ADA AIR DEFENSE ARTILLERY

MARCH - APRIL 1990

ADA and ASAT .....Page 24

CAPITAL MILITARY PUBLICATIONS, P.O. BOX 399, CEDAR PARK, TX 78613
ADDRESS CORRECTION REQUESTED

BULK RATE
U.S. POSTAGE
PAID
AUSTIN, TEXAS
PERMIT NO. 1241

ADA AIR DEFENSE ARTILLERY

MARCH - APRIL 1990

FEATURES

Errors! 3
Short-range air defense IFF programming errors continue to crop up in the field.

A^2C^2 – the Air Defender's Role 6
Air defenders must broaden their professional knowledge of the airspace management process.

Fighting the Future 12
Air Defence Artillery enters the combined arms family in a vivid battle experience provided by SIMNET.

ASAT 24
The U.S. leads in satellite and anti-satellite technology...but the Soviet Union has the only ASAT weapon system. ADA assumes a major role in ASAT weapon system development.

The Right Stuff 32
In weapons testing and acquisition, decision-making depends on correct data, properly analyzed and used with some knowledge of how it was collected and what it means.

From Coast Artillery to Air Defense Artillery 38
The evolution of ADA began (and continues) with new technology that required technically skilled and trained NCOs.

IPB – A Logical Approach 42
When molded to fit the commander's needs, IPB significantly enhances a unit's ability to prepare for and win the AirLand battle.

DEPARTMENTS

Intercept Point 1
ADA Forum 22
Vapor Trails 34
Career News 46

Original cover art by Fort Bliss, Texas, artist, Frank A. Hughes

Col. V. J. Tedesco Jr.
President, ADA Association

Blair Case
Chief, ADA Publications Division

Jim Collins
Editor-in-chief

Hubert Koker
Editor

Lisa Henry
Managing Editor

Maggie Aguilar
Angelica Garcia
Deb Letterle
Contributing Illustrators

ADA is a professional journal devoted to the advancement of the art and science of air defense artillery of the U.S. Army and is published by Capital Military Publications, Austin, Texas. Articles appearing in *ADA* do not necessarily reflect the opinion of the officers or members of the association, nor of the U.S. Army Air Defense Artillery School nor the Department of the Army, nor Capital Military Publications. Except for advertising, this version of *ADA* contains the same editorial information published in Air Defense Artillery, the official professional development bulletin compiled by the U.S. Army Air Defense Artillery School.

POSTMASTER: Send address changes to Capital Military Publications, P.O. Box 399, Cedar Park, TX 78613

CORRESPONDENCE: Address articles and letters to: Editor, ADA, USAADASCH, ATTN: ATSA-ADA, Building 55, Fort Bliss, Texas 79916-7004. Telephone (915) 568-4133. AV 978-4133.

SUBSCRIPTIONS: May be obtained by contacting Capital Military Publications, (512) 250-9023 or writing Capital Military Publications, 12416 Hymeadow Drive, Austin, TX 78750. Rates are $10 domestic and $30 foreign for six issues per year.

CAPITAL MILITARY PUBLICATIONS

Dusty Miller
Publisher

Ric Reaghard
Marketing Director

Mary Thompson
Graphics Director

Bill Lifland
Vice President
Director of Data Processing Services

Subscription Staff
Kimberly Batts, Kelly Holton, Sarah Richardson

Publications & Communications, Inc.
12416 Hymeadow Dr.
Austin, TX 78750
(512) 250-9023
(512) 331-6779 (FAX)

Gary L. Pittman
President

Tom Clark
Mary Wilson
Vice Presidents & Publishers

CAPITAL MILITARY PUBLICATIONS

Nobody Makes You Look Better On Paper

Providing the military with quality publications, and services.

For more information on Capital's products or services, contact Ric Reaghard
512-250-9023

12416 Hymeadow Drive
Austin, TX 78750

P.O. Box 399
Cedar Park, TX 78613-9987

This issue of *ADA Magazine* once again illustrates the great flexibility of the ADA Branch. Our cover and feature article deals with ADA in space while the CG's "Intercept Point" and an additional feature article talk of ADA in direct support of the Army's bottom line: a mech-armor task force. Being an air defender in the 1990's is great.

The association is proud of its role in administrating the Order of Saint Barbara for our branch. This past Saint Barbara's Day we expended countless manhours and more than $400 in association funds to make Saint Barbara's Day a great success throughout the branch. Soon we hope to publish a new SOP for awarding and wearing the proud Artillerymen's award.

Getting a great magazine off the ground is proving to be no easy task! Therefore, I continue to ask each and every one of you to get your $10 subscription in the mail and help us. We would also welcome your comments on this magazine.

First to Fire!

V. J. Tedesco Jr.
COL, AD
President, ADA Association

ADA Association Gift Shop

The ADA "company store," the Gift Shop, offers a full inventory of items, including a variety of logo items featuring the legendary design work of the late Col. Robert Matlick.

Among the new items are golf umbrellas with "First to Fire" legends, a complete set of miniature crests for tie tacs, and bandanas, aprons and tote bags emblazoned with "ADA, Hottest Brand in the Army."

The inventory also includes the familiar ADA T-shirts, sweatshirts, baseball caps, bumper stickers, patches, aprons and coffee mugs. Smaller items perfect for party favors include spoons, bookmarks, paperweights and letter openers, all with the ADA logo. Prestige items include solid walnut boxes, plaques and pen sets topped with brass and red ADA insignia.

Located in the ADA Museum, Fort Bliss, Texas, the store is open weekdays from 10 a.m. to 4 p.m. For more information, call (915) 564-4331 or write to the ADAA Gift Shop, Bldg. 5000, Pleasanton Road, Fort Bliss, TX 79906.

A CLEAR PATH IN AIR DEFENSE

In striving to modernize air defense capabilities, during this time of decreasing defense budgets, a clear path exists.

High-performance, cost-effective defense systems are a specialty at Hughes Aircraft Company. For the Royal Norwegian Air Force, Hughes has worked with Norsk Forsvarsteknologi A/S (NFT) of Norway to produce the Norwegian Adapted Hawk (NOAH) surface-to-air missile system.

Today, 24 Acquisition Radar and Control Systems, using new-generation Hughes TPQ-36A three-dimensional radars and NFT fire distribution centers, protect Norwegian air bases with HAWK missile launcher elements and short-range anti-aircraft artillery. These advanced systems have provided highly reliable service with significant improvements in firepower and life-cycle costs over the older systems they replaced.

For the future, an even newer generation surface-to-air missile system is being developed with a low-cost, low-risk approach. Expanding on their NOAH success, Hughes, NFT and the Royal Norwegian Air Force are building an even stronger system... again using the Hughes TPQ-36A radar and the NFT fire distribution center, but adding the Hughes Advanced Medium Range Air-to-Air Missile (AMRAAM) in a ground-launched mode.

Ground-launched AMRAAM, above, and TPQ-36A/NOAH, below.

