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MAY-JUNE 1996

Cruise Missiles: Tomorrow's Threat on Sale Today . . .

page 2

HQDA PB 44-96-3 MAY-JUNE 1996

FEATURES

Cruise Missiles: Tomorrow's Threat on Sale Today 2
Skyrocketing cruise missile technology puts Force XXI at risk, but the branch's already deployed FAAD systems promise to counter this incoming threat.

Army Mountain Top Experiment 5
Extended line of sight and more accurate target track files will help Air Defense Artillery counter low-altitude cruise missiles.

The Unexpected: Joint and Combined Assignments 15
Air defender Lt. Col. Joe Cooper serves his time with NATO in Bosnia during Operation Deny Flight.

Japan's Ground Self-Defense Force 26
Japanese air defenders welcome the 21st century with technologically improved missile systems.

Reviving the Gun/Missile Mix 30
Does Air Defense Artillery need guns in its arsenal?

The ADA Battalion S-2 and IPB 34
5-5 ADA S-2 explains how to package the intelligence picture in a simple, readily usable form.

DEPARTMENTS

Intercept Point 1

Common Sense Management 9

ADA Digest 10

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Intercept Point

Air Defense Artillery hit a home run during the recently completed ADA Functional Area Assessment (FAA). The Army Vice Chief of Staff (VCSA) approved, with no detours, our "road map" to the 21st century. ADA commanders who attended the ADA Commanders' Conference in April have been fully briefed on the FAA results, but I want to summarize the good news for all ADA soldiers.

Patriot Force. The Vice Chief acknowledged the stress frequent deployments have placed on our Patriot soldiers. We have a "green light" to activate a tenth Patriot battalion this October. We plan to return one Patriot battery from Europe (V Corps Patriot) and one reduced-readiness battery from Southwest Asia to help activate the new battalion, 3-2 ADA, in October 1996 at Fort Bliss, Texas. The Vice Chief also supports standardizing Patriot battalions at five batteries and will continue to support reenlistment incentives for Patriot soldiers.

Divisional Air Defense. The Vice Chief thinks air defense battalions belong in the division. He supports heavy-division standardization and approves our plan to standardize light and special divisions with 12 Avengers and eight manportable Stinger teams.

Army National Guard. Stabilizing and modernizing the Army National Guard air defense force is vital because the Guard is taking on more important total force missions. The Vice Chief supports our plan to convert Guard Hawk and Chaparral battalions and Avenger/Stinger battalions. The Army Staff supports a buyout of 93 Avengers to make the plan work. I believe Avenger is the optimal system for the Guard to train and fight.

ADA Brigade Relocation. The Vice Chief supports the 31st ADA Brigade's relocation to Fort Bliss in FY96. The 35th ADA Brigade is scheduled to relocate to Fort Bliss in FY97. Their arrival will help transform Fort Bliss into the Army's "Air Defense Center of Excellence" and will enhance the installation's role as a Force XXI power-projection platform.

Army Air and Missile Defense Command (AAMDC). The Vice Chief supports the establishment of the AAMDC, to be commanded by a brigadier general, provided we can support the grade structure from within Air Defense Artillery. Prairie Warrior and Roving Sands '96 should validate the AAMDC concept. We hope to create the organization in October 1997.

I also expressed to the Vice Chief our concerns over the shortage of ADA officers, a problem I think the branch itself can resolve, and ambiguities in joint air and missile defense doctrine. I told him that increasing the realism of the air threat portrayal at combat training centers and in modeling and simulations is now my number one priority.

In 1918, the Westervelt Board, or "Caliber Board," shaped America's antiaircraft force for decades to come. In 1986, the FAAD Working Group established a "system of systems" approach to air defense in the forward area. FAA '96 is also likely to achieve status as a watershed event in the annals of the "First to Fire" branch. There are still some "speed bumps" on the road to Force XXI, but our road map is well defined. Air Defense Artillery is leading the charge into the 21st century!

Maj. Gen. John Costello
Chief, Air Defense Artillery

FORCE XXI

Such a revolution would touch virtually all aspects of the military establishment. Cruise missiles and unmanned aerial vehicles would replace fighter planes and tanks as chess pieces in the game of military power. Today's military organizations — divisions, fleets and air wings — could disappear or give way to successors that would look very different. And if the forces themselves changed, so too would the people, as new career possibilities, educational requirements, and promotion paths became essential. New elites would gain in importance: "information warriors," for example, might supplant tankers and fighter pilots as groups from which the military establishment draws the bulk of its leaders.

— Eliot A. Cohen,
"A Revolution in Warfare,"
Foreign Affairs,
March-April 1996

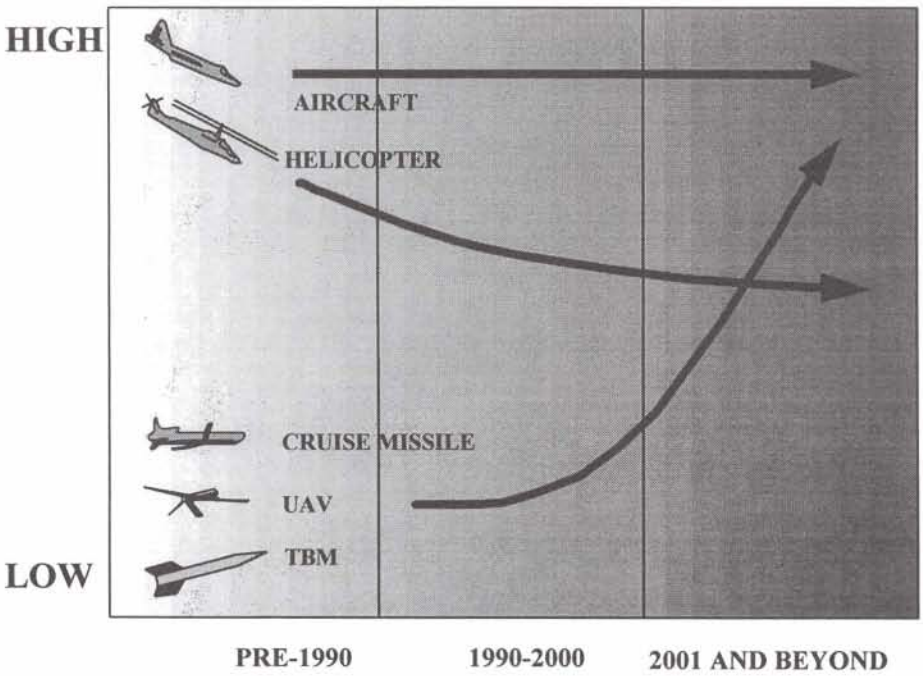
CRUISE MISSILES: Tomorrow's Threat on Sale Today

by Col. Allen M. McDavid Jr. and Capt. Brian E. Bosworth

Since the success of the Tomahawk in the Persian Gulf War, proliferation of cruise missile technology, including land attack cruise missiles (LACMs), has skyrocketed. To understand the severity of the cruise missile threat, we must look at the stressing characteristics of cruise missiles. Briefly stated, cruise missiles have a small radar cross section (one-tenth the size of an average tactical fighter) and can fly unpredictable ingress routes at high speeds and low altitudes. They can strike targets with pinpoint accuracy and, with the advent of smart submunition warheads, can strike moving targets as well. Cruise missiles employ unitary and smart submunitions, and may serve as vehicles for weapons of mass destruction. Typical missions for cruise missiles include strategic attack, air interdiction, anti-armor and suppression of enemy air defenses; they can also be used as terror weapons. What really makes cruise missiles so dangerous is their lack of a detectable launch or an easily detectable in-flight signature. Moreover, they are deadly accurate.

Approximately 100 different types of cruise missiles are now being produced, and almost all variations have ranges in excess of 150 kilometers. They range from the highly exported French Exocet, with its extremely versatile launch platform configurations, to the air-launched U.S. AGM-129A that boasts a 3,000-kilometer range and a 200-kiloton nuclear warhead. Although the vast majority of cruise missiles are anti-ship (greater than 70 percent), Third World nations desiring pinpoint accuracy see LACMs as an attractive tactical ballistic missile (TBM) alternative.

Cruise missiles reap the benefits of technological advancements in terms of lethality and availability. Today's cruise missiles come equipped with both inertial navigation and terminal guidance packages for pinpoint accuracy. Several systems, such as the terrain contour matching system and global positioning system, correct the in-flight drift associated with inertial navigation systems. New terminal seekers (such as imaging infrared [IIR] and millimeter wave [MMW]) along with automatic target recognition seekers are resulting in extremely small circular errors probable. Dual-mode seekers, with some combination of IIR, MMW or anti-radiation homing seekers, are becoming very

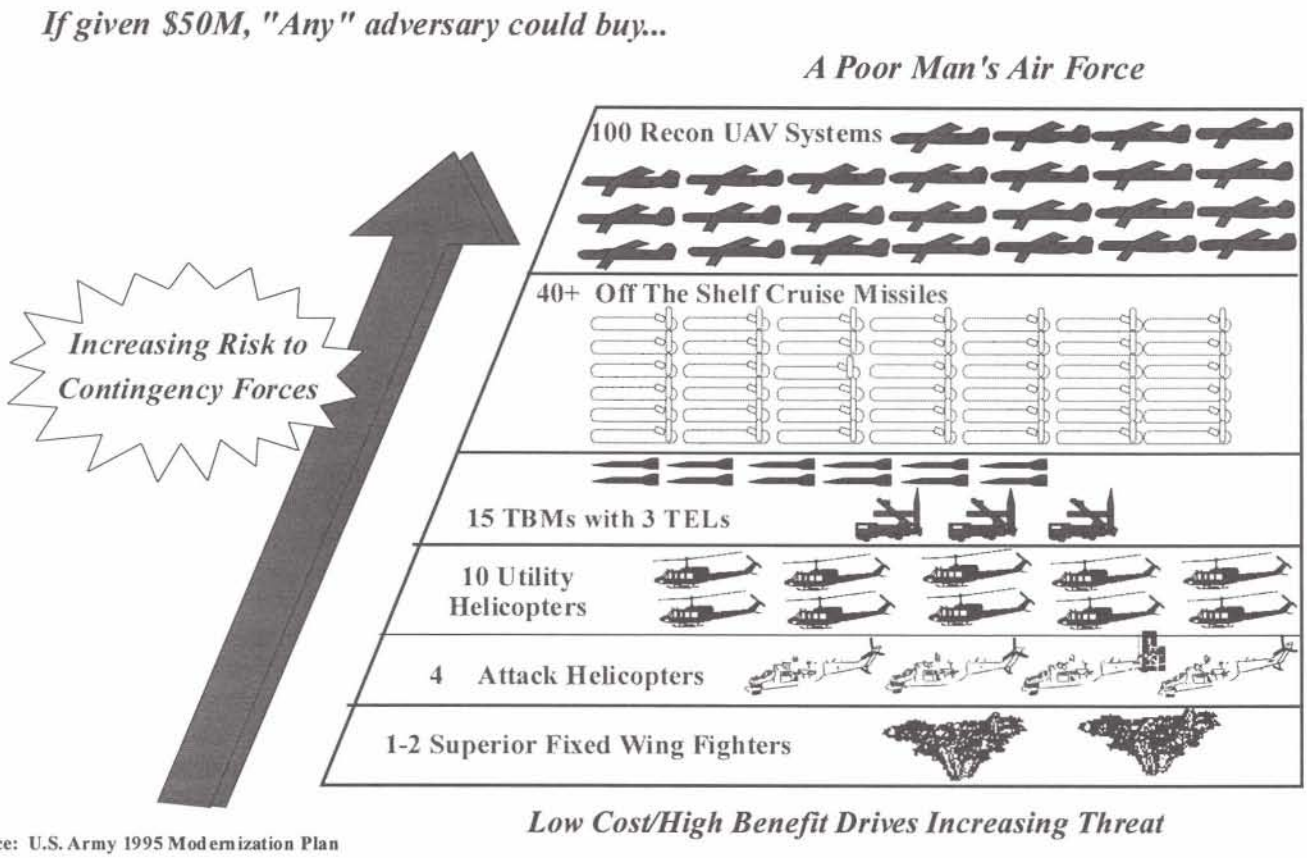


> UAV
- Info war dominance at risk
- RISTA and lethal
- Real time downlink
- Night/multimission capability

> CM
- Increasing land attack capability versus individual armored vehicles
- Increasing accuracy – CEP < 3m
- Longer ranges, lower altitude, smaller profile

> HELICOPTER
- Increasing stand-off capability
- All weather/night
- Improved fire control/greater ATGM lethality

> AIRCRAFT
- Increased payloads-precision guided munitions
- Reduced profiles/stealth
- All weather capability



Source: U.S. Army 1995 Modernization Plan

attractive because of their extreme accuracy and relative immunity to countermeasures. Unlike a ballistic missile, cruise missiles currently have very good accuracy, and the next generation of LACMs is expected to be even better.

It is almost impossible to determine exactly how many cruise missiles reside in the arsenals of countries around the world. More than 65 countries have imported cruise missiles, and some 19 countries either have cruise missile programs in production or are actively developing cruise missiles. Obviously, any country desiring to acquire an LACM capability will be able to do so. The United States must continue its efforts to deter this proliferation and must poise itself to counter this threat should deterrence fail.

Russia, France, Italy, Germany, Israel, South Africa and the United States rank at the top of the cruise missile production line. Although Russia has produced the greatest number of cruise missile systems, many of these are aged and technologically obsolete. France, a current leader in the development of cruise missile technology, is expected to field the next generation "Tomahawk-like" cruise missile (called the Apache) before the turn of the century.

Action on the open market has been mainly limited to anti-ship cruise missiles. France, China and Russia, the major exporters of these systems, continue to sell anti-ship cruise missiles around the world. The Exocet missile system, for example, is being used by more than 35 countries, including Iraq and Libya. Although the next generation of LACMs and their inherent technological advances have yet to see mass proliferation on the arms market, it is only a matter of time before Third World countries like Iraq and Libya begin adding these very capable weapon systems to their arsenals.

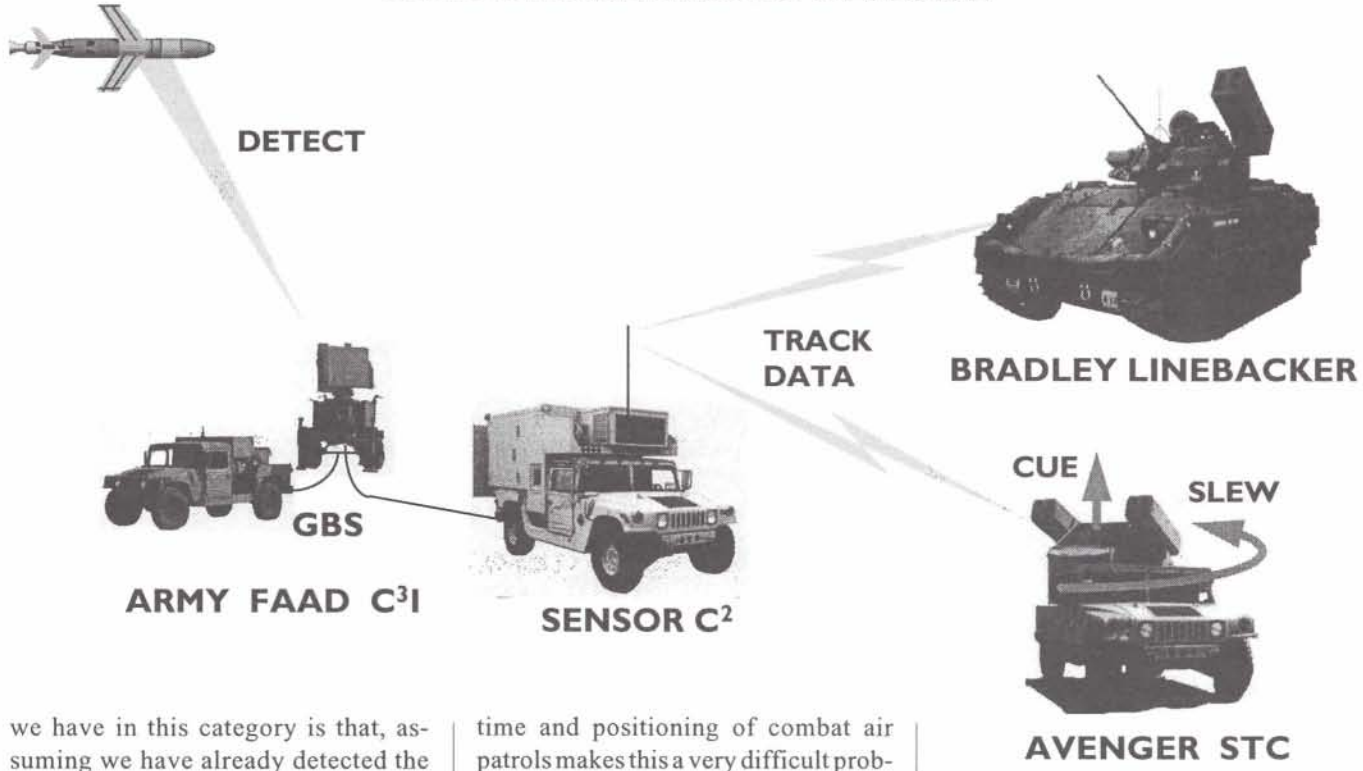
Countering the Threat

Who can best counter the cruise missile threat? The answer lies in an analysis of the challenges posed by the threat. These challenges fall into three main categories.

Detection and early warning, which covers launch detection and in-flight early warning, probably is the area of greatest difficulty. Because of their limited infrared signatures and low radar cross sections, cruise missiles are an inherently stealthy opponent. Complicating this matter are their rather extreme flight profiles and unpredictable ingress routes.

