave Bagnati is the 1-3 ADA S-3. 1st Lt. Steve Thorton is the HHB, 1-3 ADA, executive officer.


Data relayed by FAAD C²I sensor nodes appeared on FAAD C²I displays collocated with Federal Aviation Administration displays in the Air Security Operations Center.

LESSONS LEARNED

- **Plan for more EGRU/EPLRS sites when operating in an urban environment.**
- **Launch airborne communications platforms to establish line of site and bring the Sentinel systems into operation.**
- **Ensure commercial and military radio frequencies are deconflicted.**
- **Eliminate the "language barrier" between military units and civilian agencies. Translate the Military Grid Reference System and military methods of presenting latitude and longitude into language civilians can understand.**



Tenth Patriot Battalion

Sharing the burden of frequent deployment

by Sergeant Susan Coraci

Nomad: The Brat Journal, a new magazine for America's "military brats," appeared at military installations last fall. The first issues featured articles such as "Moving My Senior Year" and "My Momma Wears Combat Boots." The magazine is certain to find loyal subscribers among children of Patriot soldiers whose pedigree makes them among the Army's most frequently relocated children. On the other hand, if current retention trends continue, *Nomad* editors are likely to receive bundles of subscription cancellations from Patriot households, along with manuscripts titled "Why Mommy and Daddy Told the Army To 'Take This Job and Shove It.'"

Patriot soldiers are the most frequently deployed ADA soldiers. When a crisis looms, allied or friendly nations frequently dial 911 for U.S. assistance, but when they need a Patriot battalion, they just hit the redial button.

In 1995, key Army leaders completed a total Army analysis and determined constant deployments are breaking the Patriot force. Instead of the normal 34 to 36 months time on station, soldiers in the Patriot force averaged about 24 months on station. However, in 1996 this dropped to an average of 17 months on station.

During their time on station, Patriot soldiers are expected to complete at least one six-month rotation in Southwest Asia. Then they'll make a permanent change of station move to Europe and complete at least one more Southwest Asia rotation before spending 12 months in Korea. It's a never-ending process, and it's taking its toll.

Patriot soldiers don't have adequate time to go to college on their off duty hours and accumulate college credits they need to compete for promotion. Instead, they are majoring in contingency crises. Nor do they have the essential "quality time" to spend with their families. Patriot soldiers realize that Patriot, for the time being, is the only system capable of intercepting and destroying a tactical ballistic missile in flight. Still, in deciding whether to stay in the Army, they have to consider the stress constant deployments and accelerated permanent changes of station inflict on themselves and their families.

To eliminate some of this stress, key Army personnel proposed the addition of a 10th Patriot battalion.

The Army's 10th Patriot battalion became a reality Oct. 16, 1996, when key leaders from the 3rd battalion, 2nd Air Defense Artillery, 31st Air Defense Artillery Brigade, III Corps, unfurled the guidons and commanders took charge of Headquarters, Alpha and Bravo batteries under a table of distribution and allowances. However, that was only the beginning— the first step in laying a solid foundation on which to build the battalion. 3-2 ADA isn't scheduled to activate as a full table of organization and equipment (TOE) unit, consisting of one headquarters and headquarters battery and five firing batteries, until October 1997. But Department of the Army priorities and resourcing are not quickly redirected. To get the process started, the U.S. Army Air Defense Artillery School and Fort Bliss ADA units had to pay start-up costs. In other words, they had to "take it out of hide" for the first year.

Equipment for 3-2 ADA, the Army's tenth Patriot battalion, arrives by the truckload.

Although 3-2 ADA had received much of its needed standard equipment prior to its activation, the battalion had few pieces of Patriot-peculiar equipment, fewer than 70 soldiers and little money to field the batteries. Department of the Army guidance was to use existing assets and existing personnel.

The Army directive set off a worldwide search for available Patriot assets that required months of coordination. Key players included CW3 Willibald Flores, the 31st ADA Brigade's action officer for force modernization; Col. Bill Smith, user representative for U.S. Army Training and Doctrine Command Systems Manager - Theater Missile Defense (TSM-TMD); 3-2 ADA; the Army Personnel Command; the Patriot Project Office; and Patriot units from around the world.

The search for spare Patriot equipment, says Smith, included a worldwide "scrub" of Patriot items by serial number through a total Army analysis to identify the major pieces of Patriot equipment. 3-2 ADA acquired some of its equipment as a result of the accelerated inactivation of the 2nd Battalion, 2nd Air Defense Artillery, 31st ADA Brigade, in May 1996. Some came from the transfer of excess property from locations and units within the continental United States, including Fort Bliss, III Corps, Patriot Project Office, Army National Guard, U.S. Army Forces Command, 11th ADA Brigade, 108th ADA Brigade and the 35th ADA Brigade.