Called the Norwegian Advanced Surface-to-Air Missile System (NASAMS), it will take advantage of the advanced, proven capabilities of all three systems, including the fire-and-forget capabilities of AMRAAM. NASAMS will provide Norway with dramatically higher firepower, greater coverage and lower life-cycle costs.

Hughes Aircraft Company and European partners meeting defense needs.

HUGHES

Subsidiary of GM Hughes Electronics

©1990 Hughes Aircraft Company

INTERCEPT POINT

Measuring ADA's Battlefield Contributions

Declarations that the Cold War has ended and that we have won may be premature, but there can be no doubt that we are witnessing a world in transition. Tyranny is in full retreat. The clamoring of the Central European nations for freedom, the crumbling of the Berlin Wall and the sweeping triumph of democratic reforms have torn the Communist bloc asunder. Out of the upheaval in Europe will rise an altered world order and a total reassessment of the threat that our Armed Forces has faced since the Iron Curtain first descended across Europe.

A predominant perception exists that the world has suddenly become a less threatening place. What impact will this have on force structure and troop strength? A rollback in defense spending and a reduction in troop strength seem inevitable. The so-called "peace dividend" will result in a smaller but still professional Army structured to contend with a redefined but still potent threat.

Modeling the Future

How will Air Defense Artillery fare in the restructuring of the force? My belief is that Air Defense Artillery's stature as a fully-integrated member of the combined arms team will continue to grow.

Simulation Network (SIMNET) exercises, which took place on an electronic battlefield at the U.S. Army Armor Center's Combined Arms Tactical Training Center, Fort Knox, Ky., gave us an exciting glimpse of the future. The exercises were designed to help develop and validate doctrine, tactics, techniques and procedures for our forward area air defense (FAAD) weapons systems and to test their ability to provide protection for the Abrams/Bradley heavy force. Lt. Gen.(Ret.) John H. Cushman and Lt. Gen.(Ret.) Frederick Brown and Maj. Gen. Thomas Foley, Chief of Armor, describe the exercises in "Fighting the Future," Page 12.

OPFOR Pilots Testify

No air defender can read the article without developing a certain optimism about the branch's viability on the AirLand battlefield. "The basic lesson learned was this," conclude the authors, "modern attack helicopters and fighter-bombers are lethal. Without friendly air supremacy, the ground forces are vulnerable. Properly employed, with trained crews, in close coordination with maneuver and fire support, line-of-sight forward heavy and non-line-of-sight are extraordinarily effective. They are essential components of the combined arms team. Once the cavalry and ADA leaders learned how to fight with these weapons, they forced enemy air to fatal compromises. To survive, enemy air became much less effective . . . . The Air Defense Artillery contribution was the difference between victory and defeat . . . . These weapons proved to be more than the traditional air defense, however. Their capabilities for battle information collecting and dissemination multiply the effectiveness of the other members of the combined arms team."

SIMNET OPFOR pilots were especially enthused, or, depending on your point of view, "dis-enthused", with the performance of FAAD systems. "We started out adhering to doctrine, training and tactics," said one OPFOR pilot. "As LOS-F-H and NLOS got it together, we enemy pilots tried everything we could think of. But, because of the combinations of line-of-sight and non-line-of-sight and passive target engagement, we were never able to suppress ADA and get free access to the maneuver, C^2, logistics and fire support of the 3rd Squadron." The pilots quickly developed what Vietnam-era pilots referred to as the "five-second twitch." They took violent evasive action to avoid FAAD engagement even during iterations in which ADA assets had been removed from the electronic battlefield. One

pilot flew his computer-simulated aircraft into the ground in a frantic attempt to evade a non-existent but perceived LOS-F-H threat.

The SIMNET results furnish the sort of empirical data (effective ADA reduced air attack losses from 75 to 14 percent) for which Air Defense Artillery proponents have long been searching. Indeed, SIMNET's demonstration of ADA capabilities has already played an instrumental role in FAAD funding decisions.

SIMNET results combined with evolving AirLand battle concepts, a reassessment of the threat and anticipated troop reductions to further brighten Air Defense Artillery's future.

Evolving AirLand battle concepts require versatile, tailorable forces that can be rapidly deployed and rapidly reinforced worldwide. They demand agile and highly maneuverable forces that can fight across a broad spectrum of combat — light-, mid- and high-intensity conflicts. They must be able not only to win, but win quickly.

Between Victory and Defeat

Air Defense Artillery is at the vanguard of this revolution in combined arms thinking — a revolution that can only gain impetus from current world events. It doesn't take military genius to deduce that evolving AirLand battle concepts and their implications demand that air defense continue to play a pivotal role.

If we are to have fewer main battle tanks, smaller and dispersed formations, it becomes even more imperative that we protect them from air attack and preserve freedom to maneuver.

If we are to have a smaller force, it must be a more agile, more lethal force. Air Defense Artillery's high-tech C^3I components, as SIMNET demonstrated, supply the sensor link between reconnaissance and attack forces that make agility and increased lethality possible.

Admittedly, SIMNET looked only at the FAAD battle. However, other respected models and simulations, perhaps less dramatic than SIMNET, validate repeatedly not only the effectiveness of our current HIMAD systems but, as well, emphasize the enormous improvements to combat capability that will be achievable with execution of the ADA Modernization Plan. Since Air Defense Artillery operates from FLOT to Antwerp (and now even beyond with assignment to ADA of the ASAT mission) our mission area is, and must continue to remain, integrated. Just as FAAD will preserve freedom to maneuver in the close battle, HIMAD will guarantee operational freedom to maneuver . . . and will preserve the capability to reinforce a theater by protecting our strategic capability to do so. Remember, "the airspace of a theater is as important . . . as the terrain itself" (FM 100-5).

Our C^3I programs must function effectively between our FAAD and HIMAD systems to leverage the synergy we know will exist if we can fight FAAD and HIMAD battles concurrently, integrated and effectively.

Analytical data testifies not only to ADA's counterair effectiveness but to its contributions as a combat multiplier. The SIMNET exercises support empirically what we have long believed — Air Defense Artillery can make the difference between victory and defeat.

"First to Fire!"

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

ERRORS! crop up in the field

by Mr. Murrell E. Fassett Jr.

Short-range air defense (SHORAD) identification, friend or foe (IFF) programming errors continue to crop up in the field.

These errors surfaced during an FY 89 air defense artillery/aviation IFF unit assessment PFTEA (jointly conducted by the ADA School's Evaluation and Studies Division, DESCSD, Fort Bliss, Texas, and the TRADOC Analysis Command from White Sands Missile Range, N.M.) of programming Mode 4 IFF in the AN/PPX-3 interrogator for the Chaparral/Stinger or the AN/TPX-50 for the FAAR.

All individuals involved with programming the AN/PPX-3 or the AN/TPX-50 (SHORAD soldiers in MOSs 16P, 16S and 16J) need to address some specific problems noted during the data collection phase (June-August 1989) of the study. The analysis phase is still ongoing.