Acquisition and fire control is also a very difficult area to deal with for the same reasons. The one advantage

FAAD CRUISE MISSILE DEFENSE



we have in this category is that, assuming we have already detected the target during the detection step, we have a pretty good idea of its location. "Cueing" allows us to narrow the search considerably, thus minimizing search time.

The third area of concern is the actual *engagement* of the missile. This is the easiest of the three categories to deal with, provided we accomplish the first two correctly.

U.S. military joint capabilities (Army, Air Force, Navy and Marines) to counter cruise missiles are currently under development and refinement. The U.S. Navy faces a significant antiship cruise missile threat; its focus, correspondingly, is on protecting ships at sea, leaving the defense against LACMs to the Army, Marines or Air Force. The Marines, although somewhat capable of countering the cruise missile threat with their ADA battalions, have far too limited an amount of assets to cover more than their own areas of operation. Our Air Force fighters are the most capable in the world, but the challenge lies in detection and early warning. Moreover, reaction time and positioning of combat air patrols makes this a very difficult problem — even if the airborne warning and control system is reconfigured for cruise missile flight profiles.

The U.S. Army's capabilities against LACMs include the Patriot missile system and the forward area air defense (FAAD) family of weapon systems: Avenger; Bradley Stinger Fighting Vehicle-Enhanced or Linebacker; FAAD command, control, communications and intelligence (C^3I); and the ground-based sensor (GBS). Although the Patriot system is very effective against cruise missiles flying against it, its restricted area of coverage, coupled with the unpredictable ingress routes of cruise missiles, limit its overall effectiveness. Moreover, the detection ranges for cruise missiles are simply not great enough to give the limited amount of Patriot assets an adequate capability to provide both TBM and LACM defense for the entire spectrum of key assets it must protect. Even the Patriot Advanced Capabilities-3 (PAC-3) upgrade cannot totally alleviate these limitations.

The most capable weapon systems to counter the cruise missile threat today are also the least complicated. FAAD systems currently hold the most promise in this area. For example, the all-weather, night-capable, forward-looking infrared-equipped Avenger is capable of fire control and engagement, but is limited in its detection capabilities. The GBS and FAAD C^3I fieldings will offset this limitation. Together these systems will provide early warning and digital communications and display down to individual fire units. Furthermore, the Avenger slew-to-cue modification, when fielded, will decrease the time necessary to slew and acquire the target, thus increasing effectiveness.

The Linebacker will also have significantly improved capabilities against cruise missiles. Not only will it keep up with the maneuver forces and fire on the move, its inherent GBS to FAAD C^3I link and slew-to-cue capabilities will provide much-needed

air defense protection of our heavy divisions.

All of the FAAD systems use the Stinger missile, which is slated for some major improvements in the near future. The current reprogrammable microprocessor round is being improved in a two-step operation. The first of these, Block I, will extend the missile's battery life, improve its lethality against attack helicopters and eliminate the need for superelevation, making it more adaptable for air-to-air users. Block II will upgrade the seeker, improving the missile's acquisition capabilities against low-observable threats and helicopters in clutter.

Future Countermeasures

Two systems currently in development promise to reinforce the Army's arsenal against cruise missiles.

The Aerostat is a variant of a system that has been in use for well over 200 years: the balloon. During Roving Sands '96, a 71m Aerostat will demonstrate how its technology — lighter-than-air craft fitted with a series of sensors — will enable us to engage cruise missiles over the horizon.

This system has many promising attributes. One obvious benefit is that it will expand detection ranges by decreasing the limiting factor of the earth's curvature. Aerostat will provide significant cost savings over maintaining manned aircraft fitted with similar sensors. Another improvement is its reliability and easy maintainability. Aerostat will reap large benefits, not only in early warning technology, but also in improving ground-based missile systems' ability to counter all low-flying aircraft.

The second system that will improve our capabilities against cruise missiles is the Corps Surface-to-Air Missile (SAM), also known as MEADS (Medium Extended Air Defense System). This follow-on to Patriot, although in its infancy, should bolster the Army's abilities to counter a myriad of threat aerial platforms, including cruise missiles and TBMs. Under current schedules, a version of Corps SAM/MEADS will hit the field by fiscal year 2005.

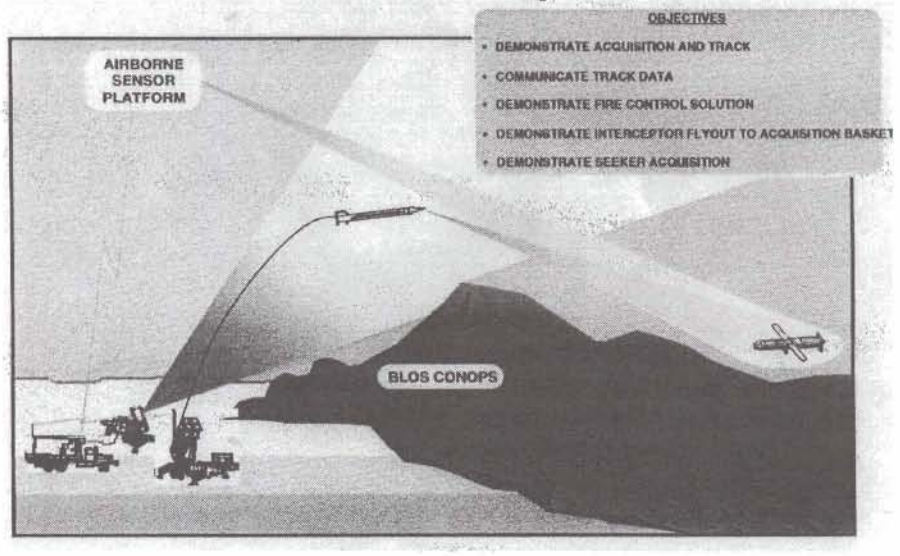
__Col. Allen M. McDavid Jr.__ is the TRADOC System Manager for Forward Area Air Defense, Fort Bliss, Texas. He has experience at both corps and division level air defense, as well as joint experience at the Defense Intelligence Agency. __Capt. Brian E. Bosworth's__ experience includes more than three years in the 32nd Army Air Defense Command as a Hawk officer. During Operation Desert Storm he served as assistant battalion S-3 for a VII Corps Hawk/Patriot task force. Bosworth is now an acquisition officer serving with the TRADOC System Manager for Forward Area Air Defense.

Operation Desert Storm, with its barrage of Tomahawk missiles, sent a message to countries around the globe: "If you don't have a cruise missile, get one." In today's arms bazaar, any country, or for that matter, any political faction, can easily purchase a potent cruise missile capability, a point made clear in the preceding article. Supply rises to meet demand, and demand is high.

The good news is that the technology required to counter cruise missiles is rapidly evolving. The bad news is that it's still not perfected. Cruise missiles are tough to handle because their small size and unpredictable flight patterns make them difficult to detect. They can skim the surface of the seas, zigzag through mountain passes or come at you from any direction. And since cruise missiles can carry warheads of mass destruction, it's not enough to stop all cruise missiles some of the time, or some cruise missiles all of the time. We have to stop all cruise missiles all of the time.

Detection of low-altitude cruise missiles by surface-based air defense systems is presently range-restricted due to the earth's curvature and terrain features that mask these low-flying targets from surveillance and tracking sensors (e.g., radars). This causes the target acquisition and fire control sensor volume to be much smaller than the associated air defense interceptor's kinematic envelope. The resultant disparity between the acquisition/fire control sensor and interceptor footprints constrains cruise missile engagement ranges and

AIR-DIRECTED SAM CONCEPT AND MOUNTAIN TOP OBJECTIVES



timelines, thus reducing the defended battle space. Recognizing this situation, it was imperative that the services explore methods to enhance cruise missile defense capabilities.

The Army Mountain Top Experiment is the U.S. Army's participation in the joint (U.S. Navy and U.S. Army) Cruise Missile Defense Advanced Concept Technology Demonstration (ACTD) that explored one way to counter the low-altitude cruise missile threat. This Navy-initiated activity was sponsored by the Under Secretary of Defense for Acquisition and Technology. The U.S. Army was then invited to participate in the exercise and use test range services already funded by the U.S. Navy.

ACTDs help air defense streamline the process for exploring operational and cost effectiveness issues while minimizing the technical risks. By definition, an ACTD is intended to facilitate the transition of advanced technology concepts into the operational force structure with appropriate consideration of operational concepts, technical requirements and affordability issues associated with potential follow-on acquisition of novel elements.

The Special Programs Office of the Program Executive Office for Missile Defense, Huntsville, Ala., managed the U.S. Army experiment with the assistance of civilian and military personnel from the U.S. Army Space and Strategic Defense Command, the U.S. Army Missile Command, the U.S. Army Air Defense Artillery School, the White Sands Missile Range and the 11th ADA Brigade. Though initiated in January 1994, integration of this complex experiment did not start until August 1994.

Mountain Top was a twofold challenge: first, to demonstrate that the air defense sensor horizon (also called line of sight) can be extended by elevating surveillance and fire control radars on a surrogate airborne platform (for this experiment, on a mountain ridge at 1,200 meters elevation), and second, that the air defense system can compensate for resultant latencies and inaccuracies (positional and angular) inherent in generating and transmitting target track files from this elevated sensor to the air defense fire unit.

Since the U.S. Army concept of engaging low-altitude cruise missiles beyond line of sight (BLOS) entails using airborne fire control radars to provide midcourse updates to an active-seeker interceptor to fly to an acceptable acquisition basket, the Patriot Advanced Capabilities-3 (PAC-3) missile would have been the optimum Mountain Top system. However, PAC-3 development is in its early stages, and consequently was unavailable for the BLOS demonstration.

To demonstrate the U.S. Army BLOS concept without access to a PAC-3 interceptor, the Mountain Top team devised an innovative test approach. Their solution was to combine a captive carry test (CCT), consisting of a prototype PAC-3 seeker suspended from a test aircraft with a real-time, high-fidelity, six-degree-of-freedom virtual engagement interceptor simulation. Both the CCT and the simulation, called the Virtual Engagement Simulation Tool, or VEST, were then connected to tactical command, control and communications equipment. The objective of this combination was to attain the most realistic demonstration possible, in real time, by combining the engagement processes of the air defense fire unit, CCT and VEST.

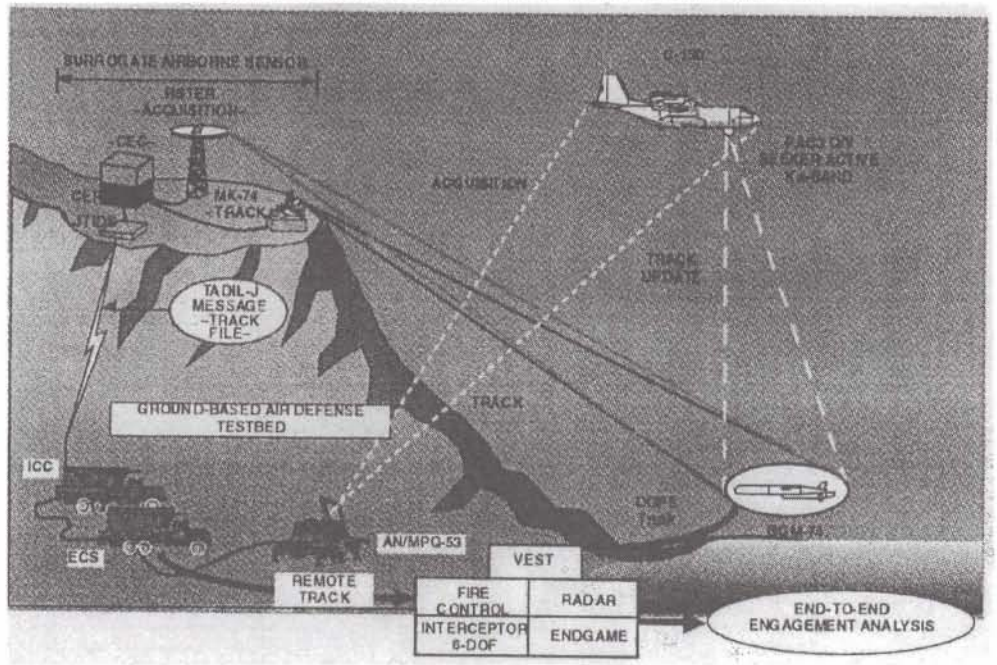
To conduct virtual engagements, the tactical fire unit (i.e., components of the Patriot missile system with soldiers from 2-7 ADA) provides command, control and communications operations, processes the elevated-sensor track data and transmits the track data to the VEST. The VEST uses the track data the fire unit provides for fire control solution, launch, midcourse and endgame functions in a real-time "virtual environment" that includes the target position. Any change in actual target drone dynamics that the elevated sensors detect are transmitted to the fire unit, processed and sent to the VEST, whereby the "virtual" interceptor responds according to PAC-3 based guidance and control algorithms. During the virtual engagement, differentially corrected global positioning system data (five meters spherical error probability, nominal) of target position ("truth") is also transmitted to the VEST. This information is used to define the ac-

tual target position in the simulation. At the time of target acquisition, the virtual engagement seeker model calculates angle, range and Doppler errors and signal-to-interference ratios to determine if the cue was accurate enough to acquire the target. If not, an angle search is initiated in an attempt to acquire the target. Upon target acquisition, the seeker transitions to autonomous track and intercepts the target.

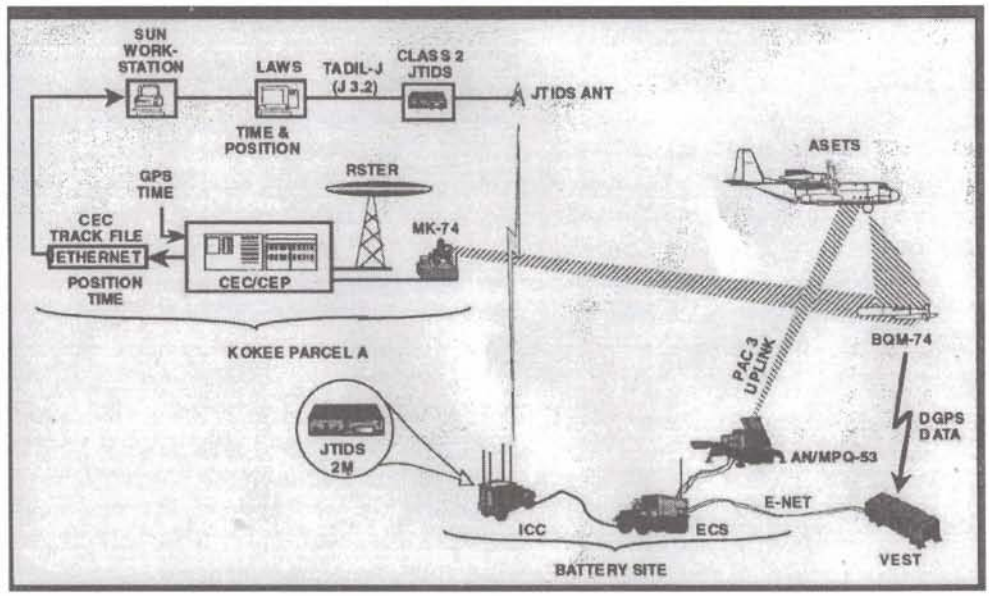
Although the VEST is a high-fidelity six-degree-of-freedom model, the need to run in real time forced minor fidelity compromises in the virtual engagement phenomenology models (second- and third-order effects in seeker and terrain clutter models). To compensate for these model simplifications, CCTs were conducted using the prototype PAC-3 seeker to provide actual seeker data on the target drone. During the Mountain Top exercises, and while the virtual interceptor engaged the virtual target in the VEST, CCTs were concurrently conducted. The fire unit generated a target position uplink message, which was then transmitted via the Patriot missile system radar (AN/MPQ-53) to a data-update receiver on the CCT aircraft. Sensor-generated target position(s) were then used to slew the on-board active Ka-band seeker that, in turn, pointed, acquired and tracked the target.

Neither the VEST nor the CCT singularly provided the necessary fidelity for Mountain Top, but by combining the high-fidelity attributes of both test tools, it was possible to perform a real-time, high-fidelity, end-to-end demonstration of the U.S. Army BLOS concept without requiring a live-fire test. Mountain Top is the first program to synchronize a high-fidelity simulation and CCT, with a tactical air defense system, in a real-time test environment.

MOUNTAIN TOP DEMONSTRATION CONFIGURATION



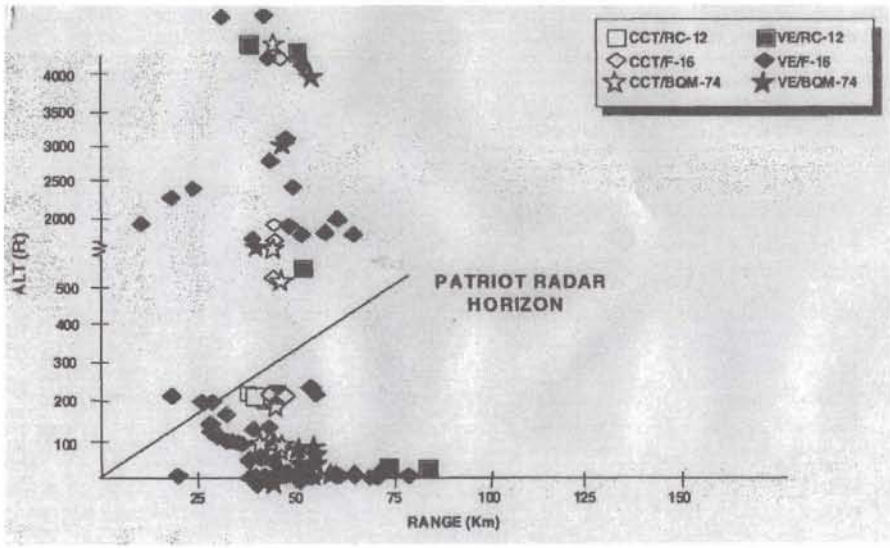
MOUNTAIN TOP COMMUNICATION ARCHITECTURE



Results

Mountain Top was completed on Jan. 26, 1996. At the conclusion of the demonstrations, a combined total of 112 CCTs and virtual engagements had been conducted, of which 101 were classified as successful, two as failures and nine as no tests (i.e., adverse anomalies that were not attributable to the Mountain Top system). The figure on the following page illustrates the altitude at which surrogate cruise missiles (RC-12, F-16 and

MOUNTAIN TOP PERFORMANCE MATRIX



BQM-74) were flown and the range at intercept.