After careful consideration, the TSM-TMD and Patriot Project Office identified the major Patriot-peculiar end items needed to fill four batteries. They are still working to locate equipment for the remaining two firing batteries.

- Headquarters and Headquarters Battery's equipment came from White Sands Missile Range.
- Battery A's Patriot equipment came from the U.S. Army Air Defense Artillery School.
- Battery B's equipment came from Letterkenny Army Depot, Chambersburg, Pa.
- Battery C's equipment is scheduled to come from Letterkenny Army Depot.
- TSM-TMD hopes to equip Battery D with float assets from United States Army Europe.
- Although no firm decision has been made about Battery E, TSM-TMD has identified a possible option.

Acquiring Patriot equipment from these units and agencies permits the 31st ADA Brigade to equip 3-2 ADA for about $12 million instead of the anticipated $300 million, saving the government $288 million. These figures, which incorporate the MTOE activation of 3-2 ADA and an

additional firing battery needed to fix the Patriot force, are a current estimate for FY97-FY98. However, 3-2 ADA is still short millions of dollars that will be needed to build the projected batteries. Without this money, 3-2 ADA cannot purchase the necessary equipment to fully field the batteries on time.

Taking this into consideration, Colonel Richard V. Geraci, 31st ADA Brigade commander, gave 3-2 ADA the go-ahead to requisition stock-funded TOE items and a reduced battery prescribed load list, which the battalion needed to participate in Roving Sands '97.

"We're building our combat power a firing battery at a time, combining soldiers and equipment into 'battle-rostered' crews, and establishing programs and procedures for supply, maintenance and training,"said Lt. Col. Michael Slotnick, 3-2 ADA commander. We are concurrently building our headquarters and headquarters battery and battalion staff capability.

A 3-2 ADA soldier inspects overboots for manufacturing flaws, but it will be up to recruiters and the Army Personnel Command to fill the boots with qualified Patriot soldiers.

"Although there have been several proposals forwarded to the department of the Army to come up with the needed funding to stand up the battalion, these are still in the works," Slotnick added. "Eventually, the decisions will be made to free up the money. In the meantime, the 31st ADA Brigade is taking the initiative and providing us an operating budget."

While working to resolve funding problems, the 31st ADA Brigade is also working with the Army Personnel Command and Fort Bliss officials to resolve the personnel shortage problem. "The sooner we can field a combat-ready battalion, the better off the Patriot force as a whole will be!" said Geraci. "This is as much a soldier quality of life issue as it is a combat readiness issue. This means focusing efforts to increase recruitment of soldiers and increasing the training base's capacity to train the soldiers."

3-2 ADA soldiers carefully inventory new items of equipment.

Today, the equipment rolls in by the truck load. Several soldiers inventory and separate the equipment for distribution. Maintenance specialists and Patriot crew members stand by to ensure it's up to "10-20" standards.

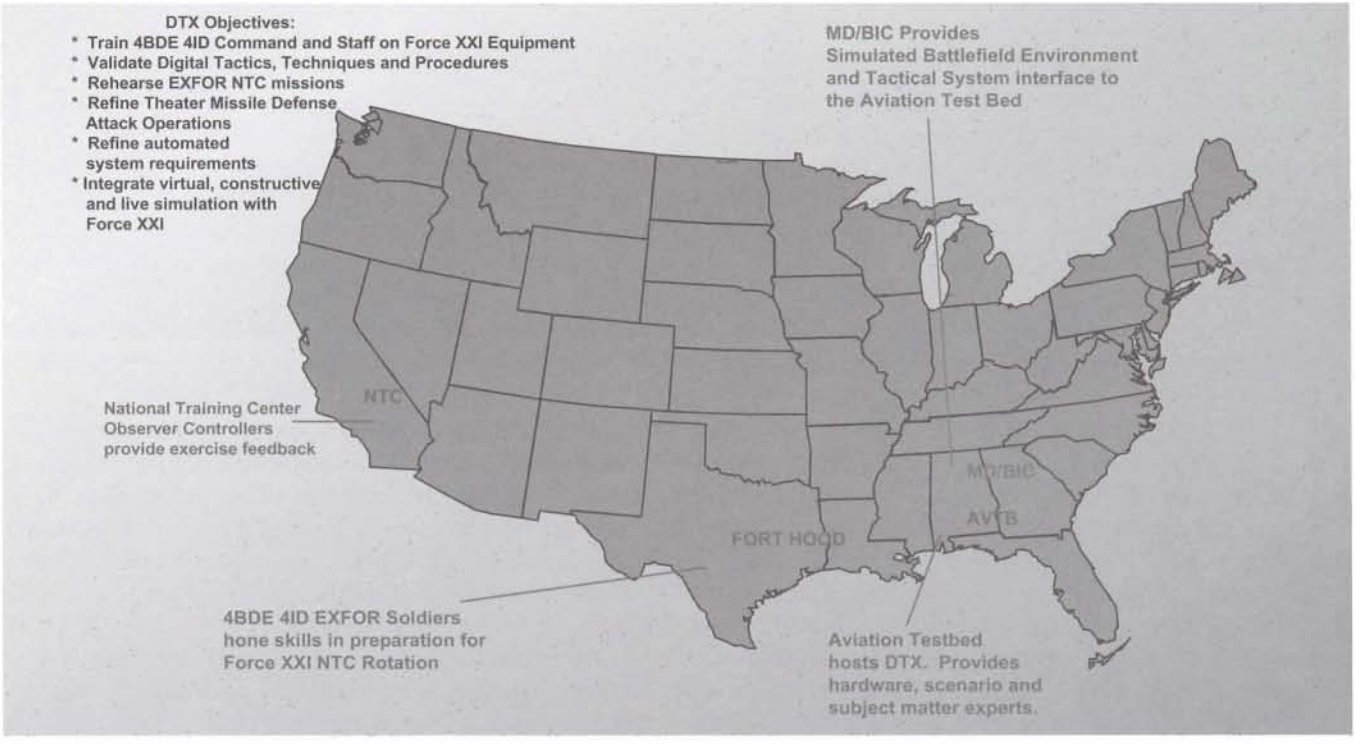
3-2 ADA is well on its way to fielding the Army's 10th Patriot battalion. Meanwhile, 3-2 ADA continues to prepare for Roving Sands '97 and its live-fire exercise in April.