Code Book

SHORAD soldiers in MOSs 16P, 16S and 16J experience problems identifying the correct table(s) they should use when coding Mode 4. Every code book is based on a 31-day month and every month a new book is used. If you have more tables than days of the month, simply destroy the extra tables at the end of the month. Table selection keys directly to the date. For example, Table 1 corresponds to the first of the month. On the 18th of the month use Table 18; on the 22nd of the month use Table 22; etc. Every table has two days of code (the day of programming and the next day). *Do not separate* the two days of code — you must use all of the code on the page.

Three extra pages appear in the appropriate places. These are "F" tables, and refer to the final day of the month. When you get near the end of the code book, the pages are numbered F28, 28, F29, 29, etc. Table F28 is used *only* on the 28th of February during a normal year. Table F29 is used *only* on the 29th of February during a leap year. Table F30 is used *only* on the last day of a 30-day month.

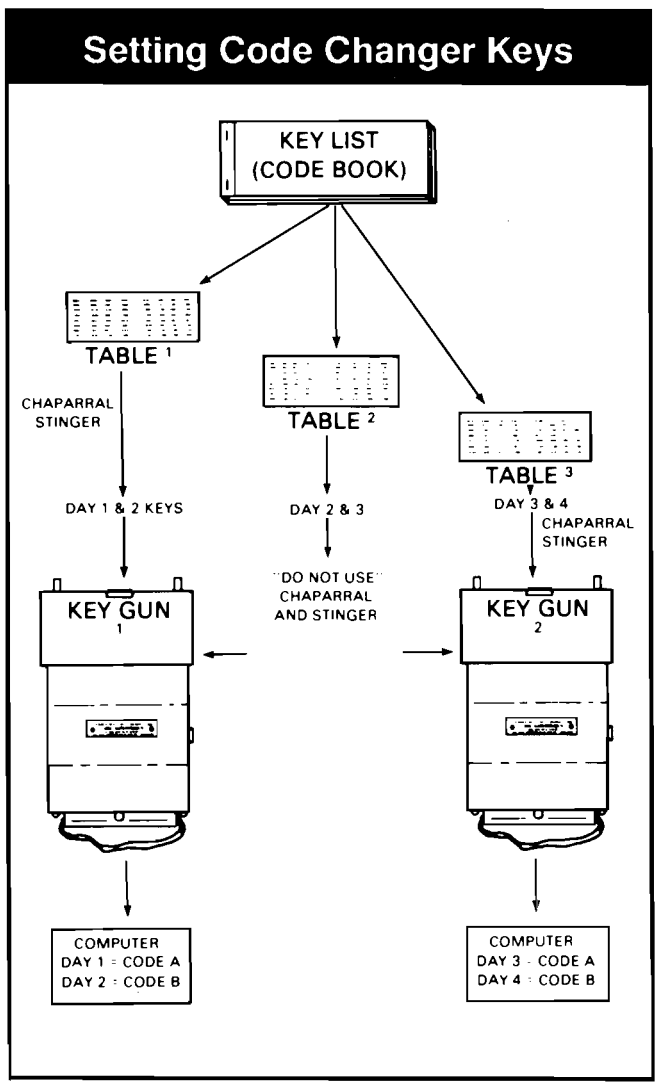
Each table in the code book contains only Mode 4 IFF codes; there are no Mode 3 codes in the book.

MOS 16J uses *only* one table of the code book each time they program the FAAR, but MOSs 16P and 16S must use two tables to program for four days of code. When selecting the tables to program the AN/PPX-3, the table number that matches the date of programming is for days one and two. Skip the next table and enter the third table for days three and four.

There are no exceptions to these procedures.