Preliminary results indicate that the nominal track positional error, transmitted throughout the Mountain Top communications architecture, was 61 meters (root-sum-square for X, Y, Z) with a total uncompensated track latency of 100 milliseconds. However, as the successful results of the demonstration show, these errors are acceptable for a ground-based air defense system to accept remote track data and complete an engagement. The virtual engagement simulator routinely conducted successful engagements at ranges exceeding 70 kilometers at very low altitudes.

The Road Ahead

The critical Mountain Top issue was whether a ground-based air defense system could use remote track data from a surrogate airborne sensor to conduct a BLOS engagement. The successful results achieved have proven this concept. This then raises the question, "Where does the air defense community go from here?" The optimal solution will be one where the cost-per-kill of a cruise missile is low and effective defense of our troops and assets is achieved.

The following considerations are designed to initiate the process for determining an approach for the future:

• The application of the BLOS cruise missile kill impacts on the battle management/command, control, communications and intelligence as it now exists. This includes the determination of what communication system timelines are acceptable to an active system, the impact on track accuracy due to sensor data link latency, an assessment of the impact on weapon performance on one or more handovers, and the peak level requirements for current and planned systems.

• There are several doctrinal and tactical implications associated with a BLOS engagement. What is the potential degradation in performance when the added responsibility of BLOS is assigned? What is the impact of added requirements on ground-based systems?

• The combination of hardware and software requirements of an airborne sensor needs to be determined. What combination of elevated sensor(s) used in conjunction with ground-based systems creates the most effective cruise missile defense coverage?

The most important question to be evaluated is whether or not there is an appreciable military value added when it is possible to engage cruise missiles beyond the line of sight of ground-based system sensors.

In the coming months, Fort Bliss and the rest of the air defense community will begin to formulate a strategy to answer some of these questions. Fort Bliss is already beginning to draft operational concepts and requirements with rationale for cruise missile defense and an over-the-horizon sensor. Exercises such as Roving Sands '96, Prairie Warrior, Theater Missile Defense Experiment '96 and several models and simulation efforts will be coupled with Mountain Top results to provide analysis for this effort.

Summary

Mountain Top has been a tremendous success. All stated objectives were achieved, and the program was accomplished on time and under budget. Mountain Top proved that cruise missiles can be engaged beyond the line of sight of a ground-based air defense system sensor, and this concept can be applied to U.S. Army air defense doctrine and systems that employ active-seeker interceptors.

The effective use of an ACTD has enabled the air defense community to streamline the process of moving advanced technology into the area of potential acquisition. Finally, the use of state-of-the-art technology during the conduct of this experiment once again proves that Air Defense Artillery is leading the way to Force XXI.

Capt. Matthew Quinn worked as the combat developer representative for the Army Mountain Top Experiment. He is assigned to the Weapons and Requirements Division, Directorate of Combat Developments, U.S. Army Air Defense Artillery School.

COMMON SENSE MANAGEMENT

My biographical sketch, which appeared in the March-April issue of *ADA* magazine, detailed my past assignments, overseas tours, military education and various achievements. So rather than repeat what's already been printed, I'll talk about those things the bio didn't explain.

I've spent most of my Army career in divisional and corps units; in fact, I'm the only ADA branch command sergeant major in recent history to come from a corps assignment directly to Fort Bliss. I'm elated that I was fortunate enough to have been selected for this position, and promise to do everything in my power to support and improve the "First to Fire" branch.

During my incoming change of command ceremony, I promised to "not forget where I came from." When I was first stationed at Fort Carson, Colo., I lived in a one-bedroom kitchenette apartment with a wife and a child to feed on a private's pay — just like most of you. I couldn't afford anything else. That period of my life left the address of the kitchenette forever engraved in my memory.

I've also done my time in Korea and Germany, so I'm no stranger to financial hardships and family separations. I understand exactly how our Patriot soldiers feel each time they face another rotation in Southwest Asia.

During the years of working my way up through the ranks, I've formed a soldiering philosophy that has helped me succeed both professionally and personally: *Whatever you do, it must pass the common sense test.*

I plan to put this common sense approach to work in my new assignment. Common sense tells us that we do not live in a perfect world. Neither do we belong to a perfect branch. I believe that Air Defense Artillery can do a better job, and I have several plans in the making to strengthen our branch while improving the quality of life for ADA soldiers. Being the branch command sergeant major puts me in a position to not only bring these issues to the leadership's attention, but to effect change — to make a difference.

Change doesn't necessarily mean reinventing the wheel. Sometimes, change is simply a better way to do what we already do well. Other times, change may define a way to get out of the rut, to stop "doing things the way we've always done."

We can make a difference. Send me your suggestions; voice your concerns. Together we can make Air Defense Artillery the place soldiers want to be.

Soldiers, America's Heartbeat!

Jeffery G. Jordan
Command Sergeant Major

REMEMBER YOUR ROOTS!

When you start feeling like you're someone of importance or carry influence, go try to order your neighbor's dog around.
— Texas "Bix" Bender

ADA DIGEST

COMBAT TRAINING CENTERS

JRTC Trends

JRTC is currently conducting a doctrine, training, leader development, organization, materiel and soldiers (DTLOMS) study of 11 recurring trends. One objective of the study is for JRTC to focus efforts toward reversal of these trends over the next year. Seven of the 11 trends have major air defense involvement:

- Force protection.
- Deliberate, quick and combat decision-making process with emphasis on wargaming.
- Staff integration and synchronization.
- Situational awareness and battle tracking.
- Command, control and communications.
- Synchronization of the combined arms team.
- Targeting.

While I plan to discuss all seven of these trends in detail from an air defense perspective, this issue I'll focus on force protection. I'll pinpoint what units are doing well or in what areas they need to improve, and recommend solutions to reverse each of the trends. Don't limit your use of these recommendations to succeeding at the JRTC; rather, view them from a "how to succeed on the light battlefield" perspective.

Force Protection

ADA units generally experience a 100- to 200-percent attrition of weapon systems during a typical JRTC rotation. Analysis indicates that the majority of this battle damage is the direct result of minefields, small arms fire and air-to-ground engagements. Minefield damage generally results from a lack of situational awareness, which I'll address in a future issue. Damage from small arms fire and air-to-ground engagements generally results from poor intelligence preparation of the battlefield (IPB), fieldcraft and lack of integration with supported or adjacent units.

IPB. While development of the aerial portion of the IPB and the concurrent integration with the S-2's product has greatly improved, ADA units remain primarily focused on air avenues of approach and potential targets of enemy air. While the brigade combat team expends considerable effort planning and executing operations to suppress enemy air defense (SEAD), they seldom consider the possibility that the enemy will, at some point in the operation, focus on destroying the brigade's ADA assets. JRTC observer-controllers often witness a well-executed enemy SEAD operation that systematically attrits ADA assets until the enemy has virtually unlimited freedom of maneuver. The problem is the failure to identify ADA assets as one of the enemy's high payoff targets.

Fieldcraft. ADA units often become frustrated at the high casualty rates they experience and begin to believe they can do little to reverse this trend. Battle damage caused by small arms fire is generally inflicted by a two- or three-man enemy team armed with M-16s. With the fielding of the M-3P machine gun for the Avenger and small arms weapon systems for many of our Stinger teams, why are we being outgunned? The answer is in a general lack of proficiency in basic fieldcraft skills as we move around the battlefield, occupy positions and engage aircraft.

Units often view movements around the battlefield as administrative moves; seldom do they plan and execute moves as a combat operation. But they must integrate with key elements of the brigade and battalion staff prior to movement. They should also address key questions and issues before the move. Is the chosen route clear? Have minefields been found along the route? What friendly units does the route pass through? Most importantly, could we synchronize our movement with another unit using the same route?

Occupation of position is a critical event for air defenders. Teams are usually operating alone at this point and seldom have a dedicated security force to assist in clearing the position. Understanding and executing proper reconnaissance, selection and occupation of position (RSOP) procedures is key to successful occupation. Most units have excellent tactical standing operating procedures (TSOP) or battle book procedures concerning RSOP that, if followed, can increase survivability. Once in position, units again need to follow their established procedures. Priorities of work focused on constant improvement of the position (with one team member always pulling security) and continuous situational awareness combine to greatly enhance survivability.

Avenger and Stinger teams are most vulnerable during and after aircraft engagements. The pyrotechnic devices that JRTC uses to simulate the missile's smoke trail instantly reveal the fire unit's position. Unfortunately, trends indicate that

teams rarely move to alternate positions after engaging. Comments from opposing force (OPFOR) pilots during after-action reviews prove that if teams move just two or three hundred meters after firing, they will significantly increase their survivability.

An oft-proposed solution to the Stinger and Avenger attrition problem is dedicated infantry security. Some missions may require this security, but this solution may cause ADA units to be perceived as a combat burden rather than a combat multiplier. Simply increasing the amount of integration between the fire units and the supported unit will greatly enhance force protection. Occupy positions within existing unit perimeters, establish communications with units in the immediate vicinity and ensure integration of Avenger and Stinger positions into the brigade and battalion fire support plans.

Summary

ADA units can expect to suffer some attrition during their JRTC rotations. The challenge is to keep the amount of battle damage as low as possible. Development of a detailed IPB, attention to detail on the basics of fieldcraft, and integration with supported units should keep our air defenders in the battle.

MAJ. MIKE HENCHEN

NTC Trends

NATIONAL TRAINING CENTER

ADA units are having difficulty passing and receiving early warning, a critical positive command and control (C^2) element. Accurate and timely early warning allows Avengers and Stinger teams to attack enemy aircraft, and also helps the maneuver commander protect his forces. Early warning dissemination requires careful coordination to ensure that those who need early warning receive it at the proper place and time and in the proper terminology.

Directed early warnings are early warnings used to alert a particular unit, units or area of the battlefield. Directed early warning defines the local air defense warning, states whether the aircraft are friendly or unknown, identifies a cardinal direction and, if known, specifies the most likely affected assets within the local maneuver force. Directed early warning must be quick, simple and redundant in nature.

Local air defense warnings have three designations. A Dynamite warning means aircraft are inbound or attacking locally now, and response is immediate. Under the Lookout designation, aircraft are in the area of interest but are not threatening, or are inbound and there is time to react. Snowman warnings mean aircraft are not in the area or have left the area, and attack is improbable.

Local air defense warnings parallel air defense warnings, but tactical ADA leaders choose the level of warning. Units should incorporate local air defense warnings into the local tactical standing operating procedures, explaining what response the supported unit desires when a local warning is broadcast.

Interaction and integration with the brigade is critical during any planning process. The ADA commander must synchronize his planning efforts with those of the brigade to ensure the successful dissemination of air defense warnings throughout the brigade.

SFC SCOTT M. PERKINS

UNIT NEWS

108th Brigade Comes to Fort Bliss

Fort Bliss and the El Paso community are becoming home to the 108th Air Defense Artillery Brigade from Fort Polk, La., as the advance party continues to lay the groundwork for the incoming units.

The 108th ADA Brigade is made up of two battalions: the 1st Battalion, 2nd Air Defense Artillery (Avenger), and the 2nd Battalion, 43rd Air Defense Artillery (Patriot). The brigade also has the 208th Signal Company, and the Patriot battalion has the 555th Maintenance Company.

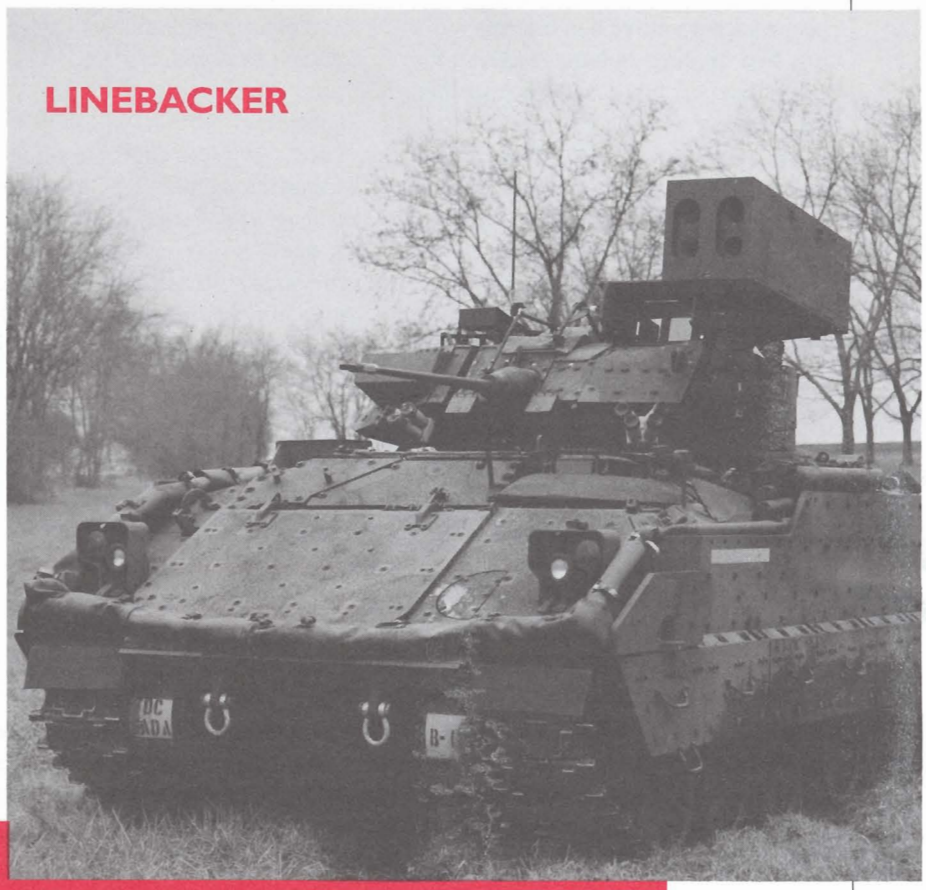
According to 108th ADA Brigade (Forward) CSM Harold E. Howell, the advance party began with three soldiers in September 1995. "We now have more than 170 soldiers who are rapidly gearing up for soldiers and their family members," Howell said. "They are acquiring barracks, motor pools, office buildings and different assets here [at Fort Bliss] to accommodate more than 1,200 soldiers of the 108th Brigade."

The advance party includes representatives from each unit, plus personnel from supply, maintenance and communications. With the advance party at Fort Bliss up and running, the rest of the soldiers will arrive in phases throughout the next several months.

"The first phase was the advance party," said Howell. "The second phase will be the arrival of 2-43 ADA and the brigade headquarters, followed by the arrival of 1-2 ADA and the Signal battalion. By the end of September, the entire brigade will be on the ground."

SGT. TAMMY M. WEBB

STINGER



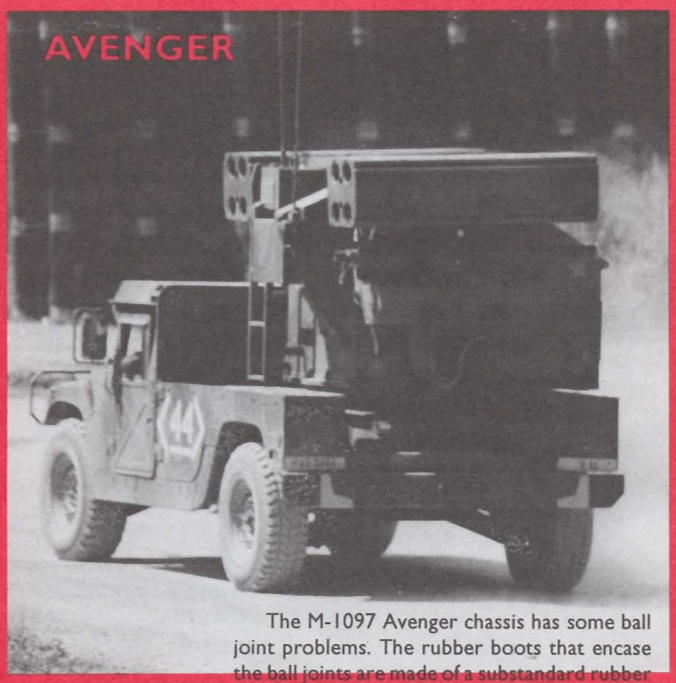
LINEBACKER

The Bradley Stinger Fighting Vehicle-Enhanced, now known as the Bradley Linebacker, just got some good news: the Army has canceled the Armored Gun System and has transferred some of its funding to the Linebacker. Linebacker is now funded for Force Package 1. If the Linebacker initial operational test and evaluation that began in April is successful, the Linebacker may be fielded by 1997.

The Linebacker upgrade allows crews to fire Stinger missiles from the turret rather than dismounting a shoulder-fired Stinger team. Linebacker replaces the TOW launcher with a light-armored, four-missile Stinger pod derived from the Avenger.