The rapid proliferation of weapons of mass destruction and ballistic missile technology, which only Patriot can counter, is widely viewed as the most serious threat to U.S. forces as we approach the 21st century. So, there will be no shortage of work for Patriot battalions in the foreseeable futures. However, the burden of frequent deployments will soon be spread across a larger Patriot force.

As the build up of 3-2 ADA nears completion, the Patriot force will reap the rewards. Patriot soldiers will soon see fewer rotations to Southwest Asia and Korea, and will spend more time at each duty station. The frequent deployment burden will also be lightened as allied and friendly nations deploy tactical missile defense systems. The end result will be a better quality of life for America's hard-pressed Patriot soldiers and their families.

Sergeant Susan Coraci is the public affairs officer for the 31st ADA Brigade, Fort Bliss, Texas.

Digital Training Exercise



by Col. Steve Moeller
and Lt. Col. (Ret.) Patrick Sheahan

Air Defense Artillery's goal is still to execute tough, realistic field exercises as the primary means of validating training. However, decreasing resources, increased weapons system ranges, an expanded threat target set (e.g., tactical ballistic missiles, cruise missiles) and environmental constraints severely limit Air Defense Artillery's ability to train. These factors, coupled with broad mission requirements, indicate a need to create synthetic battlefields . . .

Army Air and Missile Defense Master Plan

Simulation-based training is the path we will must follow to victory in the campaign to maintain training standards in the face of post-Cold War budget cuts and force reductions. Most air defenders are by now convinced that today's highly sophisticated conduct-of-fire simulators do a terrific job of training high- to medium-altitude and short-range air defense soldiers to engage and destroy aerial platforms. But what about tactical training for division, brigade and battalion staff and command elements?

We recently monitored a revolutionary training exercise conducted at Fort Rucker, Ala., that unveiled the "synthetic" future of command and staff training. We assure you that the Force XXI simulation-based training holds bright promise.

What: The exercise featured Task Force XXI Experimental Force leaders. The Army Aviation Center hosted the exercise with help from the Missile Defense Battle Integration Center, U.S. Army Space and Strategic Defense Command and other organizations. The implications for leader training, especially in Air Defense Artillery, are profound.

Why? Budget, logistics, resources, feedback, evaluation and time.

Background: Traditionally, our Army has used brigade combat teams to train elements of the division. This was primarily because resource constraints prohibited the deployment of an entire division. Consequently, division elements, referred to as "separates," including Air Defense Artillery, have been task organized under 1st, 2nd or 3rd Brigade to train for other than purely tactical reasons. Unfortunately, this system often eliminated the tactical training of the staff and command of the ADA battalion and/or brigade staff and command. At times, the system even eliminated battery commander training.

What's New? The Digital Training Exercise teamed constructive simulation, virtual simulation, live simulation and the Army Tactical Command and Control Systems (ATCCSs) in a synthetic battlefield environment. Pioneer work in this area had been done by the U.S. Army Space and Strategic Defense Command with its Force Projection Tactical Operations Center and the Synthetic Battlefield Environment developed at its Missile Defense Battle Integration Center. The Digital Training Exercise was a trial run for the use of this technology at battalion level.