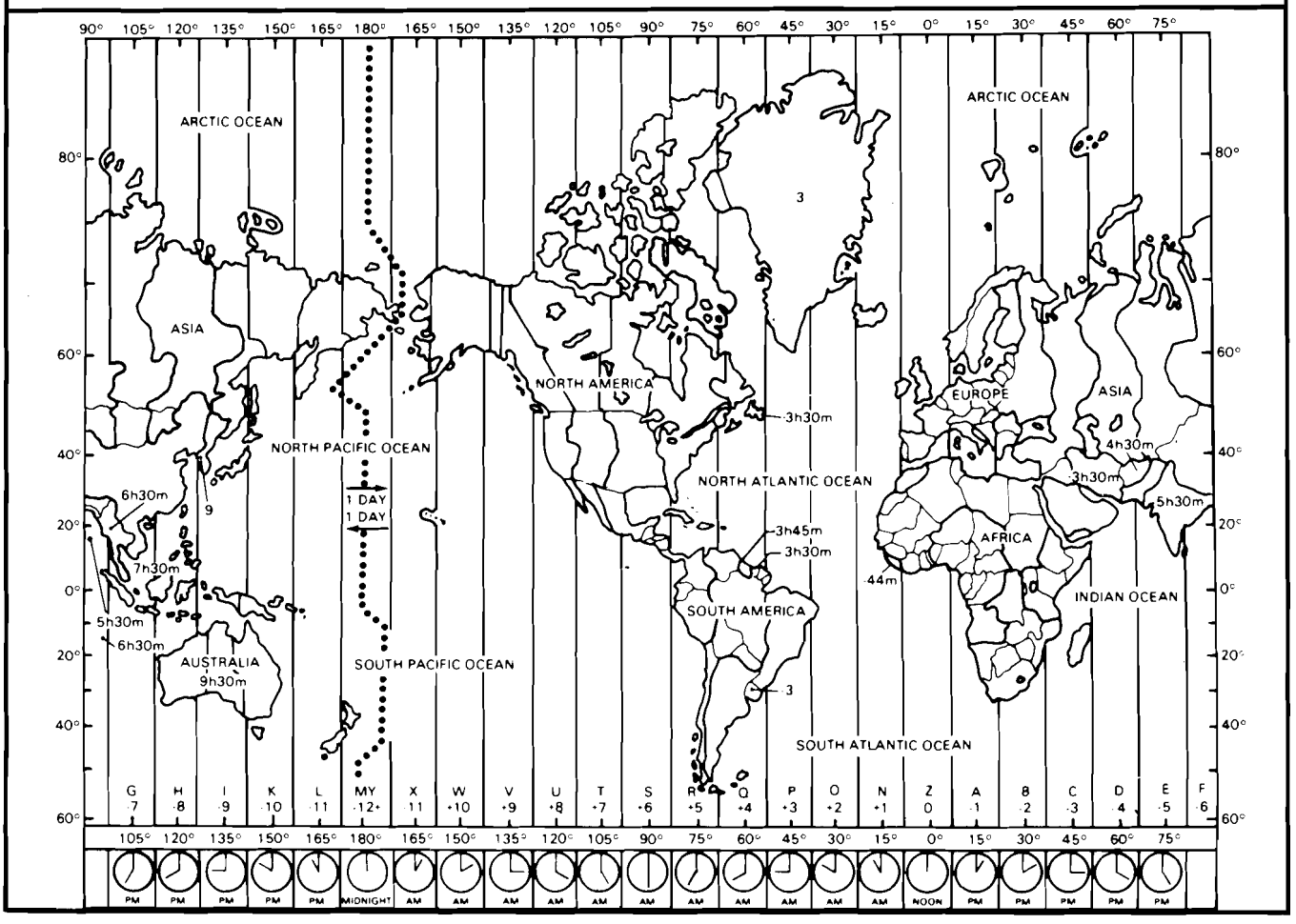
Zulu Time

MOS 16P and 16S soldiers have problems with the correct Zulu time. Many units we visited had clocks displaying local time and Zulu time, but these clocks were normally in the battery orderly room or battalion headquarters. The average soldier, the soldier who has to program the IFF, does not have access to these clocks, and most SHORAD soldiers have no idea what Zulu time is! Also, most soldiers don't know how to convert local time to Zulu time in their area. No one ever told them how much



Telling Zulu Time

STANDARD TIME CHART



TIME CONVERSION CHART

PREVIOUS DAY	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	SAME DAY
	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	
	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	
	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	
	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	
	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	
SAME DAY	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	NEXT DAY
	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	
	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	
	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	
	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	
	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	
	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	
	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	
	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	
	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	
	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	
	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	
	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	
	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	
	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	
	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	
	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	
	Y +12	X +11	W +10	V +9	U +8	T +7	S +6	R +5	Q +4	P +3	O +2	N +1	Z 0	A -1	B -2	C -3	D -4	E -5	F -6	G -7	H -8	I -9	K -10	L -11	M -12	

time to add or subtract. You absolutely *must* know the correct Zulu time when programming the AN/PPX-3.

AN/PPX-3 Procedures

The procedures for programming the AN/PPX-3 interrogator (soldiers in MOSs 16P and 16S) appear in both TM 9-1425-429-12 (with change 4) and on the inside of the box covering AN/GSX-1 programmer/battery charger.

A minor step has been added to the technical manual that does not appear on the programmer cover. This step involves pushing the "interrogator test switch" prior to programming. This step checks the cable connections, battery condition and operability of the AN/PPX-3. Write this step on the programmer cover between Steps 2 and 3. If you wait until you have completed programming to test the interrogator, you may find that you have a defective battery, cable or interrogator. That means you have to replace the defective part and start programming again.

Follow these steps *exactly as written*. Some soldiers are modifying these steps by entering the mode and time repeatedly, changing the mode from M4/M3 to M4 during programming, and by updating the Zulu time clock and re-entering it after programming has begun. These procedural errors may invalidate the code. These errors are under investigation by the manufacturer.

Some soldiers don't understand what the M4/M3 and M4 positions on the programmer mean. The M4/M3 position tells the AN/PPX-3 to challenge in Mode 4 first, then, if there is no reply, to challenge in Mode 3. The M4 position tells the AN/PPX-3 to challenge in Mode 4 only. You cannot enter both commands into the AN/PPX-3 because whichever one you enter last applies.

AN/TPX-50 Procedures

The procedures for programming the AN/TPX-50 in the FAAR (MOS 16J soldiers) appear in TM 9-1430-588-10.

Because many units don't require their FAAR personnel to program Mode 4 IFF in the AN/TPX-50, many soldiers have had little or no practice coding or using Mode 4 IFF and operating the associated switches.

Many 16J soldiers don't understand that one page of the code book has two days' of code on it. When they enter the code into the KIR-1A computer, they believe they are entering only one day of code.

They also don't understand that the A/B switch separates the code into today's code (A) and tomorrow's code (B). They are not sure why or when they should use the A/B switch.

Use Position A during the day of programming up to 2400Z. If you operate past 2400Z, switch to Position B at exactly 2400Z. This allows the FAAR to challenge in Mode 4, using the new code of the day.

Equipment Security/Damage

Some MOS 16P, 16S and 16J soldiers fail to zero the KIK-18 code changer key. This violates security because the code could be compromised if unauthorized personnel see it. Always zero the KIK-18 code changer key when you are through using it, or keep it in a secure place if you will be using the same code later.

Also, some SHORAD soldiers fail to properly zero a KIK-18. They damage the locking mechanisms, bending the pins and damaging the pin setting fingers. Complete instructions on how to zero a KIK-18 appear in TM 9-1425-429-12. *Follow these instructions exactly.* There is a built-in "zeroize bar" in each half of the KIK-18. Do not use your fingers, the tabletop, a book or the floor to push the pins to the zero position.

Marking the Interrogator

After programming is complete, some MOS 16P and 16S soldiers mark the wrong expiration date and time on the interrogator. They add four days to today's date — inadvertently telling the soldier who is going to use the interrogator that he has one more day of code than he actually has. The AN/PPX-3 is programmed for four days, and the day that you code is always day one. The internal clock in the AN/PPX-3 starts when you enter the mode/time. The clock counts from the time you have entered to 2400Z, then switches to the next day's code. At 2400Z on the fourth day, the clock zeroes all Mode 4 code. The interrogator will only challenge in Mode 3 until you reprogram it with Mode 4 code.

Lack of Proficiency

Too many soldiers state that they have never programmed the IFF or have not programmed in many months and have forgotten how. Some soldiers incorrectly program the IFF because they follow word-of-mouth changes made by others.

SHORAD soldiers *must* practice programming to become proficient in IFF, and they must understand what information IFF provides to use it correctly. During practice, soldiers must *follow the instructions* on the programmer cover or in the manual *exactly as written*.

If you have any questions about these or other problems involving SHORAD IFF programming, contact Mr. Murrell E. Fassett Jr. at (915) 568-6157 (AV 978-6157).

Mr. Murrell E. Fassett Jr. is a training specialist in the Directorate of Evaluation, Standardization, Concepts, Studies and Doctrine (DESCSD) (formerly DOES), Fort Bliss, Texas.

A^2C^2 the Air

by Capt.(P) Robert F. Barrow

Successful integration of combat systems requiring the use of airspace on the battlefield hangs precariously on the critical role played by Army airspace command and control (A^2C^2). These systems include air defense artillery, field artillery, aviation, close air support, airlift support, electronic warfare and smoke operations.