Plans are to standardize each battery in special and light division ADA battalions with 12 Avengers and eight manportable Stinger teams (presently, no standardization exists). Stinger Block I improvements will extend the missile's battery life, improve its lethality against attack helicopters and eliminate the need for superelevation. Block II will upgrade the missile's seeker, improving the missile's acquisition capabilities against low-observable threats and helicopters in clutter.

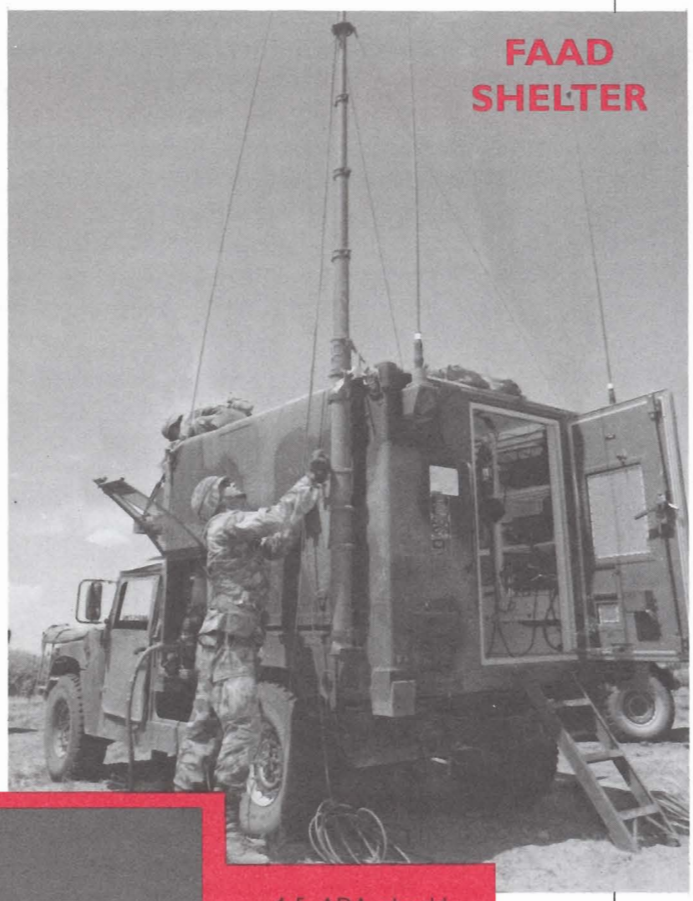
AVENGER



The M-1097 Avenger chassis has some ball joint problems. The rubber boots that encase the ball joints are made of a substandard rubber compound that tends to dry rot and disintegrate.

The unserviceable boot is not a deadline deficiency, but it will eventually lead to premature ball joint failure. There are no available ball joints in the supply system, and the sole manufacturer of these repair parts is backlogged. Until a fix becomes available, all units should ensure that the affected ball joints remain thoroughly greased.

FAAD SHELTER

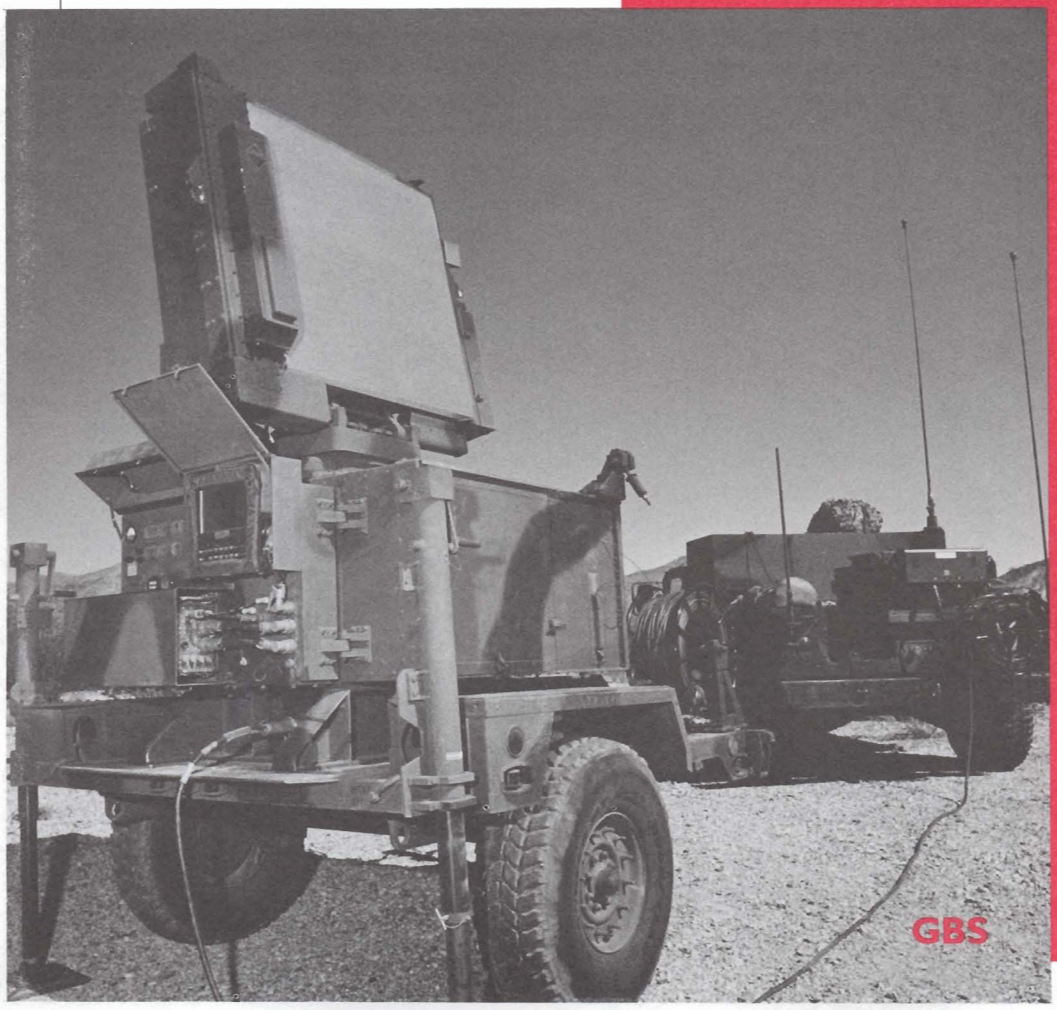


4-5 ADA should complete new equipment training on the FAAD shelter course and three simplified hand-held terminal unit courses by June 1996.

High mobility, multipurpose wheeled vehicle (HMMWV) ground-based sensor (GBS) production is on schedule. The first two radars will be delivered to 1-44 ADA in August or September. 1-44 ADA's new radars will participate in Task Force XXI.

Work is continuing at Redstone Arsenal, Ala., to modify the generator and fuel tank on the two Task Force XXI GBS HMMWVs. The generator is mounted and undergoing tests, and the Forward Area Air Defense Sensors Product Office is evaluating two fuel tanks.

GBS



CAREER NEWS

CWO 5 Positions on the Rise

A current proposal promises to increase Air Defense Artillery's chief warrant officer 5 (CWO 5) authorized strength to six (possibly seven) positions, rather than the three CWO 5 positions the branch is now authorized.

Here is the plan for distribution of the new positions (once approved):

• One MOS 140A or MOS 140E position in the Office, Chief of Air Defense Artillery (OCADA), U.S. Army Air Defense Artillery School, Fort Bliss, Texas. Designated as the senior ADA warrant officer position, the incumbent will act as the subject-matter expert and advise the chief of ADA on all warrant officer issues.

• Two CWO 5 positions (one MOS 140A and one MOS 140E) assigned to the new Army Air and Missile Defense Command. Incumbents will serve as ADA warrant officer advisors not only to the commanding generals of the new command, but also to the commanders in chief of Central Command, European Command, Pacific Command, U.S. Army Command and Southern Command.

• One MOS 140E position assigned to G-3, U.S. Forces Korea. The incumbent will serve as the ADA warrant officer advisor to the commander general of Eighth Army.

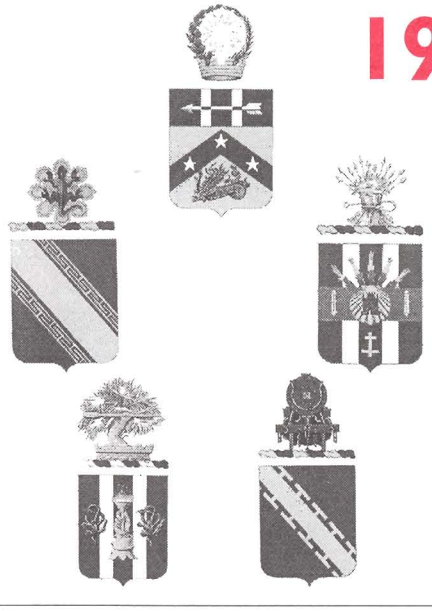
• An MOS 140A position will be assigned to J-3, European Command. The incumbent will serve as the ADA warrant officer advisor to the commanding general. The warrant officer in this position will have responsibility for determining command, control, communications, computers and intelligence (C^4I) requirements necessary to support mature and contingency theater air defense operations.

• One MOS 140E position assigned to the U.S. Army Air Defense Artillery School as the Chief , Patriot Instructor/Writer. The incumbent will interface with senior-level personnel in the weapons procurement process for all future product improvements or new weapons systems.

CWO 4 BRUCE FRADY

REGIMENTAL REPORT

1996 Reflaggings



The Center for Military History selected seven ADA units for reflagging during fiscal year 1996. Reflaggings ensure the continued history of older, more decorated ADA units. The ADA units to reflag, along with their new designations and redesignation dates, are listed below.

• 2-5 ADA, Fort Hood, Texas, was redesignated as 1-44 ADA on Dec. 15, 1995.

• 6-43 ADA, Ansbach, Germany, was redesignated as 6-52 ADA on Feb. 15, 1996.

• 1-5 ADA, Fort Stewart, Ga., was redesignated as 1-3 ADA on March 15, 1996.

• 4-43 ADA, Fort Hood, Texas, will be redesignated as 1-1 ADA on May 3, 1996.

• 4-7 ADA, Fort Lewis, Wash., will be redesignated as 2-1 ADA on May 15, 1996.

• 2-7 ADA, Fort Bliss, Texas, will be redesignated as 5-52 ADA on Sept. 15, 1996.

5-3 ADA, Wackernheim, Germany, was scheduled to redesignate as 1-4 ADA on Feb. 15, 1996, but the unit's deployment to Bosnia has pushed the reflagging to 1997.

MURRELL FASSETT

THE UNEXPECTED: JOINT AND COMBINED ASSIGNMENTS

by Lt. Col. Joseph P. Cooper

NATO Success in the Balkans

Like most Army officers, I shuddered when the branch notified me, in late 1992, that I was to be reassigned, on very short notice, to a joint assignment. Within 60 days I was packed up and headed to NATO's 5th Allied Tactical Air Force (5ATAF) in Vicenza, Italy, as chief of their Surface-to-Air Missile (SAM) Branch and the sole U.S. Army representative at the headquarters.

During two tours in the Central Region, I had worked with 4ATAF in Heidelberg and had a good idea of an ATAF's functions. I also knew that both 4ATAF in the Central Region and 2ATAF in the Northern Region were recent victims of NATO downsizing, and that 5ATAF was uneasy about its own future. 5ATAF also had a reputation as a "sleepy hollow" in the Southern Region. In short, I felt I was being banished to the extreme edge of the air defense world!

I arrived in Italy braced for what I anticipated to be a tedious joint assignment filled with endless staff papers, interrupted only occasionally by tactical evaluations of Italy's Nike, Hawk and SPADA ADA units. I could not have been more wrong!

Within the first two weeks of my arrival in December 1992, I found myself briefing the Commander of Allied Air Forces Southern Europe (COMAIRSOUTH) on the proposed redistribution of air defense assets in the theater should NATO be tasked to enforce the "no fly zone" over Bosnia-Herzegovina. After dreading my assignment to a seemingly obscure NATO command, I found myself right in the middle of NATO's first-ever "out-of-region combat operation."

In the next few pages, I will attempt to describe the many successes enjoyed by NATO in the Balkans and how, as an Army officer in a joint assignment (even a "Blue" oriented assignment), you can make significant contributions while learning more about joint and combined operations than you ever imagined.

NATO Involvement

The NATO Implementation Force in the Balkans is receiving well-deserved accolades for their efforts to support the Dayton Peace Agreement and preserve a fragile peace. It is important to remember, however, that NATO has been alive and well in the Balkans since July1992. NATO got involved in the Balkans by dedicating NATO airborne early warning aircraft to support the naval embargo against the former republic of Yugoslavia in the Adriatic Sea.

NATO extended that support and added a second NATO airborne early warning orbit over southern Hungary in October 1992 in support of U.N. Security Council Resolution (UNSCR) 781. This effort, called Operation Sky Monitor, was designed to monitor the ban on military flights over Bosnia-Herzegovina. Thirteen of the 16 NATO nations took part in Operation Sky Monitor using NATO E-3As, British E-3Ds and French airborne early warning and control aircraft flying out of six locations in Europe. By U.N. and NATO estimates, as many as 500 flights violated the ban between Oct. 16, 1992, and April 12, 1993.

On March 31, 1993, UNSCR 816 provided for enforcement of the "no fly zone" in Bosnia-Herzegovina, and authorized member states to take all actions necessary to ensure compliance. The North Atlantic Council accepted the challenge and chose 5ATAF as executive agent for Operation Deny Flight. At noon (GMT) on April 12, 1993, NATO high-performance aircraft began flying combat air patrols over that beleaguered country. Participation initially began with aircraft from France, the Netherlands and the United States. The United Kingdom and Turkey added aircraft very quickly thereafter. Spain contributed combat aircraft in December

PARTICIPATING FORCES

Almost 4,500 personnel from 12 NATO countries — Belgium, Canada, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Turkey, the United Kingdom and the United States — have deployed for this operation. NATO aircraft are available at air bases in France, Germany, Italy and the United Kingdom, and on carriers in the Adriatic Sea.

NATO Airborne Early Warning Aircraft

8 x E-3A aircraft at Geilenkirchen, Germany; Trapani, Italy; and Preveza, Greece

France

5 x Mirage F-1CR reconnaissance aircraft at Istrana Air Base, Italy
6 x Mirage 2000C fighter aircraft (NFZ) at Cervia Air Base, Italy (3 available on recall in France)
6 x Jaguar ground attack aircraft (CAS), plus one on recall at Istrana Air Base, Italy
6 x Mirage 2000K/D ground attack aircraft (CAS) (plus 3 on call) at Cervia Air Base, Italy
3 x F-1CT aircraft (CAS) available upon recall from France
1 x C-135 air-to-air refueling aircraft flying from Istres, France
1 x E-3F AEW flying out of Avord, France

Germany

14 x Tornado aircrat (SEAD/RECCE) at Piacenza Air Base, Italy

Italy

8 x PA-200 Tornado (CAS) aircraft at Ghedi Air Base, Italy
1 x C-130 transportation aircraft at Pisa Air Base, Italy
4 x C-222 transportation aircraft at Pisa Air Base, Italy

The Netherlands

6 x F-16A fighter aircraft (NFZ) at Villafranca Air Base, Italy
7 x F-16A ground attack aircraft (CAS) at Villafranca Air Base, Italy
5 x F-16R reconnaissance aircraft at Villafranca Air Base, Italy

Spain

1 x CASA 212 support aircraft at Dal Molin Military Airport, 5ATAF, Vicenza, Italy
8 x EF-18A fighter aircraft (CAS/NFZ) at Aviano Air Base, Italy
2 x KC-130 air-to-air refueling aircraft at Aviano Air Base, Italy

Turkey

8 x F-16C fighter aircraft (NFZ) (plus 10 on recall) at Ghedi Air Base, Italy

United Kingdom

6 x F-3 Tornado fighter aircraft (NFZ) a Gioia del Colle Air Base, Italy
10 x GR-7 Harrier aircraft (CAS) at Gioia del Colle Air Base, Italy
2 x GR-7 Harrier reconnaissance aircraft at Gioia del Colle Air Base, Italy
6 x Sea Harrier aircraft (CAS/NFZ) on call on the British aircraft carrier when in the Adriatic Sea
2 x K-1 Tristar L-1011 air-to-air refueling aircraft at Palermo Air Base, Sicily (Italy)
2 x E-3D electronic warning aircraft at Aviano Air Base, Italy

United States

8 x USAF F-15E (CAS) fighter aircraft at Aviano Air Base, Italy
12 x USMC F-18D fighter aircraft (CAS/NFZ) at Aviano Air Base, Italy
12 x USAF F-16C fighter aircraft (CAS/NFZ) at Aviano Air Base, Italy
8 x USAF F-16C/D fighter aircraft (CAS/NFZ) at Aviano Air Base, Italy
12 x USAF O/A-10 ground attack aircraft (CAS) at Aviano Air Base, Italy
4 x USAF EC-130 airborne battlefield command and control center aircraft at Aviano Air Base, Italy
3 x USAF EC-130 electronic warfare aircraft at Aviano Air Base, Italy
4 x USAF AC-130 gunships at Brindisi Air Base, Italy
14 x USAF KC-135 tankers at Pisa Air Base, Italy
6 x USAF EF-111A EW aircraft at Aviano Air Base, Italy
10 x USN EA-6B EW aircraft at Aviano Air Base, Italy
12 x USN FA-18C fighter aircraft (NFZ) on a U.S. carrier in the Adriatic Sea
6 x USN FA-18C ground attack aircraft (CAS) on the U.S. carrier
5 x KC-10 tankers at Genoa Air Base, Italy
2 x C-21 transportation aircraft at Naples, Italy

CAS = aircraft on close air support missions. **NFZ** = aircraft dedicated to no fly zone enforcement. **CAS/NFZ** = dual role aircraft.