How does it fit? The new technology allows a unit to deploy its entire staff and command down to, and including, company commanders. The Synthetic Battlefield Environment permitted these personnel to conduct a grueling five-day "virtual National Training Center" rotation.

Staff and commanders used ATCCSs to plan and rehearse missions. Virtual simulators allowed commanders to "execute" the plan under realistic threat and battlefield conditions. A "thinking" enemy made every effort to disrupt the plan. Command and staff used digitized equipment to battle track and adjust while the mission was in progress. Observer-controllers from the real National Training Center observed the planning, preparation and execution of each mission and provided feedback to the unit via an after-action review.

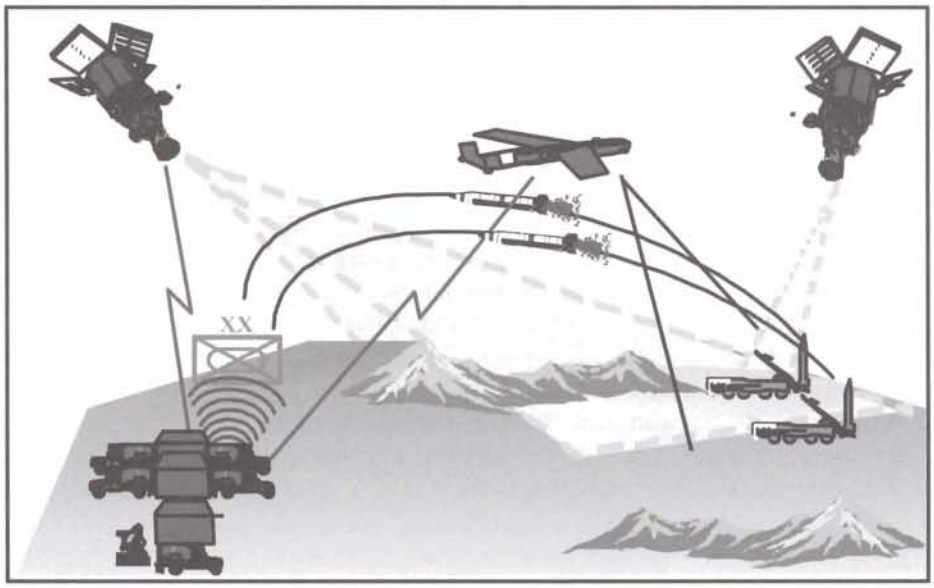
The Future: The Digital Training Exercise shattered the budget/collective -training paradigm. Tactical units will soon have the opportunity to train the entire scope of their specific leaders' tasks at company, battalion and brigade level using Distributed Interactive Battlefield Simulation or its heir, High Level Architecture. The Digital Training Exercise demonstrated the ability to report actions and counteractions on ATCCSs in near-real time. Further, the Digital Training Exercise provided a glimpse at the Army's new ability to train those traditionally left out of the brigade combat team system. In the near future, air defense staff officers and commanders will have the opportunity to train staff operations in near- real conflict conditions. Concurrently, this new technology will drastically improve our Army's ability to train all staff officers in a true, tactical wartime setting.

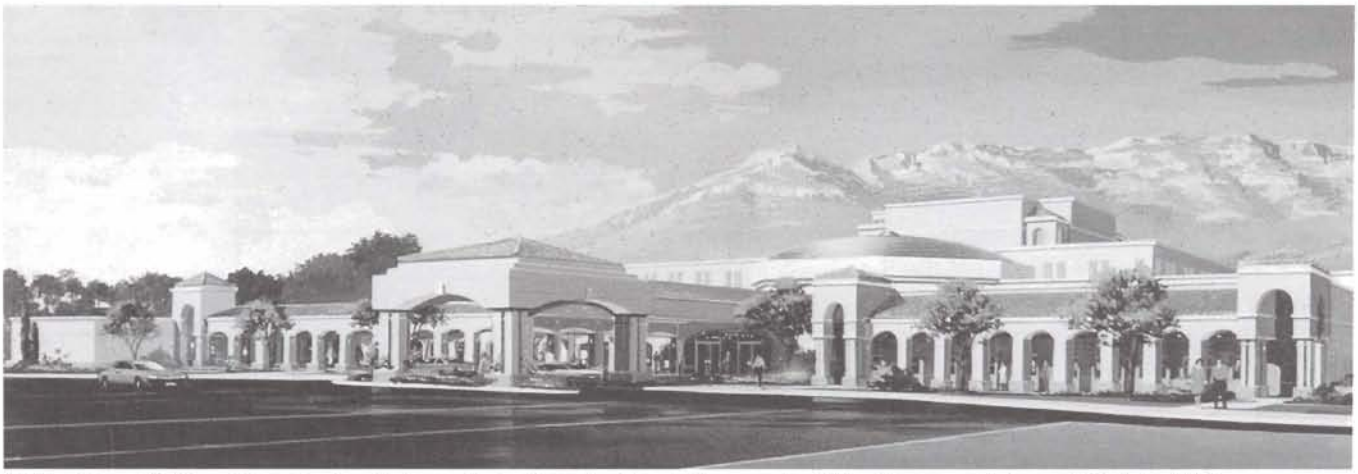
Conclusion: America's combat power is like a two-edged sword. One edge is honed by the continual fielding of new weapon systems and the constant application of advanced technologies. The other edge is honed by constant and effective individual and collective training. We cannot afford to let either edge grow dull. Air Defense Artillery is leading the Army in the move from equipment-based to device- and simulation-based training. In seeking to maximize training effectiveness, the branch will continue to leverage 21st century automation and digitization