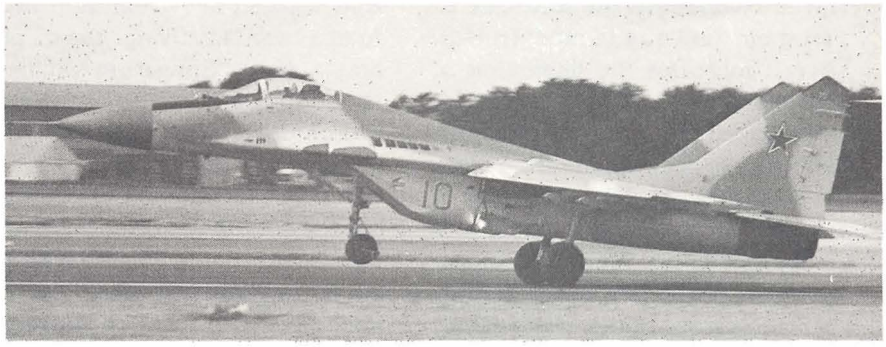
Field Manual 100-103, *Army Airspace Command and Control in a Combat Zone*, states that the objective of A^2C^2 is, "to ensure the most effective employment of combat power by those airspace users whose unrestricted use of airspace might result in the loss of friendly air assets." Stated another way, A^2C^2 maximizes friendly use of airspace while minimizing the chance of fratricide. Air defenders play a crucial role in this process.

Failure to comply with A^2C^2 procedural doctrine, coupled with the lethality of modern air defense weapons, can potentially prove catastrophic to friendly air operations. The Arab-Israeli War demonstrates what can happen when we fail to properly manage airspace. The Egyptians lost over 35 aircraft to friendly fire during that brief conflict. In World War II, during the Sicily campaign, the Allied forces suffered terrible fratricide losses in an attempted airborne operation. Of 144 planes participating in the assault, 23 never returned and 37 suffered severe damage as a result of friendly fire. Outnumbered U.S. forces cannot expect to fight and win unless we avoid repeating these bitter lessons.

Over the years, the air defense community developed a reputation for emphasizing engagement control measures for both high- to

Defender's role

medium-altitude air defense (HIMAD) and short-range air defense (SHORAD) units. Visual aircraft recognition continues to be a major training challenge for air defenders worldwide. So why the sudden concern for potential fratricide of friendly air assets? Some would argue that the ADA community does more than its share to avoid this unfortunate consequence of war. While there is no question that we



The UH-60 Blackhawk (left) and the MIG-29 Fulcrum (above).

make an effort to limit this possibility, it may not be enough.

One still hears the old adage "shoot 'em down and sort 'em out on the ground" during routine training events. Aviators contribute to this ill-advised mentality as well. Many continue to fly according to the "big sky, little bullet" theory. Regardless of past efforts, we must stand at the forefront in the development of airspace control measures.

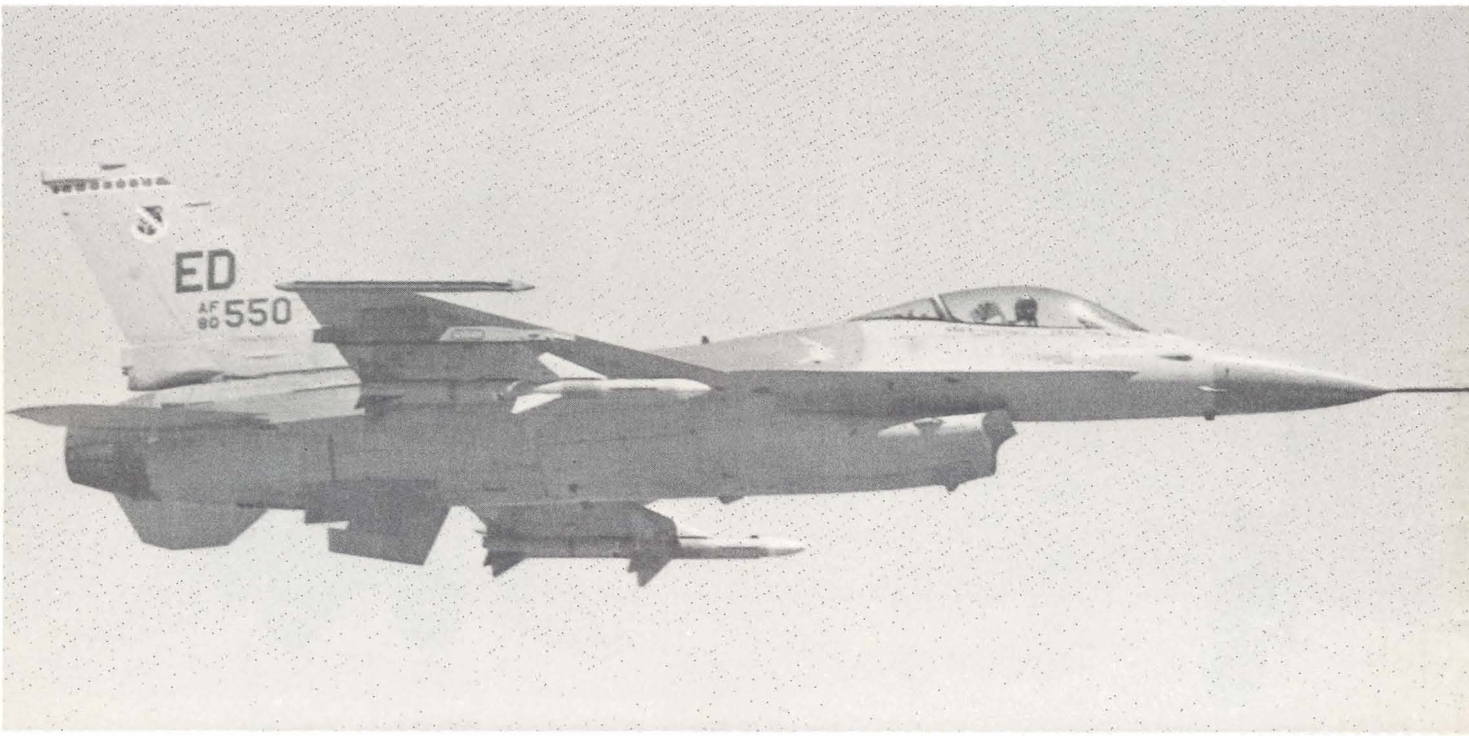
Advances in the Soviet air arsenal warrant greater concern. The deployment of the MiG-29 Fulcrum, Su-27 Flanker and Mi-28 Havoc compounds the fratricide issue: their similarity to modern U.S. aircraft increases the likelihood of misidentification and loss to friendly fire. Even the Army's primary lift helicopter is not immune from identification miscues. Many veterans of combat training centers attest that an approaching UH-60 Blackhawk, seen from a distance, bears a striking resemblance to the Mi-24 Hind, particularly when equipped with extended fuel pods.

ADA weapons will significantly impact the outcome of any future war. We recently witnessed how the introduction of Stinger into the war in Afghanistan ultimately resulted in the withdrawal of Soviet occupational forces. The Stinger struck the Soviet's center of gravity and drove the cost of continuing the war beyond the reach of present Soviet leadership. All of us in the air defense community take pride that one of our prized weapons played such a crucial role in determining the outcome of that conflict. However, we must exercise caution when attempting to apply the lessons learned in Afghanistan to any future war involving the United States (see "Stinger in Afghanistan," *Air Defense Artillery*, January-February 1990, page 3).