1994, and in the spring of 1995, after much national debate, the German air force arrived. When Italian fighters joined in a few weeks later, the deployed NATO air forces exceeded 250 aircraft.

Command and Control

At the tactical command and control level, the objective of the Combined Air Operations Center (CAOC) in Vicenza is to schedule and orchestrate the tactical execution of the Deny Flight mission. Early manning for the CAOC consisted of Italian and U.S. personnel assigned to 5ATAF and a number of temporary duty personnel. Many of the key initial augmentees came from U.S. forces assigned to one of NATO's other CAOCs at Sembach Air Base in Germany. As the operation matured, U.S. personnel were replaced by more and more NATO staff officers from various NATO headquarters in all three of NATO's regions. Today, more than 400 augmentees are on temporary duty in Vicenza, including tactical communications experts crucial to the success of this 24-hour, 365-days-per-year operation. For the first 18 months, many of these communications folks were U.S. Army soldiers out of the 7th Signal Command in Germany.

Above the tactical level, the Southern Region of NATO is commanded by the commander in chief of Allied Forces Southern Europe (CINCSOUTH), U.S. Navy Admiral Leighton Smith, who replaced Admiral Mike Boorda (currently Chief of Naval Operations) in April 1994. Smith and his joint and combined staff are located at Allied Forces Southern Europe (AFSOUTH) in Naples, Italy. His regional air commander is U.S. Air Force (USAF) Lt. Gen. Michael Ryan, COMAIRSOUTH, also located in Naples. Ryan replaced Lt. Gen. Joe Ashy, who departed in July 1994 to head Space Command. 5ATAF, a subordinate command of AIRSOUTH, is responsible not just for Operation Deny Flight but also for major Southern Region exercises; tactical evaluations of NATO air bases, SAM units, and command and control centers; and defense of NATO and national airspace. Italian Air Force Lt. Gen. Antonio Rossetti took command of 5ATAF as Operation Deny Flight began, and was replaced by Lt. Gen. Andrea Fornasiero in June 1994 when Rossetti moved on to become chief of the Italian Air Force Staff.

To illustrate early on how successfully this operation has been commanded, even the critically important CAOC director and deputy CAOC director (USAF Lt. Gen. "Bear" Chambers and Brig. Gen. Ben Nelson) who began Operation Deny Flight have departed. Maj. Gen. Hal Hornburg is the current CAOC director and Brig. Gen. Dave Sawyer is his deputy (dual-hatted as deputy commander, 5ATAF). In fact, all the senior leadership in the region has turned over since the beginning of Operation Deny Flight.

The turnover in key personnel has not negatively impacted the mission. Part of the reason the turnover has not been disruptive is that NATO very carefully developed rules of engagement for air enforcement and subsequent missions, and meticulously presented these rules to all air crews.

USAF A-10 ON TAXIWAY AT AVIANO AIR BASE, ITALY

NATO Role Expanded

At the NATO Foreign Ministers Meeting on June 10, 1993, NATO responded to UNSCR 836 by agreeing to provide protective air power in case of attacks against U.N. protection forces (UNPROFOR) in Bosnia-Herzegovina. This led to the deployment of close air support (CAS) aircraft to the Southern Region, and 5ATAF was prepared to provide CAS to the UNPROFOR beginning July 22, 1993.

On Aug. 2, 1993, NATO decided to prepare for stronger measures, including air strikes against warring factions responsible for the strangulation of Sarajevo and other safe areas in Bosnia-Herzegovina and for continued widespread interference with the delivery of humanitarian aid. On Aug. 9, 1993, the North Atlantic Council approved military planning for various air strike options.

By midsummer 1993, daily Deny Flight operations began with fighter coverage over Bosnia-Herzegovina, both in terms of air-to-air enforcement and CAS combat air patrols. 5ATAF was also providing air-to-air refueling, airborne command and control, airborne early warning, tactical aerial reconnaissance and other functions necessary to accomplish the mission.

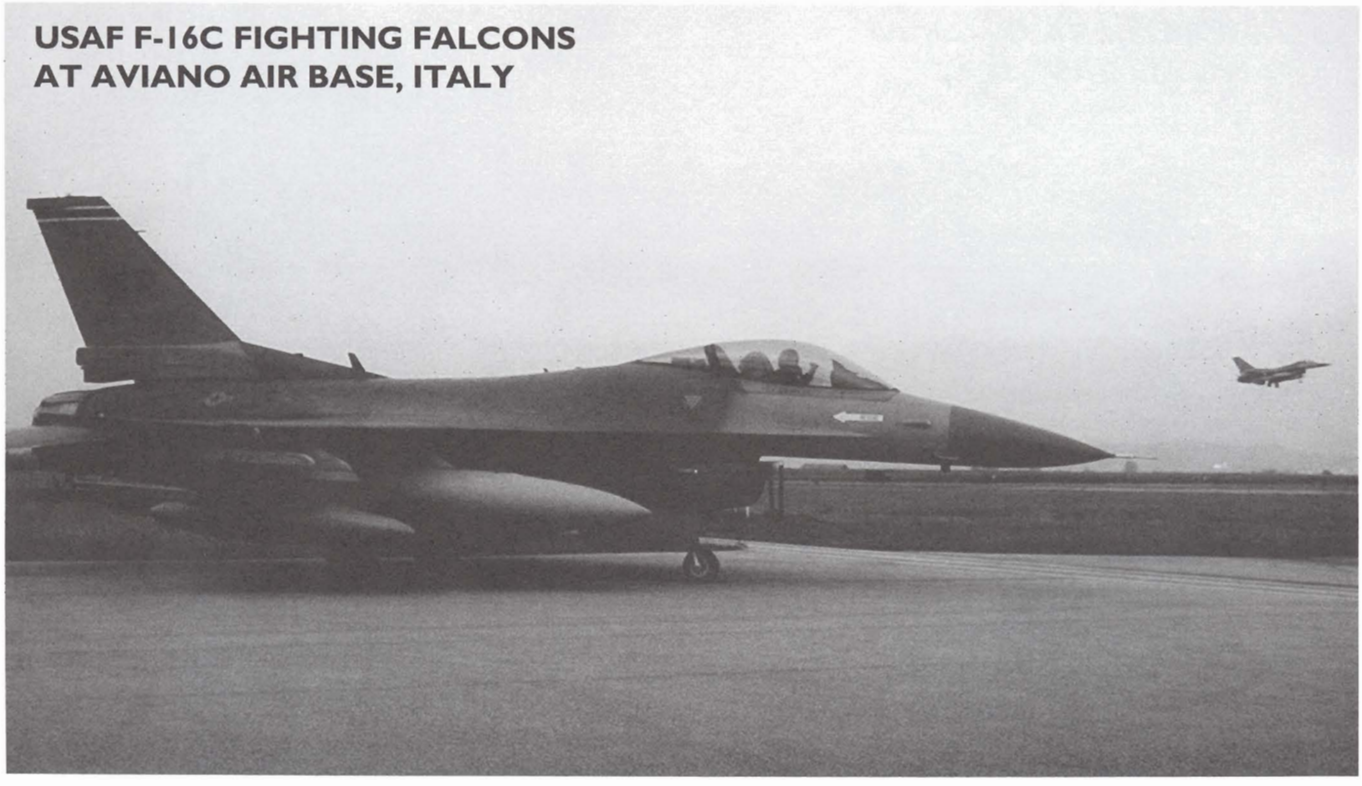
During these early stages of the operation, the warring parties respected the threat of enforcement, although they slowly began to test just how serious NATO and the United Nations were. The few no-fly-zone violations that did occur were almost exclusively rotary-wing aircraft flying with civilian passengers. Most importantly, none of these helicopters were doing anything militarily significant. Consequently, the NATO and U.N. team consciously decided not to engage the helicopters because of the possibility of injuring or killing innocent civilian passengers.

NATO Passes the Test

NATO's resolve in the Balkans was finally put to the test in February 1994. With the unfortunate Sarajevo marketplace bombing that left scores of civilian casualties, the North Atlantic Council issued an ultimatum on Feb. 10 that required the warring factions to turn heavy weapons in to the United Nations or withdraw all heavy weapons and mortars from a 20-kilometer exclusion zone around Sarajevo by midnight on Feb. 20. The council further informed the warring factions that if they failed to comply with the ultimatum, those weapons would be subject to NATO air strikes.

Despite a lack of modern transport, the Bosnian Serb Army (BSA) and the Bosnian (primarily Muslim) government removed hundreds of pieces of heavy artillery and, by Feb. 21, the remaining artillery pieces could be counted on one hand. NATO pilots stood by with target folders in hand, prepared to destroy the remaining artillery pieces. However, NATO and the United Nations had agreed on a "dual key" approach to air strike options. In this case, the United Nations refused to turn their key. Always cautious of retaliation, the United Nations recognized a good faith effort by the warring factions to comply with the intent of the ultimatum, and perhaps more importantly, the halt of shelling in Sarajevo. Within a short

USAF F-16C FIGHTING FALCONS AT AVIANO AIR BASE, ITALY



time, the warring factions removed the remaining heavy weapons. The Sarajevo ultimatum was a success!

NATO in Combat

In the predawn hours of Feb. 28, 1994, NATO faced its first challenge in the skies over Bosnia-Herzegovina. For reasons that are still unclear, six Serbian Galeb/Jastreb aircraft took off from Udbina airfield, in the Serbian-held portion of Croatia, to conduct air strikes against a Bosnian government munitions plant in Bugojno, Central Bosnia.

What happened next was a "textbook" example of no fly zone enforcement. The NATO airborne early warning aircraft detected unknown tracks south of Banja Luka and vectored NATO combat air patrol aircraft (two U.S. F-16s), on routine patrol over Mostar, toward the area. The F-16s soon intercepted and identified the six Galebs. According to the rules of engagement, the Galebs received two "land or exit the no fly zone or be engaged" orders: the first by the NATO airborne early warning aircraft and the second by the F-16s. The Galebs ignored the warnings. Just as the F-16s received their engagement authorization, the lead Galebs rolled in on their intended target and dropped bombs. Within five minutes, four of the Galebs were shot down in aerial combat. The final two Galebs, one trailing smoke, reached the safety of the Croatian border. The original combat air patrol aircraft received credit for three kills while a pair of additional U.S. F-16s, re-roled from CAS combat air patrol to the air enforcement role, received credit for shooting down the fourth violator. NATO was now in combat!

Only U.S. aircraft participated in the Galeb shootdown, but it is important to note that had the Galebs flown 90 minutes earlier, French Mirage 2000 pilots would have had kills. If the Galebs had flown 60 minutes later, Turkish F-16 pilots would have had kills. The Galebs happened to fly during the only two-hour period that only U.S. aircraft were airborne.

The Bosnian Serb may not be the "nineties type of guy," but he is tough and proud. His response to the Galeb shootdown was a March 8, 1994, manportable air defense (MANPAD) attack against a Vicenza-based Spanish Casa 212 on a routine flight between Zagreb and Split, Croatia. The Casa (a durable, light cargo plane) took a direct hit in the aft section, but was able to execute a successful emergency landing at Rijeka Airfield in Croatia. Four passengers received minor wounds from "shrapnel," and the U.S. Navy passenger earned a Purple Heart.

NATO CAS Operations

NATO had been providing CAS training missions to work with tactical air control parties (TACPs) on the ground in Bosnia since July 1993. However, until March 12, 1994, the UNPROFOR had yet to approve its use. On that date, French forces in the Bihac Pocket came under fire from an armored vehicle. Although the U.N. Secretary General's special representative approved the first use of NATO CAS, it was an involved and lengthy process. Because the approval process took so long (until after midnight), the ground situation had quieted and the UNPROFOR French TACP did not request weapons delivery.

USAF F-15E STRIKE EAGLES AT AVIANO AIR BASE, ITALY

Events transpired rapidly thereafter. The BSA attempted to strangle and then overrun the U.N. safe area of Gorazde in April 1994. The UNPROFOR ground troops in Gorazde requested air support and the U.N. Secretary General's special representative's approval was expedited. On April 10 and 11, 1994, NATO provided "live" CAS in support of U.N. peacekeepers for the first time: two USAF F-16Cs on April 10 and two U.S. Marine Corps F/A-18Ds on April 11, 1994.

Although the initial result of increased NATO involvement was to stem the Serb advance around Gorazde, the BSA soon licked their wounds and began to increase pressure on the enclave. Subsequently, on April 15, a French Etendard IV reconnaissance aircraft was hit by a MANPAD missile over Gorazde. Although the Etendard sustained significant damage, the pilot was able to coax his damaged aircraft back to the French carrier, *Clemenceau*, for an emergency landing.

On April 16, 1994, a British Sea Harrier from the *HMS Ark Royal* was shot down over Gorazde by a MANPAD missile while attempting to execute another U.N.-approved CAS mission. This particular incident was personally important to me, for as primary command briefer, I had conducted a unit in-brief of Operation Deny Flight to all pilots and air crews aboard the *Ark Royal* in the Adriatic Sea just a few weeks earlier. Fortunately, the pilot ejected safely. He was rescued unharmed by a friendly Bosnian farmer and returned to U.N. control.

On April 22, 1994, the North Atlantic Council decided that if the U.N. safe areas of Bihac, Srebrenica, Tuzla, Zepa or Gorazde were attacked by heavy weapons from any range or if there was a concentration or movement of such weapons within 20 kilometers of these areas, they would be declared military exclusion zones. NATO would back up such declarations with air power.

That same day the North Atlantic Council declared Gorazde an exclusion zone and issued a NATO ultimatum to the Bosnian Serbs. The ultimatum required the Serbs to pull their forces back three kilometers from the center of the city by 0001 (GMT) on April 24, 1994, and from that time on allow UNPROFOR and humanitarian assistance free access to the city. Additionally, the North Atlantic Council declared a 20-kilometer military exclusion zone around Gorazde and required all BSA heavy weapons to be withdrawn by 0001 (GMT) on April 27, 1994. As a result of U.N. and NATO cooperation, effective compliance with the NATO ultimatum occurred and air strikes were not required.

My Duties

From April 1993 onward, all U.S. personnel were primarily involved in Operation Deny Flight and their original 5ATAF duties became secondary. I was fortunate to have an excellent Italian air force lieutenant colonel as my 5ATAF SAM Branch deputy, and was able to depend upon him for management of SAM Branch responsibilities. Nevertheless, I was available for duties as operations area coordinator and team chief for tactical evaluations of

BRITISH VC-10 TANKER AT PALERMO AIR BASE, SICILY

Italian air force Nike and SPADA units and Italian Army Hawk units.

As for Operation Deny Flight duties, I started out managing the Friendly Air Movements Cell, coordinating NATO approval of all U.N. High Commissioner for Refugee, UNPROFOR, Red Cross and other non-NATO flights. Three weeks into the operation, I began to brief the operations portion of the 5ATAF commander's morning briefing, a briefing attended by five general officers, national representatives from all participating NATO nations, cell chiefs and staff in what is truly a "21st century" 5ATAF briefing room.

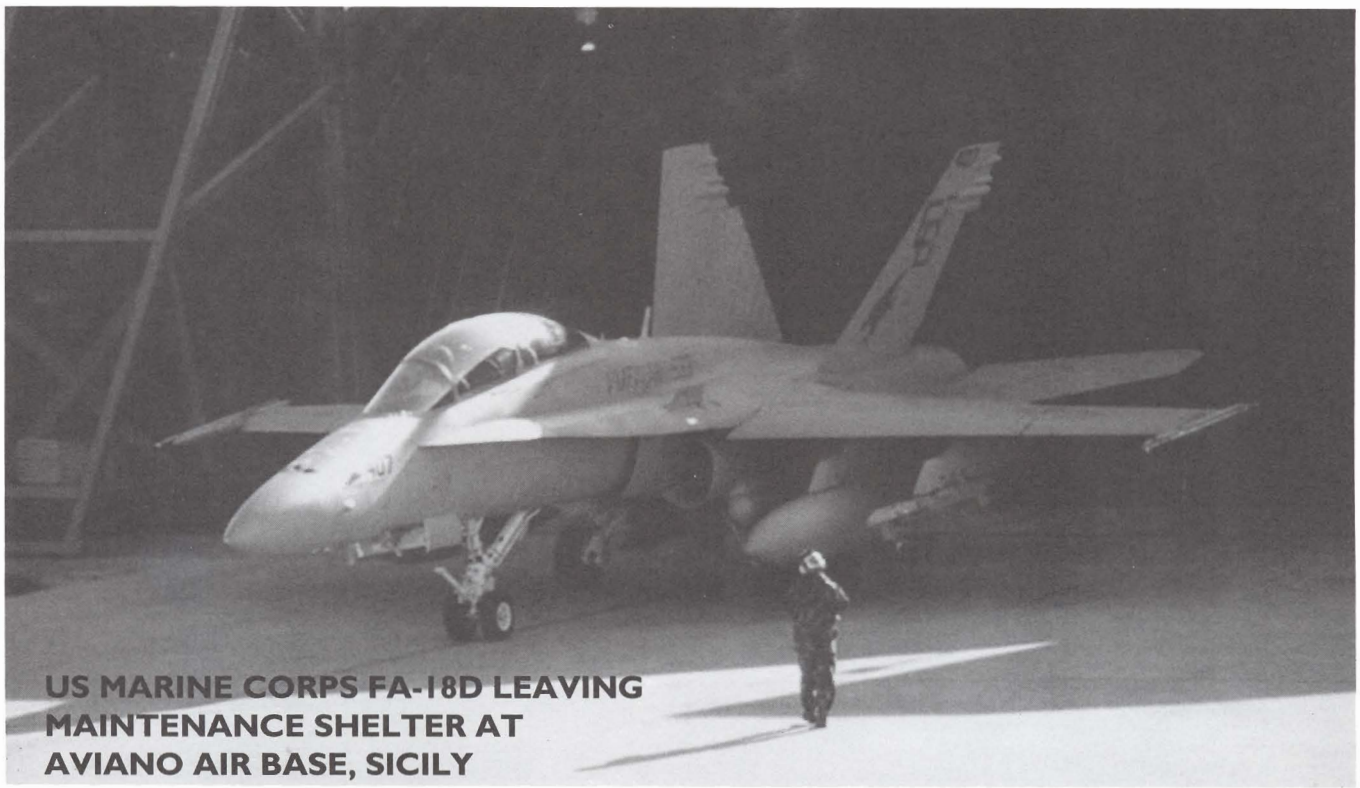
I was also fortunate to be chosen the third cell chief (first non-USAF pilot) to lead our 5ATAF forward-deployed cell in Zagreb, Croatia. My first duty in Zagreb was mid-June through July 1993, after which I returned to Vicenza to assume duties as plans officer and primary Operation Deny Flight VIP briefer. I would continue with these duties until Jan. 1, 1995, when I assumed control of the CAS Cell. Although I continued as the primary briefer through April 1995, I eventually had to give up briefing responsibilities in favor of the many demands of the CAS Cell.