The technology demonstrated during the Digital Training Exercise will allow our Army to train its leaders as they will fight. If leaders will fight at division, separate brigade or separate battalion level, they must train at that level. The execution of gunnery, command inspections and quarterly training briefings will soon be joined by "command and staff training." This training will help answer the question asked at the Command and General Staff College since the late 1930s: How do we train staff officers for combat? If you are currently on active duty, there is a digital training exercise in your future. Congratulations!

Col. Steve Moeller is the deputy director of the Missile Defense Battle Integration Center, Fort Rucker, Ala. Patrick Sheahan works on the center's battlefield and theater missile defense simulations.

'Simulation-based training is the path we will must follow to victory'





If Operation Enlightenment meets its milestones, Phase I construction of the new Fort Bliss Museum will be completed in 2000.

Operation Enlightenment

Building a Fort Bliss Museum for the 21st Century

The Air Defense Artillery Association recently launched "Operation Enlightenment," a redirected and reinvigorated campaign to fund a showcase facility for the Fort Bliss Museum, Fort Bliss, Texas. The association hopes to raise $6.5 million to complete Phase I of the new museum construction in 2000 and another $4.5 million to complete Phase II in 2004. Architectural design work, fund-raising activities and sustainment costs will raise the ante by another $3 million, pushing total cost to $14 million.

"Army Vision 2010 assigns Air Defense Artillery a major role on the 21st century battlefield," said Maj. Gen. (Ret.) John B. Oblinger, association president. "But in looking to the future, Air Defense Artillery has not forgotten its past. Our goal is to create a museum that will be the envy of all combat arms and set new standards for military museums. Operation Enlightenment maintains the lofty goals set when plans to build a new museum facility were first unveiled in 1994. The new museum will safeguard the heritage and traditions of Fort Bliss and Air Defense Artillery and serve as a source of inspiration to future generations of soldiers."

"The museum needs a new facility to display its treasure trove of artifacts and continue building its historical, cultural, scientific and technical education exhibits," explained Brig. Gen. (Ret.) Ernst E. Roberts, Museum Project Committee chairman. "The museum is currently housed in an antiquated building that has been identified for razing. It is a World War II vintage building originally designed as a recreation facility and later modified to marginally meet the needs of a museum learning center. Today, as a result, education exhibits and artifacts are widely dispersed around Fort Bliss in temporary structures as an interim solution to preserve assets. We need to gather the museum's collection of artifacts to be displayed and exhibited under a single roof.

"The museum has a first-rate staff," said Col. Jack W. Carter Jr., Museum Project Committee vice chairman. "We intend to give them a first-rate facility that will enable them to showcase Fort Bliss and Air Defense Artillery, expand a variety of educational and cultural programs, and strengthen the ties between Fort Bliss and its host community."

Col. Kevin T. Ryan, the association's executive director, said, "The initial capital campaign, launched in 1994, produced some initial successes and generated invaluable lessons learned. We are confident that Operation Enlightenment will fully achieve its objectives. For the first time, we have a sound strategic plan, an operational plan based on achievable objectives and a robust organization anchored on subcommittees

that are staffed by distinguished individuals with proven performance records. We have completed a thorough target market analysis, have identified potential donors and have created an attractive donor recognition strategy. We've also developed an aggressive marketing and advertising plan and, for the first time, have provided training to volunteers to help them solicit donations.

"The decisive factor," he concluded, "will be the committment of leaders, soldiers and units. The funding campaign, like a military campaign, depends on teamwork."