Many key aspects of that war are not applicable to a Central European or Southwest Asian scenario. For example, the *Mujahideen* rebels in Afghanistan were not burdened with airspace management responsibilities. They truly had an "if it flies, it dies" approach to air defense. This virtual "weapons free" status provided to be a tremendous tactical advantage. Additionally, the numbers and types of Soviet aircraft flown during that war cannot compare to what we expect to see in a more conventional high-intensity conflict. The potential number of Soviet and Warsaw Pact sorties in a European scenario is mind-boggling. Add that to U.S. and Allied air force sorties, helicopters, remotely piloted vehicles, rockets, missiles, etc., and the potential for fratricide increases tenfold. It becomes painfully obvious that airspace management is absolutely critical, particularly to those of us in air defense artillery.

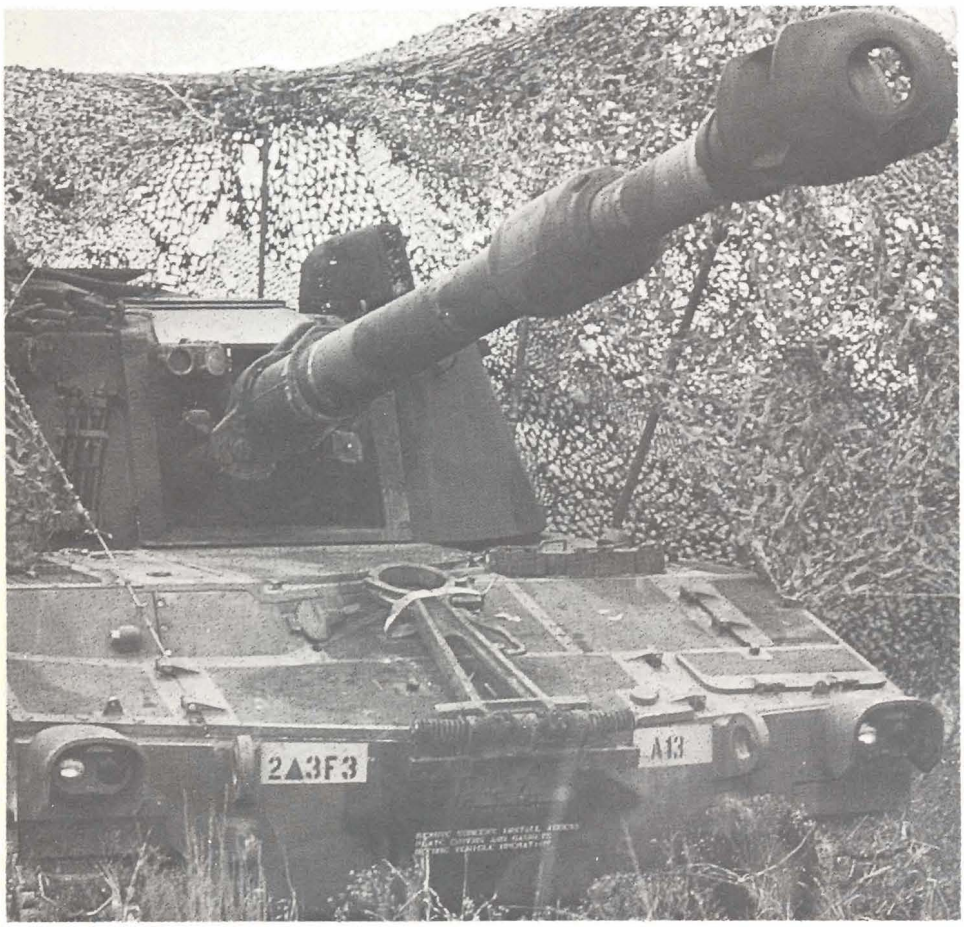
Air defenders are familiar with much of the material found in FM 100-103. Minimum risk routes (MRRs), restrictive operating zones (ROZs) and base defense zones (BDZs) are part of an air defender's daily dialogue. The manual also defines some terms with which

F-16 Falcon (below) and M-109 155mm self-propelled Howitzer (right).



some air defenders may not be familiar. Examples include fire support coordination measures, standard operational procedures for special purpose aircraft, and procedures for A^2C^2 vertical/horizontal information networking. Air defenders must know specific airspace control measures like those mentioned earlier. Equally important, we must clearly articulate the duties and composition of the tactical air control party (TACP) and what information they can provide. We should know what a standard use Army aircraft flight route (SAAFR) is used for and to what boundary it extends. We should understand how the fire support element (FSE) develops an airspace coordination area (ACA) and what effect is has on air defense operations. We must understand what a battlefield coordination element (BCE) is and where it is located. The list can go on and on. The fact is, if we intend to successfully perform the ADA mission, we must talk to other members of the joint and combined arms team using their terminology.

Air defense artillerymen are not responsible for supervising the A^2C^2 element. This is the doctrinal responsibility of the G-3/S-3 air. However, more often than not, the air defender is tasked to provide the commander with recommendations on A^2C^2 procedures and priorities. This happens both at the corps and division staff level as well as at brigade and battalion task force levels. We need to be prepared to assume that role. Very often, maneuver commanders confuse the responsibilities of the A^2C^2 element with those of the FSE. This is understandable since many members of the FSE are also a part of the A^2C^2 element. Maneuver commanders must understand that functions associated with airspace management are unique and deserve equal planning priority by the staff.



Unfortunately, many major training events fail to reinforce this concept. For instance, commanders at the National Training Center (NTC) and Joint Readiness Training Center (JRTC) concentrate on fire control measures designed to synchronize indirect fires while avoiding fratricide. The concern is warranted. However, in focusing on fire control measures, they often overlook equally important A^2C^2 measures designed to synchronize the use of airspace. For example, commanders in the field are typically adamant regarding the establishment of ACAs. These fire control measures provide an area for close air support (CAS) that is reasonably safe from friendly surface-delivered fire. Commanders insist that extreme caution be exercised when integrating CAS and indirect fire. Conversely, there is normally little concern regarding the disposition of friendly air defense units and whether or not aircraft corridors have been included in the air defense scheme of maneuver. As a result of numerous live-fire operations involving the integration of artillery, CAS and attack helicopters, aviators know fire support procedures. However, since there exists no "real" threat from friendly ADA in the training environment, they seldom demonstrate concern for the disposition of those assets operating in the forward area. Unfortunately, fixed- or rotary-wing aircraft are more likely to be shot down by friendly ADA than by friendly artillery. Until we deploy a better ADA command, control and identification (C^2I) system, we must recognize and correct this significant shortcoming.

The identification, friend or foe (IFF) system was designed to help

remedy this situation. Some suggest that if IFF procedures were adequately adhered to, no problem would exist. However, we cannot disregard the fact that many of our allies do not have IFF. Additionally, if we intend to fight the way we train, we need to review our policies regarding use of IFF at the CTCs. Army aviators, and many Air Force pilots, typically do not train on proper IFF procedures. This is perpetuated by the fact that the multiple integrated laser engagement system (MILES) Stingers used at the CTCs are incapable of transmitting IFF.