NATO Air Strikes

I was again chief of the 5ATAF Cell in Zagreb in August 1994, when NATO was next challenged on the ground. Since the Serb attack on Gorazde in April, the warring factions had continued to bludgeon each other but had stayed clear from exclusion zone violations or significant harassment of UNPROFOR troops. However, on Aug. 5, 1994, the BSA seized a number of heavy weapons from a U.N. weapons collection site outside Sarajevo, despite being warned by the UNPROFOR not to do so. These weapons had been turned into the United Nations during the Sarajevo ultimatum. The BSA complained that they needed the weapons to defend themselves from a perceived Bosnian government threat.

At the request of UNPROFOR, NATO launched aircraft that afternoon to attack heavy weapons violating the Sarajevo exclusion zone. Despite poor weather conditions the force, made up of French, Dutch and American aircraft, located an M-18 tank destroyer (U.S. World War II vintage). U.S. A-10s rolled in and strafed the target with 30mm ammunition. With the sky still full of NATO aircraft, the local BSA commander called Lt. Gen. Sir Michael Rose, the U.N. commander in Bosnia, and promised the immediate return of the missing heavy weapons. UNPROFOR agreed to cancel the air strikes, NATO ceased the air attacks, and the weapons were returned as promised.

Being in Zagreb for the Aug. 5, 1994, air strike provided an excellent vantage point to observe the operation from the U.N. perspective. For instance, my NATO Cell at UNPROFOR headquarters had the best communications in the city (e.g., secure satellite communications, secure telephone unit version 3 [STU III] and secure faxes). Consequently, when Rose flew to Zagreb to consult with French Gen. Bertrand De La Presle, the overall U.N. commander in the Balkans, he came



US MARINE CORPS FA-18D LEAVING MAINTENANCE SHELTER AT AVIANO AIR BASE, SICILY

to my office to communicate with his own headquarters in Sarajevo. Furthermore, when the special representative to the Secretary General of the United Nations and De La Presle wanted to monitor the progress of the air strike, they came to my cell as well.

On Sept. 22, 1994, U.N. peacekeepers came under hostile fire during 12 separate incidents. U.N. sources attributed seven of these attacks to the Bosnian Serbs and three to the Bosnian Muslims; two remain undetermined. The most serious incident was a Bosnian Serb attack against a French armored personnel carrier near Sarajevo that wounded several French peacekeepers. At the request of the UNPROFOR, NATO aircraft attacked a Bosnian Serb T-55 tank that was within the 20-kilometer Sarajevo exclusion zone. U.S. A-10s and British Jaguars operating out of Italy carried out the retaliatory air strike. The very next day, reconnaissance showed that the T-55 tank had been rendered non-operational and had to be towed from its original position.

Two months later, on Nov. 21, 1994, NATO aircraft attacked Udbina airfield in Serb-held Croatia. The air strike, conducted at the request of and in close coordination with UNPROFOR, was a response to attacks that had been launched from the airfield against targets in the Bihac area of Bosnia during the preceding three days. The Serbs vehemently denied that the attacks took place. However, one of their air strike aircraft came in too low, clipped a chimney and crashed into a courtyard. The crash left clear evidence that the Serbs had violated U.N. sanctions.

NATO would normally have intercepted the no fly zone violations; however, the Bihac area presented particular challenges. The Serb targets were within one minute's flying time of the Serb-controlled Croatian border, and violators in the Bihac area could remain radar-masked all the way from Udbina airfield to the target area because of the mountainous terrain. These factors made early intercepts in the Bihac area particularly difficult.

The NATO surgical air strike against the Udbina airfield, designed to cripple the airfield, was carried out by more than 55 aircraft from five NATO nations (United States, France, United Kingdom, the Netherlands and Spain). The air strike included pre-strike reconnaissance, suppression of enemy air defense, strikers, post-strike reconnaissance and all the requisite tankers, early warning and command and control aircraft. The Udbina airfield was out of operation for more than a month.

Stakes Increase

The next day, the Serbs responded. SA-2 SAMs engaged two British Sea Harriers that were flying routine combat air patrols. The Sea Harriers took evasive maneuvers and escaped unharmed. The Serbs, however, had upped the ante: they had, for the first time, employed SAMs larger than MANPADs against NATO aircraft.

NATO responded early the next morning, Nov. 23, 1994, with a protected (escorted) recce mission. When SA-2 radars at Otoka and Dvor illuminated the aircraft, they

USAF F-16Cs REFUELING OVER THE ADRIATIC SEA

attacked the SAM sites with anti-radiation "Harm" missiles. Later in the day, NATO carried out an air strike against the Otoka SAM site to ensure its destruction. Nov. 23 had particular significance for me as I worked in the undermanned CAS Cell during the Otoka mission. It was shortly thereafter that I was offered the position of chief, CAS Cell.

CAS Cell

I became chief of the CAOC CAS Cell on Jan. 1, 1995, at the start of a four-month cease-fire on the ground in Bosnia. At full strength, I had four USAF majors (three of them pilots) and three USAF enlisted tactical air controllers. The CAS Cell also included two USAF captains and two USAF radio operators from the Airborne Battlefield Command and Control Center (ABCCC) detachment. We coordinated all in-flight CAS missions with the on-station ABCCC (EC-130). Through critical satellite communication (SATCOM) radios and very capable ABCCC crews, we were able to control CAS aircraft over Bosnia from Vicenza.

Cease-fires during winter months were common, giving the warring factions time to resupply and regroup for spring offensives. During the cease-fire, we continued daily CAS training with U.N.TACPs on the ground in Bosnia. It was important to keep the U.N. forward air controllers assigned to the TACPs proficient.

All U.N. forward air controllers were either from NATO countries or trained at NATO schools prior to controlling NATO aircraft. Additionally, all air operations were closely coordinated with the United Nations through the U.N. Air Operations Coordination Center (AOCC) in Sarajevo. Coordination with the AOCC was the responsibility of my CAS Cell, and we maintained a dedicated "hot line." The hot line was the primary lash-up between NATO and the United Nations at the action officer level and was used extensively each day. My CAS folks became good friends with their AOCC counterparts, making effective coordination much smoother.

As the weather improved in March 1995, the ground situation heated up amongst the warring factions. Before the cease-fire was scheduled to end, full-scale fighting had resumed.

NATO Challenged Again

By May 1995, Sarajevo had once again become the target of Bosnian Serb artillery. On May 25 and 26, in response to a U.N. request for NATO air support, NATO attacked a Bosnian Serb ammunition depot at Pale, southeast of Sarajevo. This well-planned air strike destroyed numerous bunkers within the Pale complex, several of which included secondary explosions. However, this course of action developed into a standoff as the BSA took hundreds of U.N. peacekeepers hostage, tying many of them to the doors of ammunition storage bunkers and other high-value assets. In the end, they released the hostages unharmed and agreed again to stop shelling Sarajevo.

FRENCH MIRAGE 2000Ds ON PARKING APRON AT CERVIA AIR BASE, ITALY

The Serbian military response to the Pale air strike came on June 2, when Capt. Scott O'Grady's F-16C was shot down over western Bosnia by a well-executed SA-6 SAM engagement. This was another situation that personally affected me. O'Grady had been his fighter squadron's unit representative to the CAOC until less than a week before the shootdown. We had worked together on his unit's CAS training missions and his unit's participation in the Pale air strike. Like most young fighter pilots, he was eager to get away from the headquarters and back to his unit to fly.

The next six days were preoccupied with seemingly futile attempts to contact O'Grady. Missions designed to make contact in the middle of the night seemed to carry the prospect of most success, only to leave the headquarters and aviators involved with a sense of disappointment. Ironically, on June 8, 1995, contact was established in the middle of the night by members of O'Grady's own squadron, and a flawless rescue mission followed. It was indeed the stuff movies are made of!

As the operating tempo increased on the ground between the warring factions, the situation in the enclaves worsened. By early July, the U.N. enclave at Srebrenica was the target of a major BSA offensive. Although NATO was prepared to assist early on, the United Nations hesitated. When the United Nations did ask for assistance, it was too late to affect the outcome. Serb armored forces had already penetrated the pocket from the north and south. Despite the desperate situation, my cell was instructed to provide CAS to assist the Dutch UNPROFOR battalion on the ground. CAS aircraft (American, Dutch and Spanish) attacked ground targets throughout the afternoon, but by day's end, the Srebrenica enclave had fallen to BSA forces.

Many observers believe that an earlier application of air power by the United Nations in Srebrenica may have made a difference. Employing CAS or air strikes earlier may have dissuaded the BSA from pursuing its objective by making the cost, in terms of manpower and equipment, too high.

NATO/U.N. Team Gets Tougher

On Aug. 10, 1995, NATO and U.N. commanders signed a memorandum of understanding on the execution of NATO air operations for the protection of U.N.-designated "safe areas" in Bosnia. The agreement followed the London Conference of July 25, 1995, and the subsequent North Atlantic Council decisions of July 26 and Aug. 1, 1995. Without going into great detail, those decisions prepared NATO for the greatest and most successful air campaign in the organization's 40-year history.

In late August, the BSA renewed their shelling and probing air attacks around Sarajevo. It began to look as though a major offensive may have been developing against the Sarajevo safe area. As a result, on Aug. 29, NATO aircraft began a series of air strikes on Bosnian Serb military targets and infrastructure that would eventually bring the Serbs to the negotiating table in Dayton, Ohio. This operation, called Operation Deliberate Force, included more than 3,500 sorties against 55 different

FRENCH MIRAGE 2000 TAKING OFF FROM CERVIA AIR BASE, ITALY

targets with more than 700 designated mean points of impact (DMPIs).

During Deliberate Force, my CAS Cell controlled several CAS missions in support of the United Nations in and around Sarajevo. We also passed critical mission changes to airborne air strike packages and controlled more than 200 CAS missions with hip-pocket battlefield air interdiction targets. These hip-pocket targets were carried by my CAS pilots as they flew their scheduled CAS combat air patrols. With about 30 minutes of station time remaining on each mission, the CAOC would re-role the CAS aircraft to a battlefield air interdiction mission, and they would strike their pre-planned target.

By Sept. 14, 1995, the BSA finally agreed to release its stranglehold on Sarajevo. Unfortunately for the BSA, Operation Deliberate Force had so decimated the Bosnian Serb command and control system, equipment storage, ammunition storage depots and lines of communication, that major Croatian and Muslim offensives that came on the heels of Operation Deliberate Force were surprisingly effective.

Ground Situation Changes

The Bosnian Croatian/Muslim offensives that followed Operation Deliberate Force recaptured much of the ground in Bosnia they had lost in the preceding four years. The Croatians, whose rapid employment of armored forces was particularly impressive, also recaptured 75 percent of the land in sovereign Croatia that the Krajina Serbs had controlled since 1991. This left only a strip of Croatian territory (eastern Slavonia) anchored against Serbia that was still controlled by the Krajina Serbs. The remaining disputed territory is covered by the Dayton agreement, calling for its return to Croatia.

It is important to stress that the offensives launched by the Bosnian Croats and Muslims in Bosnia and the offensive launched by the Croatian Army aganst the Krajina Serbs in Croatia were not done in concert with or approved by NATO. The warring parties saw the opportunity to seize the initiative and did so.

NATO did not choose sides in the Balkan conflict. NATO was not the "de facto Bosnian air force," even though some news reporters would have the listener believe so. Although all hostile actions taken by NATO during Operation Deny Flight were against the Serbs, it was more by circumstance than by design. NATO did not play favorites! All the warring factions were potential targets when they threatened the UNPROFOR or interfered with UNPROFOR operations. As it turned out, only the BSA "pushed the envelope" in U.N. NATO tolerance.

When I was in Zagreb, I found the Croatians to be warm, friendly and very hospitable people. But when it comes to the Bosnian Muslims, Croats or Serbs, I find a Canadian U.N. field artillery officer put it best. He said, "There are no good guys or bad guys here. Each faction is as cruel as the other and they all practice 'ethnic cleansing'." Unfortunately, many innocent non-combatants from each side are dying unnecessarily.

NATO Relieves the United Nations

After Operation Deliberate Force and the subsequent Dayton Peace Agreement, the 5ATAF CAOC, always a beehive of activity, assumed the mission of protecting NATO's implementation force. Operation Deny Flight became Operation Decisive Edge. Just prior to the operation's name change, Operation Deny Flight logged its one hundred thousandth sortie!

A NATO ground liaison element replaced the U.N. detachment at 5ATAF, with several of the U.N. personnel merely swapping Blue berets for national headgear. Many units from NATO countries did the same in Bosnia. The United Nations had tried with great tenacity to be a peacekeeper where there was no peace. U.N. soldiers paid dearly for their efforts. More than 200 U.N. soldiers died in Bosnia-Herzegovina and more than 1,500 were wounded or injured. Although the majority of the casualties were from mines and accidents, Bosnia proved to be a dangerous place to work.

We also absorbed a large airlift contingent that orchestrated the massive airlift operations into Tuzla and Sarajevo. And much smoother than I expected, we integrated representatives from other participating implementation force nations — most noticeably the Russians.

My CAS Cell wrote and published a new CAS standing operating procedure and briefed it to all 1st Armored Division TACPs (some of whom had served in my CAS Cell as enlisted tactical air controllers while on temporary duty in Vicenza). We also worked closely with the new NATO Air Operations Coordination Center (NAOCC) prior to their deployment to ensure a smooth transition with the U.N. AOCC in Sarajevo.

The NAOCC deployed to Sarajevo and collocated with the headquarters of the ACE Rapid Reaction Corps. I visited the NAOCC in late January 1996 and found it ironic that the Rapid Reaction Corps had chosen the once magnificent Serbia Hotel as its headquarters (the Serbia, Bosnia, Herzegovina and Adriatic hotels comprise the core of what was a premier conference center in the former Yugoslavia). Archduke Ferdinand of the Austro-Hungarian Empire slept in the Serbia Hotel the fateful night prior to his assassination in downtown Sarajevo that ignited World War I. The Balkan tragedy is truly filled with irony.

Conclusion

With the armed services getting smaller, joint and combined operations are going to become the "rule" rather than the exception. As I depart a busy 5ATAF and Vicenza for my new assignment in Germany, I would like to reassure my fellow air defenders who may get offered a job in NATO or any joint or combined organization. It could turn out to be an incredibly worthwhile experience.

Lt. Col. Joseph P. Cooper *is the SAM officer at the Combined Air Operations Centre 3 at Sembach Air Base, Sembach, Germany.*

87-AW Antiaircraft Gun

Modernization of Air Defense Artillery

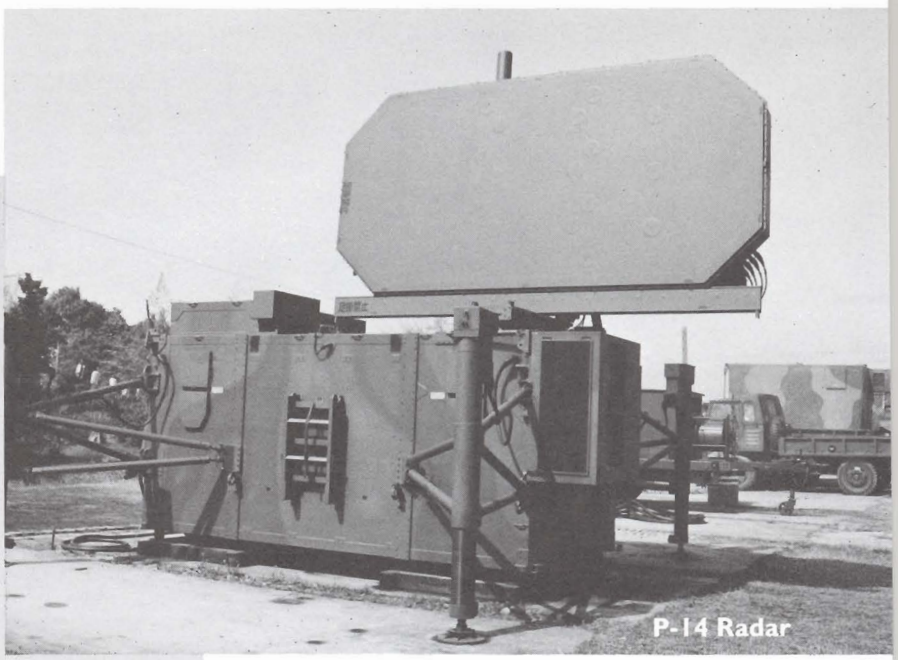
JAPAN'S GROUND SELF-DEFENSE FORCE

by Col. Nobuhiko Ishikawa, Ph.D.