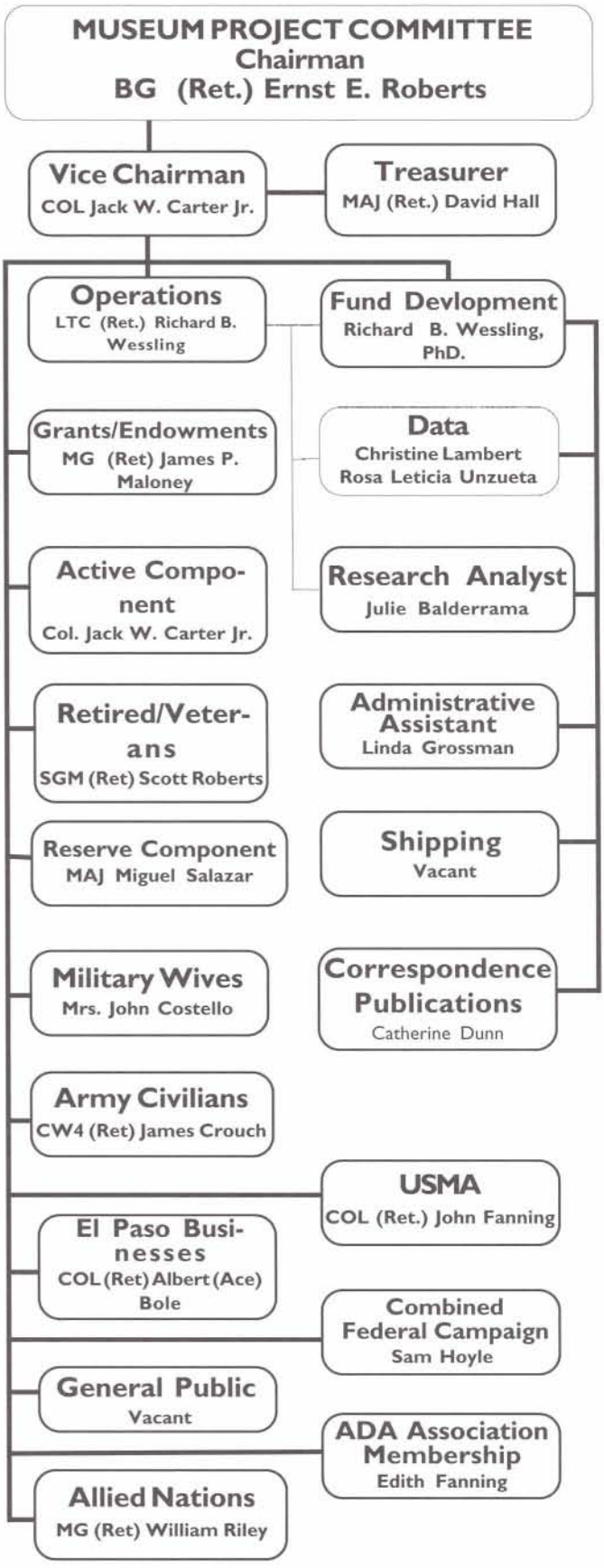
"We continue to enjoy the enthusiastic support of military, corporate and civic leaders," said Lt. Col (Ret.) Richard B. Wessling, who serves as subchairman of the committee's Operations Subcommittee and director of its Fund Development Office. "Commanders recognize that the envisioned facility will help instill Army values. Corporate leaders see the museum project as a symbol of their partnership between the military and industry. Civic leaders understand that the new museum would better serve the community as a bicultural educational center and a major regional tourist attraction."

Staffed by salaried employees, with most positions funded by the Upper Rio Grande Valley Private Industry Council, as well as volunteer workers, the Fund Development Office empowers Operation Enlightenment with focused planning, management, grant application writing and administrative assets missing from previous fund-raising efforts.

The new museum will be built in separate phases to spread out construction costs and permit the museum to open as early as possible. Phase I will include the ADA Gallery, which will house a 36,000-square-foot pageant of the history of Air Defense Artillery. Phase I construction also will include artifact collection vaults and museum construction shops where specialists will construct colorful displays that recre-

Funding Source Goals

In-Kind Services & Materials	$200,000
Grants/Endowments	9,000,000
Small Air Defense Contractors	200,000
Major Air Defense Contractors	2,000,000
Active Component	500,000
Reserve Component	250,000
Retired Military/Veterans	500,000
Department of the Army Civilians	20,000
El Paso Businesses	160,000
Military Wives Associations	50,000
General Public	50,000
U.S. Military Academy	170,000
Allied Nations & Governments	50,000
Combined Federal Campaign	200,000
ADA Association Members	200,000
State, County and City Governments	450,000
	$14,000,000



ate the branch's past achievements. Administrative office space will be included, along with a 7,000-square-foot patio for evening activities.

Phase II will contain the Fort Bliss Gallery, which will tell the story of the installation's evolution from a frontier outpost to the Army's air and missile defense center of excellence. Phase II will also feature the construction of a 250-seat auditorium, an education center and a food service facility to provide refreshments for visitors.

The creation of a modern, fully-equipped museum would literally be Sam Hoyle's dream come true. Undaunted by the absence of official funding and widespread pessimism, the director of Fort Bliss' Museum Office waged a decades-long battle to push the museum project to its present stage.