As a result, air defenders fail to practice IFF code distribution plans, Stinger gunners skip the IFF portion of their engagement sequence, and aviators fail to key up their IFF transponders. SHORAD gunners still rely on visual aircraft identification as their primary means of determining hostile status. The lethality and rapid pace of the modern battlefield guarantees confusion and misidentification. This, coupled with the difficulties inherent in the manual SHORAD control system, ought to concern aviators operating in the forward area.

Commanders at all levels need to be aware of these potential problems. Air defense artillerymen should insist that maneuver units give equal priority to A^2C^2 measures and integrate *all* tactical training with A^2C^2 measures. Maneuver commanders must ensure the proper integration of air corridors, weapons control statuses and location of ADA units into their scheme of maneuver. Information exchange between the Air Force TACP and the ADA liaison officer should be continuous. We need to know the disposition of CAS, airlift operations and AMRRs. The avi-

ation LO should share the same type of information regarding the status of friendly helicopter operations. Air defenders need to know the status of forward arming and refueling points (FARPs), aviation unit locations, proposed air routes/corridors, and selected battle positions. AD LNOs can pass this information to higher and lower ADA headquarters.

Increased awareness of these problems by all airspace users will not only help synchronize the AirLand battle, but also greatly reduce the likelihood of fratricide. Simply said, we must assume a more active role in the A^2C^2 process.

Air defense artillery plays a key role in developing and implementing airspace management measures. FM 44-100, the new capstone manual for Army ADA operations, emphasizes the importance of proper management of airspace. It states in part that . . . "the most important function of airspace control in air defense operations is aircraft identification. Positive hostile and friendly identification ensures timely engagement of targets and reduces the potential for fratricide . . . . From an ADA perspective, many airspace control measures provide a means of probable friendly identification and default hostile identification. These measures allow friendly air forces optimum use of airspace while minimizing the risk of early engagement by friendly air defense."

Air defense artillerymen assigned to corps and division staffs, and those in critical liaison positions, should try to attend the Battle Staff Course at the Air Ground Operations School at Hurlburt Air Field, Fla. This course provides a fundamental understanding of tactical battle management functions within the tactical air control system and the Army air ground system (TACS/AAGS) and the principles of exploiting Air Force and Army capabilities in the AirLand battle.

The Battle Staff Course serves as a prerequisite for the Joint Combat Airspace Command and Control Course. It provides an understanding of the fundamentals of combat airspace control at echelons of division and above. Both courses provide unique insight into the airspace management process.

FM 100-103 and FM 44-100 should be a part of every air defender's library, particularly those involved in any liaison capacity. The ADA School should review NCO and officer courses to ensure they include instruction pertaining to airspace management.

Air defenders must broaden their professional knowledge of the airspace management process. This, coupled with aggressive participation in the A^2C^2 process, will result in in the ADA community having a profound impact on the modern battlefield should we be called upon to fight. All measures that maximize the friendly use of airspace while simultaneously reducing the potential for fratricide concern us. If air defenders assume a leading role in the airspace management process, then we have done our share to fight and win on the modern battlefield.

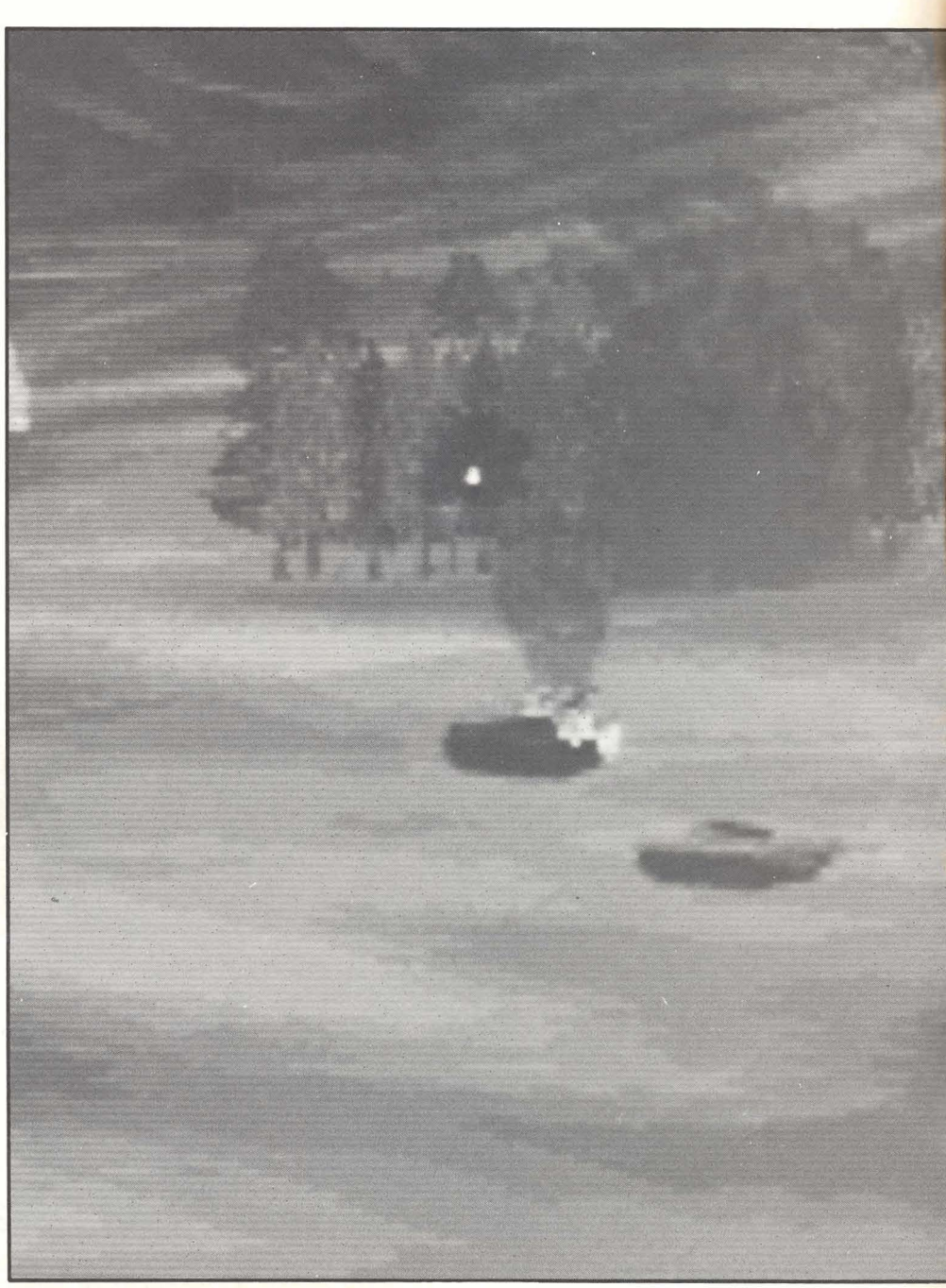
Manned Hawk platoon command post (PCP) (left) and Stinger (below).