Japan organizes its air defense forces under the Ground Self-Defense Force (GSDF), which is the Japanese equivalent of the U.S. Army, and the Air Self-Defense Force, the Japanese equivalent of the U.S. Air Force. This article explains the role Japanese air defenders perform in the GSDF.

Japan organized the GSDF in 1954. During the next four decades, the GSDF was systematically modernized according to Japan's constitution and national defense strategies expressed in the Basic Policy on Defense Planning, National Defense Program Outline and Mid-Term Defense Program. However, the drastic changes in the geopolitical map caused by the end of the Cold War prompted Japan to review its National Defense Program Outline. As a result, the GSDF authorization is being reduced by 10 percent, from 180,000 to 160,000, including the reserve component of 15,000.

The new National Defense Program Outline, approved by the cabinet Nov. 28, 1995, calls for four of the 12 divisions deployed in various areas of Japan in peacetime to downsize to brigades. In addition, two existing brigades will be modified. The restructuring will not affect divisional air defense battalions, but battalions in the brigades,



P-14 Radar

P-9 Radar

Japanese air defenders, like their American counterparts, face the challenge of offsetting force reductions by fielding more effective weapon systems.

except for one on Okinawa, will become ADA batteries. Today, Japanese air defenders, like their American counterparts, face the challenge of offsetting force reductions by fielding more effective weapon systems.

GSDF Air Defense Artillery, at first, grew mainly with the help of the U.S. Army. Early weapons systems, such as the M-15 and M-16 half-track antiaircraft guns, M-42 Duster, 75mm SkySweeper gun and 90mm gun, were either furnished by, or purchased from, the United States. All of these weapons were subsequently phased out and replaced by new systems. Japan then procured the Hawk, followed by the Stinger, air defense systems.

Air Defense Artillery in the GSDF currently consists of two ADA brigades, eight Hawk groups and 13 divisional ADA battalions. Divisional combat arms, such as infantry, armor and field artillery, are supported by manportable air defense (MANPAD) Stinger teams. The mission of divisional air defense artillery is to protect key forces and valuable assets in the divisional area of operation. Presently, divisional ADA battalions in Infantry divisions are equipped with the Type-81 short-range surface-to-air missile (*Tan*-SAM) and the 35mm, two-barreled antiaircraft gun (L-90). The Type-87, self-propelled antiaircraft gun (87-AW) is unique to armored division ADA battalions, which

Tan-SAM
Fire Control System

Tan-SAM Launcher

Kin-SAM

also have *Tan*-SAMs. The 87-AW is mounted on a Type-74 tank chassis. Although its 35mm barrels are Swiss made, Japan Steel Works, Ltd., is the prime 87-AW contractor.

In the near future, a newly developed missile system, the Type-93, close-range surface-to-air missile (*Kin*-SAM), will replace the L-90 35mm gun in the Infantry division. And the *Tan*-SAM in both the Infantry and Armored divisions will soon be replaced by an improved system called the I-*Tan*SAM.

The I-*Tan*SAM, an indigenous short-range missile system manufactured by Toshiba, has various technological improvements, the highlight of which is a highly sophisticated seeker. The system employs either a missile equipped with a radio frequency seeker or a missile equipped with a visibility/infrared seeker. These two types of missiles enhance the I-*Tan*SAM's operational capability, permitting all-weather engagement. The first unit will be equipped with the I-*Tan*SAM in FY97.

The *Kin*-SAM, an indigenous, close-range missile system also developed by Toshiba, was fielded to divisional ADA battalions in 1995. It employs state-of-the-art technologies, including a remarkably accurate image-homing seeker that enables the missile to intercept targets exactly in the image center of gravity.

The GSDF continues to field Hawk to protect key forces and valuable assets in the army operational area. Japanese air defense units currently employ Hawk Phase I, II and III

Air Defense Coordination Center

Air Defense Tactical OperationsCenter

systems. These will soon be replaced by the developmental medium-range, surface-to-air missile.

The Divisional Air Defense Information Management System (DADS), developed by NEC Corporation as the prime contractor, has greatly improved command, control, communications and intelligence (C^3I) capabilities. The DADS can control an entire divisional ADA battalion and cue MANPAD Stinger teams equipped with portable receivers.

The P-5 Surveillance Radar, once organic to ADA brigades and ADA groups, has been recently replaced by the three-dimensional P-14 Radar. Divisional ADA battalions are now equipped with P-5 Radars for medium- to high-altitude surveillance and P-9 Radars for low-altitude surveillance. MELCO is the prime contractor for the P-14, initially fielded in 1990, and the P-9, initially fielded in 1982.

The impending GSDF downsizing will surely affect the structure of GSDF Air Defense Artillery. Under such bleak circumstances, the GSDF will have to seek further high-quality ADA weapon systems to meet future requirements and enhance ADA capabilities.

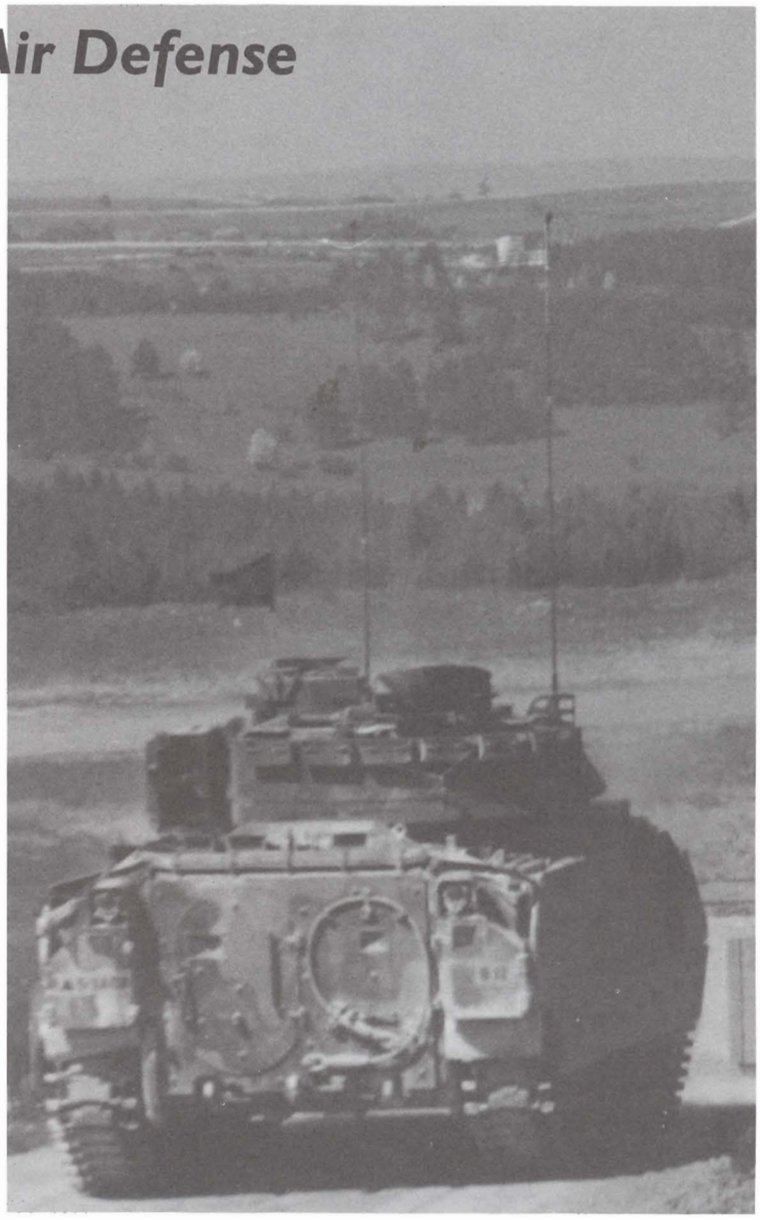
Col. Nobuhiko Ishikawa, Ph.D., is the Japanese Ground Self-Defense Force liaison officer to the U.S. Army Air Defense Artillery School, Fort Bliss, Texas. He received his Ph.D. from the University of California, Berkeley.

VIEWPOINT

Reviving the Gun/Missile Mix

The Golden Rule of Air Defense

by Capt. Daniel P. Correa and Col. Michael Vane



"Maintain the gun/missile mix."

This was once the "golden rule of Air Defense Artillery," and any air defender who prophesized that the "First to Fire" branch might one day accomplish its mission without antiaircraft guns would have been accused of heresy.

Today, budget cuts and force reductions have enticed us to compromise the golden rule. Now that we've canceled the Sergeant York air defense gun and given Vulcan its discharge papers, the barrel of the 25mm machine gun mounted on the Bradley Stinger Fighting Vehicle (BSFV) is the only effective antiaircraft gun barrel left in ADA's arsenal. Even this will disappear if those who advocate eliminating organic air defense units from the division's order of battle get their way.

I, for one, believe that the Force XXI divisions cannot afford to cut costs by eliminating a dedicated air defense capability consisting of a gun and missile mix. We must observe the golden rule of air defense.

Guns have been an integral part of the Army's ADA forces since the first biplane flew in combat. From the high-muzzle-velocity, heavy-caliber antiaircraft guns of World War I to the Quad .50-caliber machine guns of Vietnam to the 25mm chain gun of the Bradley, guns have always served to enhance ground division commanders' firepower while countering hostile aircraft. These are immutable facts. Air Defense Artillery must continue to support the maneuver commander as we progress to Force XXI.

Air Defense Artillery protects the force and allows the ground commander freedom to maneuver. Since threat airpower can disrupt the capability of our forces to maneuver, the airspace of a theater of operations can be as important to ground operations as the terrain itself. Ground maneuver commanders cannot be expected to fight the primary ground battle and still support the air defense battle. Focusing on air defense would distract them from their most important mission, and the training effort required to train non-air defenders in air defense tasks would dilute the intensity of training critical for those highly skilled soldiers to fight their own battle. This generates the requirement for a system primarily dedicated to the role of air defense that can also maintain the rapid movement of mechanized maneuver forces.

4-3 ADA outshot Infantry battalions . . . and has lent credibility to giving the air defenders BSFVs.

— Maj. Gen. Richard F. Keller, Commanding General, 3rd Infantry Division

The results of two 1990 studies substantiate the need for a dedicated system: the Program Executive Office Air Defense Combined Arms Effectiveness Comparison in the Line-Of-Sight Forward (Heavy) Initial Operational Test and Evaluation and the Operational Test and Evaluation Agency's Independent Evaluation Report of the Line-of-Sight Forward (Heavy) Initial Operational Test and Evaluation. The working parameters for these studies called for removing the dedicated air defense systems, leaving the tanks and Bradley Fighting Vehicles to defend themselves. Half of the tanks and Bradley Fighting Vehicles were dedicated to air defense and engaged ground targets in a secondary role during the conduct of both offensive and defensive trials. The results were a real eye-opener.

Overall, the Bradleys' ability to fight the air defense battle was minimal. They killed only a small number of rotary-wing aircraft, usually those in a hovering or running profile, and never scored hits against fixed-wing aircraft. During defensive ground battles, Blue forces received a significantly increased number of hits by Red ground forces. On the offense, Blue forces again received a significantly increased number of hits by Red ground forces, but Blue hits on Red ground forces decreased dramatically. These evaluations proved that, although the combined arms force demonstrated an ability to provide itself with some degree of self-defense against an aerial threat, it was "*at a significant cost in overall effectiveness.* A consequence of this self-defense capability . . . was [an] increased vulnerability to and reduced effectiveness against threat ground systems." Obviously, the loss of dedicated air defense subjects our maneuver forces to significant operational risks and, moreover, greatly reduces their effectiveness.

Having made this point, it is of paramount importance that we identify a solution that allows dedicated air defense systems to counter the aerial threat to the maneuver forces, thereby eliminating their risk and enabling them to focus on the ground battle. A gun and missile mix is the optimal solution. I submit that the Bradley Stinger Fighting Vehicle Enhanced, or Linebacker, is this solution.

Equipped with a Stinger missile pod or, ultimately, an air defense turret, Linebacker combines the broad versatility and effectiveness of the Bradley's 25mm main gun with the lethality of Stinger missiles. This gun-missile combination provides a defense against all types of low-level aircraft, including UAVs, and will drive attackers up into the highly effective defenses of the U.S. Air Force (USAF) and Patriot weapon systems.

History repeatedly reinforces the effectiveness of guns in the antiaircraft role. In World War II, the 8th Air Force lost 5,380 aircraft to antiaircraft artillery fire as compared to 4,274 from air-to-air engagements (1942-1945). The USAF lost more than 544 aircraft to ground guns (five times more than those lost to air-to-air engagements) during the Korean War. In Vietnam, guns downed more than 2,100 fixed-wing aircraft and 410 helicopters. Ground air defense fire also accounted for more than one-third of Israel's total air losses during the 1973 Yom Kippur War. Gulf War estimates suggest that antiaircraft fires around Baghdad shot down six Tomahawk missiles.

Guns *are* effective, and the larger the volume of fire, the more effective they become.

Bradley 25mm aerial gunnery results continue to roll in. 4-3 ADA, the first Bradley battalion to shoot at aerial gunnery targets and maintain data (1992), showed a 90-percent probability of hitting aerial targets with at least one round of an eight-round burst. Data collected from the most recent aerial gunnery (1995) shows 1-3 ADA gunners achieving an equally high probability of hit with a higher number of rounds. These results prove that high volumes of fire make guns equally effective against slow-moving targets (such as helicopters) or fast-moving aircraft and unmanned aerial vehicles (UAVs.) The high volume of fire also has a debilitating psychological effect on pilots.

Guns, by virtue of the psychological effects of gunfire, suppress all types of aircraft, even the ones they don't shoot down. The Bradley's gun, primarily dedicated to "looking up," can have a chilling effect on enemy pilots. This is called suppression or virtual attrition. Pilots are aware of the important contribution guns make to the battle. Even when guns miss, pilots must jink and maintain a high air speed, which decreases the accuracy of weapons delivery. The stress inherent in this situation dramatically diminishes a pilot's performance. This is true for both rotary-wing and fixed-wing pilots.

I think the division requires the capabilities of specialized air defense systems.

— Maj. Gen. Wesley Clark, Commanding General, 1st Cavalry Division

During World War II, more than 442 German aircraft attacked the Remagen bridgehead, the only remaining bridge over the Rhine River, shortly after U.S. infantry had seized it. Although antiaircraft artillery units that had quickly massed to defend the bridge only shot down 142 aircraft (with another 59 probables), the heavy volume of antiaircraft artillery fire that filled the daytime sky with clouds of flak and lit up the nighttime sky with tracers kept the Germans from effectively and accurately delivering their bombs. In *Prodigal Soldiers,* published in 1995, Gen. Chuck Horner, the Gulf War air commander, relates to author James Kitfield that, during the Vietnam War, "if pilots flew low they were vulnerable to conventional AAA [antiaircraft artillery] fire, still the most dangerous threat to pilots." Those pilots who were lucky enough to survive the volcano of antiaircraft fire that erupted from North Vietnamese batteries that lined the Red River along the route to Haiphong Harbor called themselves the "Red River Rats;" a testimony to the fear guns put into a pilot's mind. In a recent book on the Gulf War, *Strike Eagle: Flying the F-15 in the Gulf War*, author William Smallwood quotes Capt. Jim "Boomer" Henry as saying:

> *"The triple A was . . . well, imagine sitting around a big campfire at night — one with lots of embers — and then some drunk idiot throws in a big log. The embers go everywhere — that was what triple A looked like. As far as I could see there was nothing but tracers. I was scared sh....."*

The concern enemy guns cause these USAF pilots — unquestionably the world's best — leads to the logical conclusion that guns, wherever they are, are effective.

The BSFV also brings another factor to the battle that I think every division commander should appreciate. It is another weapon in the task force that enhances firepower and has a crew trained to operate at great distances from their leaders. BSFV crews trained to Gunnery Table VIII are capable of bringing fire on the objective when there is a minimal air threat or no air threat.

An equally important reason for the use of guns is that they provide self-defense against threat armored vehicles (lower-end BMP types). Guns also cover high- to medium-altitude air defense (HIMAD) and missile dead zones and provide quick reaction against pop-up targets such as helicopters. At close proximity, guns provide a less expensive kill than missiles. And countermeasures (flares, smoke or dust) are less effective against guns than missiles.

The Stinger missile is a necessary complement to the Bradley's 25mm gun. This missile increases the Linebacker's effective killing capability, under ideal conditions, to beyond five kilometers (versus the Bradley's maximum effective range of 2.5 kilometers). The Stinger missile also brings increased lethality and accuracy against high-performance aircraft that is lacking in a solely gun-based system. The Soviet-Afghan War best highlights the effectiveness of the Stinger missile. During this war, Mujahideen soldiers successfully employed the Stinger missile against Soviet heli-

copters. The Soviets first curtailed Mi-8 Hip helicopter reconnaissance, then stopped it altogether. Overall, the Stinger missile prevented the Soviets from effectively employing their aircraft and forced them to suffer heavy attrition. This eventually helped the Mujahideen win the war. Properly employed, the potent, lethal Stinger is a winner of wars.