"Museums are no longer just repositories for relics, curiosities and artifacts," Hoyle said. "They have become teaching institutions. A major part of our 21st century mission is to provide historical, cultural, scientific and technical education programs to El Paso's military and civilian communities. The new facility will allow the museum to achieve its potential as an educational and cultural center."

Other goals, Hoyle said, are to enhance branch pride by providing displays and educational programs to the Air Defense Artillery School and explain Air Defense Artillery's role as a member of the combat arms team. The new museum, he added, would also work to increase the branch's standing within the community, form allegiances between air and missile defense allies, create bonds between developers and users of air and missile defense technologies, and recognize the role of women in the history of Fort Bliss and Air Defense Artillery.

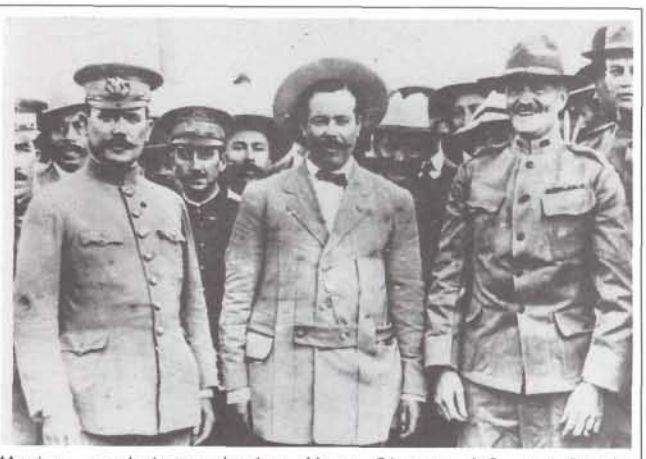
"The all-volunteer Army has produced a superior fighting force, but the end of the draft has widened the gap between the Army and the civilian world," Hoyle added. "Today, the only military decision the average youth makes is whether to watch combat operations on *CNN* or switch to network television. It's important that we reach out to new generations of young people who may lack the appreciation we grew up with for the tremendous role the military — Fort Bliss and Air Defense Artillery, in particular — plays in American life."

— Volunteers Needed —

The Fort Bliss Museum project deserves the full support of ADA soldiers and civilians around the world. The museum is our bridge between generations, a link between past, present and future cohorts. It helps instill Army values — honor, integrity, selfless service, courage, loyalty, duty and respect — in every soldier who trains at the U.S. Army Air Defense Artillery School.

Operation Enlightenment needs volunteers to serve on subcommittees and participate in fund-raising events. I urge you to call (915) 568-0128/DSN 978-0128 to find out how you can help make Operation Elightenment a success.

— Maj. Gen. John Costello
Chief of Air Defense Artillery



Mexican revolutionary leaders Alvaro Obregon, left, and Pancho Villa, center, pose with Brig. Gen. John J. Pershing.

Cast of Characters

The new Air Defense Artillery Museum will tell the story of Fort Bliss as well as the saga of Air Defense Artillery. A small sampling of the legendary figures who have paraded through the post's colorful history follows.

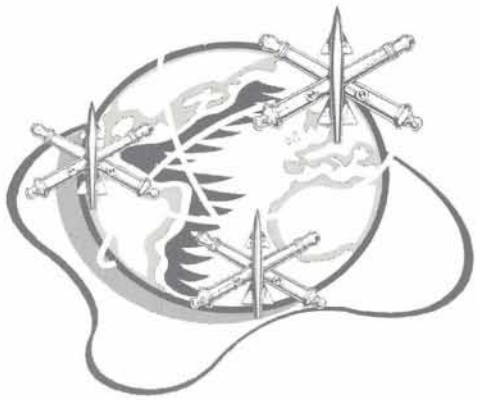
Capt. James Longstreet arrived at Fort Bliss in 1855 to relieve **Capt. George Pickett**. Both resigned their commissions and donned Confederate gray for the War Between the States. It was Longstreet's nod to Pickett at the Battle of Gettysburg that launched Pickett's Charge, the "decisive moment" in American history.

Brig. Gen. John ("Blackjack") Pershing posed for photographers with Mexican revolutionary generals **Francisco ("Pancho") Villa** and **Alvaro Obregon** on the steps of what would later become Fort Bliss' Pershing House. Soon afterward, Obregon deployed machine guns and barbed wire to defeat Villa's cavalry in the "War of the Winners," the final stage of the Mexican Revolution. After Villistas raided Columbus, N.M., Pershing led the Punitive Expedition deep into Mexico's Sierra Madre. Pershing later commanded the American Expeditionary Force in World War I and became General of the Army.

1st Lt. George S. Patton arrived at Fort Bliss as the Punitive Expedition was about to depart for Mexico. He wrangled a spot as an aide on Pershing's staff and had his first brush with fame when he gunned down Juan Cardenas, one of Villa's chief lieutenants.