The current reprogrammable microprocessor (RMP) Stinger version is very capable against current threats, but it has several deficiencies we must correct if Stinger is going to counter next-generation systems. The Block I RMP missile will have much improved capability against low-aspect targets (head-on), slow and stationary targets (rotary-wing and unmanned aerial vehicles) and smaller targets (unmanned aerial vehicles and cruise missiles). It will also have improved capability against infrared countermeasures and targets flying at night. The Block I missile, however, does not possess the capability to engage low observables (low infrared) or targets in clutter at the required ranges. The Block II RMP missile's new seeker resolves these deficiencies and, in effect, buys back battlespace Stinger has lost to these kinds of targets.

The currently fielded BSFV solves several shortfalls of past systems but, unfortunately, can only serve as an interim system. The BSFV suffers from inadequate air defense coverage and mobility because it must stop to deploy the Stinger team and, therefore, cannot maintain pace with the defended force. When the BSFV lags, the defended force loses its air defense coverage. This system also provides inadequate survivability. When the Stinger team dismounts to engage a target, they are vulnerable to lethal direct and indirect fires. They may be injured when they dismount among maneuvering armored vehicles: a prediction proven by documented accidents at the NTC. The BSFV also cannot effectively use forward area air defense command, control, communications and intelligence data. A lack of automatic orientation makes alignment of the simplified hand-held terminal unit target display slow and cumbersome, and the information it provides is accessible by the Bradley commander or Stinger team, but not both. And because the Stinger team must deploy to engage the enemy, another shortcoming comes to bear: target acquisition and identification. Since the Bradley commander or gunner cannot pass target information accurately and rapidly to the deployed Stinger team, the Stinger team must autonomously redetect, reacquire and visually identify the target. Lastly, the Stinger team has no night engagement capability.

The Linebacker solves these problems. Not only does it possess the necessary gun and missile mix, it is also a better integrated system. Because the turret eliminates the need for the Stinger team to dismount, the Linebacker can keep pace with the supported unit. The survivability issue is also moot because the whole crew remains under armor during the battle. The Linebacker's slew-to-cue capability, automatically oriented simplified hand-held terminal unit, integrated forward-looking infrared radar and direct-view optics allow the quickest reaction time possible. The FLIR also provides a limited nighttime capability. Lastly, studies have shown that the Linebacker can provide better than 85 percent of the performance of a full ADA turret at a fraction of the cost. The cost-effective Linebacker is available now.

I remain convinced the Army is doing the right thing by keeping Air Defense Artillery in the divisions and equipped with the Bradley 25mm gun and Stinger Block II RMP. The air defense weapon system is a critical member of the combined arms team and plays a unique and crucial role in suppressing the enemy's fixed- and rotary-wing capabilities. As such, it must remain in the divisions.

The Linebacker increases the threat to attacking aircraft and provides an additional means of repelling ground threats. It is survivable, durable, light, robust and easy to fix, and can effectively engage all target sets. Guns cover missile dead zones and increase the threat to the attacker by broadening the spectrum of violence directed at him. Guns have a faster reaction time and shorter time of flight, and are better in situations where engagement space is constricted (urban, mountain, forest). Moreover, a combination of guns and missiles provides a defense against all types of unmanned aerial vehicles and low-level aircraft. This defense forces the attacker's high-performance aircraft to fly up and into the highly effective defenses of the USAF and Patriot weapons systems. For these reasons I believe we need to get the Stinger team under armor and purchase the Linebacker version as soon as possible. The Army and Air Defense Artillery need your continued support for this capability.

Capt. Daniel P. Correa wrote this article while attending the Officer Advanced Course at Fort Bliss, Texas. His follow-on assignment was at Fort Hood, Texas. Col. Michael Vane, director of the Directorate of Combat Developments, U.S. Army Air Defense Artillery School, served as technical advisor.

THE ADA BATTALION S-2 AND IPB

by Capt. Danny Wallace

Korea: Land of the Morning Calm. Not so for me when I learned about my upcoming assignment in the 2nd Infantry Division. I was "stuck" as the 5-5 ADA S-2 — surrounded by non-intel types who expected me to be a wealth of knowledge on enemy air threat and intelligence preparation of the battlefield (IPB). I sunk into an even deeper depression when I discovered that sources on the process of producing air intelligence and threat information were extremely limited. I had just come from the Military Intelligence Advanced Course, and probably slept through the block of instruction on third dimension IPB, because the only thing I remembered was how to make air avenues of approach. I was facing 12 months in Korea in a job that I felt only marginally qualified to perform.

5-5 ADA is very unique in that it is the only separate combat battalion in the 2nd Infantry Division. Separate battalions are expected to generate brigade-level products and information with a battalion-size staff. The S-2 section of an ADA battalion is authorized three personnel: an S-2 (captain), NCO in charge (E-7) and an intelligence analyst (sergeant). Being a separate S-2 does have its advantages, however, the best being direct access to the brigade S-2s and G-2 for information to answer even the most obscure questions that commanders may ask.

Getting Started

In deciding how to represent the air threat picture, I did find a few field manuals that proved helpful in figuring out how to represent third dimension IPB. The U.S. Army Air Defense Artillery School does have some informative sections on air threat and analysis in its manuals. These references include FM 44-10, *U.S. Army Air Defense Operations*, FM 44-6, *FAAD/SHORAD Battalion Operations* and FM 44-48, *Tactics, Techniques, and Procedures for the Sensor Platoon.*

I also referred to two Military Intelligence manuals (FM 34-1, *Intelligence and Electronic Warfare Operations* and FM 34-130, *Intelligence Preparation of the Battlefield*), but I initially found the ADA sources more applicable. It's a lot easier to justify certain techniques to ADA officers by quoting from manuals produced by *their* schoolhouse.

The forward area air defense (FAAD) ADA battalion has more than 70 individual firing units and six light and special division interim sensor (LSDIS) radars. These radars, used for early warning of approaching enemy aircraft, can help the S-2 confirm predicted air avenues and help with determining the locations of airfields and forward operating bases (FOBs). These radars are the best internal assets for battlefield threat information.

Outside the battalion, I obtained useful information from other S-2s and the G-2. A working relationship with the Air Force was also helpful; they look at enemy air much more than the Army and have experts on enemy ground attack tactics. Another excellent source, if you are overseas, is the host nation. They have usually been facing the threat as long, or longer, than you have. As a courtesy, I always kept the G-2 informed of attempts to obtain any information outside the division.

Intelligence Preparation of the Battlefield

I've discovered two important tenets: there is no universally accepted way to do third dimension IPBs, and the battalion commander always determines the right way to present the threat. The hardest part about being an S-2 is packaging the intelligence picture in a simple, readily usable form. This is driven by the audience (my audience consisted of the battalion and battery commanders) and can mean the difference between comprehension of the actual threat and misconception of the real situation.

Between the demands of the commander and the inputs from G-2, I found the best way to do third dimension IPB involves a few steps similar to those for ground IPBs:

- Define the battlefield environment.
- Describe the battlefield effects.
- Evaluate the threat.
- Determine threat courses of action.

The primary difference between third dimension and ground IPBs is figuring out how to analyze and present the air threat

AIR SORTIE GENERATION

Information Needed

# Aircraft Available	_____	
Operational Readiness Rate	_____	(usually 50 - 90%)
# Sorties per Aircraft per day	_____	(depends on enemy's ability and willingness to turn around aircraft)
Attrition Rate (how many we'll shoot down per mission)	_____	(10 - 40%)

Compute Sorties on the First Day

Step 1:	# Aircraft X Operational Readiness Rate	=	First Attack
Step 2:	First Attack X (100% - Attrition Rate)	=	Second Attack
Step 3:	Second Attack X (100% - Attrition Rate)	=	Third Attack
Step 4:	First + Second + Third Attacks	=	1st Day Sorties

Example. If you are facing 135 total aircraft, the calculations would be as follows:

135 X 85% (OR Rate)	=	115 Aircraft in 1st Attack
115 X (100%-20% Attrition)	=	92 Aircraft in 2nd Attack
92 X (100%-20% Attrition)	=	74 Aircraft in 3rd Attack
115 + 92 + 74	=	281 Aircraft Sorties on 1st Day

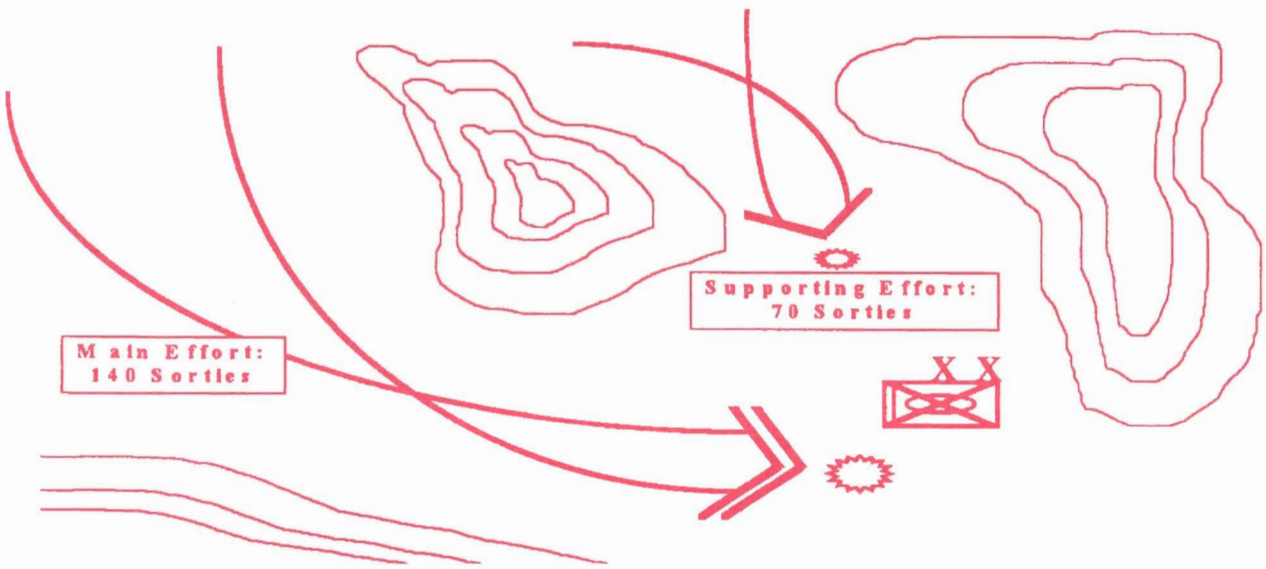
Break the total aircraft sorties into specific numbers of aircraft dedicated to the division's area of interest:

1. Decide how you'll divide the forces.

Main Effort	=	2/3 of committed forces (example)
Supporting Effort	=	1/3 of committed forces

2. Divide the total amount of aircraft between the efforts.

Main Effort	=	210 x 2/3	=	140 Sorties
Supporting Effort	=	210 x 1/3	=	70 Sorties:



in relation to the "big picture." Aircraft are often employed in relation to or in support of ground forces, so you must consider the ground situation when deciding how the enemy will attack. Here's an example of how to apply the IPB-developing steps listed above.

Define the Battlefield Environment. This includes both the ground and air areas of interest. The S-2 must focus on all ground avenues that ADA units will travel through and be affected by (to include enemy attack and counterattack routes). The air portion includes all air and ground avenues of approach into the division sector, ingress and egress routes, and the airfields and FOBs that the enemy will use to deploy aircraft. The rapid speed and deployment capability of aircraft makes the battlefield environment very large, and the S-2 must look deep to accurately predict enemy aircraft deployment and attacks.

Describe the Battlefield Effects. This includes a detailed terrain analysis with special emphasis on known and planned enemy and friendly obstacles. A typical FAAD battalion relies heavily on high mobility, multipurpose wheeled vehicles (HMMWVs) to move its missiles, and the individual batteries must be aware of the best routes available to their battle positions. Korea, for example, is filled with pre-planned obstacles, and engineer overlays are essential to assist units in getting around on the battlefield.

You must determine and evaluate air avenues of approach to accurately predict where the enemy will fly. Determining the ground avenues of approach is the first step: the enemy may use some of these as air avenues because enemy air attacks often (but not always) occur in support of ground force movements. When identifying masked routes, you must take into consideration the enemy's flight characteristics; for example, flying low over bodies of water helps aircraft evade radar detection and makes for easy navigation. Consider all of these factors along with the types of aircraft (fixed-wing, helicopter, UAVs) and the competence of the enemy to determine plausible air avenues.

Finally, weather analysis is key for any determination of flying times and techniques. In Korea, the early morning fog at certain times of the year will ground most aircraft until mid-morning. As the S-2, you are *directly* responsible for the weather, or so it seems at times. Learn about the climatic norms for a specific time during the season and how to get in contact with the local Air Force weather team for daily forecasts. I also learned how to do simple predictions with experience: rain and cool temperatures one day mean fog the next and, during monsoon season in Korea, *always* say there is a chance of rain.

Evaluate the Threat. This part of the third dimension IPB process involves the most homework. With adequate preparation and research, you can determine the enemy's order of battle, capabilities and deployment techniques. The only variable is how enemy air will be used in your area of interest. The S-2 must look at the enemy with a doctrinal template (how do the *books* say he'll attack) and with common sense develop a situational or event template (how will he *actually* attack given the current state of his equipment, personnel and the situation). ADA-branched personnel in the battalion are excellent sources of information on typical flight patterns and techniques. Never be afraid to walk over to the S-3 and let them proof your estimate; the point is not to work in a vacuum.

Determine Threat Courses of Action. This is the final stage, the "bread and butter" of the IPB process. When the commander asks, "Exactly where and when will enemy aircraft attack?" the S-2 should be able to give him an accurate *guess.* Produce the situation template with the enemy forward line of troops and air avenues. Use a large map (1:250,000 or larger) to display and brief enemy airfields and staging areas. The other products you produce depend on the situation. If you predict the enemy will surge during certain times in the battle, then develop an event template and decision support template.

Enemy air employment is fluid and often unpredictable, so you must adapt conventional templates to fit the threat environment. The commander will ask you exactly how many sorties of enemy aircraft (defined as one aircraft flying one mission) will be committed down each air avenue in a given situation. This is one of the toughest questions to answer as the ADA S-2, but you can predict actual numbers using the process illustrated on the preceding page.

Once you know how many aircraft the enemy can commit to a given course of action, then you can predict how he'll fly and fight. The ability to develop numerous air employment options depends on the time available and on enemy and friendly ground courses of action. Again, the commander and the battalion decide how, and to what degree, to present this information.

Conclusion

This IPB business is not difficult, but it does involve being attuned to the needs of both the commander and battalion. Knowing which questions to ask G-2 and where to go to find other answers is key to being successful. Establishing ties with other S-2s, the G-2 staff and higher-level intelligence producers (corps G-2, J-2, the Air Force and host nation sources) makes predicting enemy courses of action easier. As the ADA battalion S-2, you can present third dimension IPB simply and effectively if you use the tools available to gather and disseminate the information. Never be afraid to make a prediction based on an analysis of the current situation.

The entire division looks to the ADA battalion S-2 as the air threat expert. It's your job not to let them down!

Capt. Danny Wallace just finished his first year in Korea as the 5-5 ADA S-2. He is currently assigned to the 532nd Military Intelligence Battalion, 501st Military Intelligence Brigade, Yongsan, Korea.

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FORCE XXI

Today's Vision Tomorrow's Reality

The ADA Vision is the result of a careful review of National Security Strategy, ADA doctrine and vision statements articulated by the Army Chief of Staff; the Commander, U.S. Army Training and Doctrine Command; and chiefs of other combat arms. The review was accomplished in light of technological trends and the availability of resources for force structure and materiel. During the review, the Chief of Air Defense Artillery identified six ''enablers'' (stabilizing, reorganizing, standardizing, modernizing, modularizing and rightsizing) that will transform today's vision into tomorrow's reality. These enablers, which will serve Air Defense Artillery as catalysts for change, are described below.

Stabilizing the Force

We need the best soldiers we can recruit , and we must keep them in the Army. We will strengthen our recruiting efforts to attract the best soldiers. We will train soldiers to the highest standards and create professional development programs that ensure each ADA soldier a bright future. We will cut our frequently deployed Patriot soldiers a little slack by creating a tenth Patriot battalion and reducing rotational assignments for all ADA soldiers. First-rate soldiers shouldn't live like second-class citizens. We will eliminate substandard housing and replace it with quarters that single soldiers will be proud to call home.

Reorganizing the Force

We will reorganize the branch at all echelons so that ADA units can interoperate seamlessly on 21st century battlefields as an integral part of Force XXI. We will establish the Army Air and Missile Defense Command to fully integrate air and missile defense operations, command and support echelon above corps ADA units and support air component commander liaisons.

Standardizing the Force

Joint and multinational operations are the future. We will standardize doctrine, organizations, weapons, C^3I systems, equipment and operational procedures to achieve complete compatibility and interoperability throughout theaters of operation. We will organize Patriot, Avenger/Stinger and divisional ADA into standardized battalion and battery configurations across the total force.

Modernizing the Force

We will look always to the future. We will upgrade the Avenger, Bradley Stinger Fighting Vehicle, FAAD C^3I, Patriot and Stinger. We will field THAAD, MEADS/Corps SAM and fully automated air defense tactical operations centers. We will develop advanced short-range air defense and national missile defense systems to deal with evolving threats.

Modularizing the Force

We will modularize ADA organizations, systems and components for task force packaging and rapid deployment for force projection and force protection operations. We will create a highly deployable, easily tailorable ADA force that will be ready to fight the moment the ramp touches down.

Rightsizing the Force

We must cut manpower, materiel and operating costs, but we can still afford to be the best. We will optimally size air defense systems and organizations to balance affordability, effectiveness and operational risk.

ADA GOAL

'No One Targets Or Shoots At Our Ground Forces From The Air'