When his sister **Julia** visted Fort Bliss, the young lieutenant introduced her to Pershing. Pershing, a widower, was immediately smitten by Patton's younger sister. The two were unofficially engaged, but Julia (who never forgave Blackjack for what she perceived as a period of neglect when he returned home from World War I a "conquering hero") broke off the relationship. She never married. Despite the unhappy ending, Pershing continued to serve Patton as a mentor and career advocate.

Air Defense Artillery *Online*



http://bliss-www.army.mil

Information available from our website:

ADA Screen Saver
Download the ADA Screen Saver.

First to Fire Brochure
Contains information on current ADA weapon systems.

ADA Magazine
Read the latest issue of the ADA Magazine.

ADA Highlights
A concise synopsis of developments, initiatives, and actions that affect ADA units, soldiers, and weapon systems.

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Collection of ADA related photographs.

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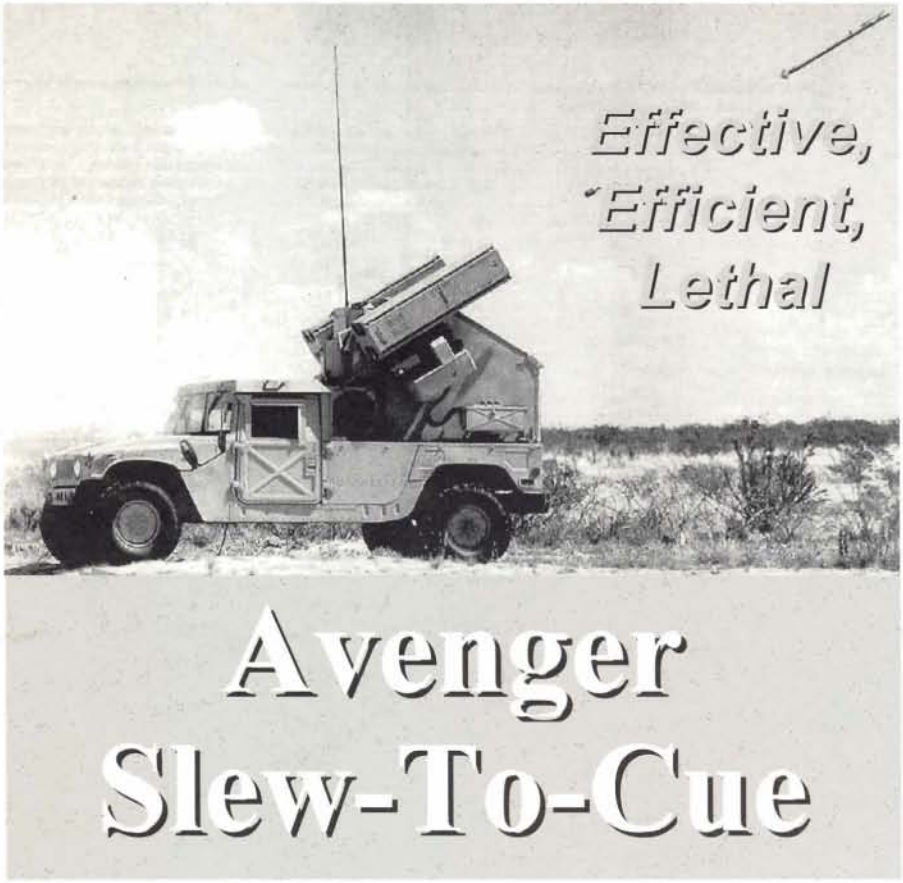

Mission

The Avenger provides mobile short-range air defense protection to divisions, armored cavalry regiments, and corps air defense brigades.

The Army's Low Cost Answer To The Cruise Missile Threat For Force XXI

The **Avenger Slew-To-Cue** is a significant upgrade to the existing Avenger weapon system. Using STC, the Avenger can now take digital early warning data and automatically slew the turret in both azimuth and elevation, centering the threat target in the gunner's field of view. This improvement not only improves the efficiency and effectiveness of the Avenger, but also allows it to kill the broadening spectrum of 21st century threats, including cruise missiles and unmanned aerial vehicles. With STC, the Force XXI air defense soldier is more effective, more efficient, and more lethal.

Characteristics

Armament:	8 ready Stinger missiles/.50-caliber machine gun.
Sensors:	FLIR/Laser/Optical.
Fire Control:	Digital fire control computer/gyro-stabilized turret.
Communications:	Enhanced Position Location Reporting System (EPLRS)/ Single Channel Ground and Airborne Radio System (SINCGARS)
C^2 Link:	FAAD C^2 via Simplified Hand-Held Terminal Unit (SHTU)

FORCE XXI

Air Defense Artillery

TSM-SHORAD Fort Bliss, Texas (915) 568-6546 DSN 978-6546