Capt.(P) Robert F. Barrow is chief, Air Defense Branch, Combined Arms Division, Combined Arms and Tactics Department, U.S. Army Infantry School, Fort Benning, Ga.

Fighting

With SIMNET — A

by Lt. Gen.(Ret.) John H. Cushman, Lt. Gen.(Ret.) Frederic J. Brown, and Maj. Gen. Thomas C. Foley



"There were moving targets, burning targets, shooting targets, artillery impacting the target area, helicopters, enemy aircraft, surface-to-air missiles, excited voices on the radio, and winners and losers."

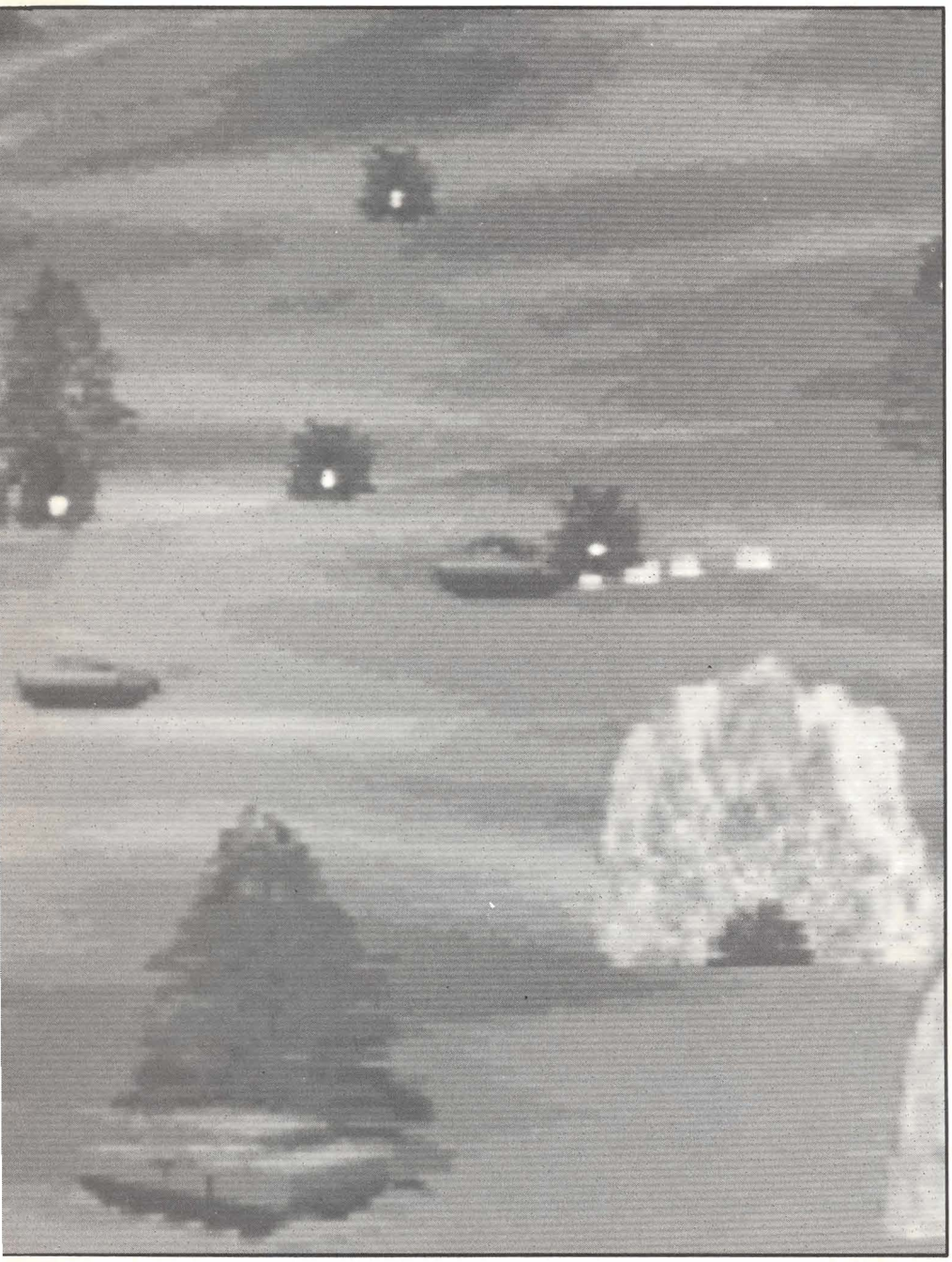
These words of Maj. Dan Sloan, an A-10 pilot of the 303rd Tactical Fighter Squadron, convey accurately the battlefield of the future. This future battlefield is, however, here today. The battlefield was created to develop and validate the doctrine, tactics, techniques and procedures for the U.S. Army's future air defense systems slated to provide forward area air defense (FAAD) for the Abrams/Bradley heavy force.

Few get to participate in a revolution in ways of fighting. But in September 1989, at Fort Knox, Ky., Capt. Ricardo Cortes and his small contingent from the 3rd Armored Cavalry Regiment at Fort Bliss, Texas, did just that. With an even smaller contingent from the 6th Air Defense Artillery Brigade, led by Lt. Jim Lucas, also from Fort Bliss, they fought a combined arms battle of the future.

Working together for seven days of intensive all-arms combat, this team brought Army air defense artillery into the combined arms fam-

the Future

Combat Development Revolution



This article first appeared in ARMOR's *professional bulletin, January-February, 1990.*

ily in ways no one could have visualized without that vivid battle experience. And they dramatically demonstrated the value of combined arms warfighting prior to expenditures of large sums of increasingly scarce weapon acquisition dollars.

The Force

Cortes commanded the bobtailed 3rd Squadron. It was realistically short-handed, able to field a total of 35 combat vehicles, including its direct support ADA units; after several days of fighting, two troops might well be all that was left of his squadron.

Cortes' small team included a new and exciting element: a platoon of line-of-sight forward (heavy) (LOS-F-H) and two non-line-of-sight (NLOS) air defense systems. These advanced air defense weapon systems have yet to be tested in the DoD system's acquisition cycle, let alone in battle. In seven days of fighting, this platoon, reinforced with two NLOS fire units, was battle-tested. The cavalry soldiers who benefited from these modernized ADA systems were convinced they were fighting with a winner.

The Battle Setting

The terrain was typical for armor — open fields and rolling hills, and

wooded areas which limited mounted combat yet offered cover and concealment to attacking helicopters before they unmasked to fire their antitank missiles. Stretched between two defending divisions of a corps, the 3rd ACR was in a standard economy of force situation, with all three squadrons on line. For the seven days of battle, the 3rd Squadron's task was to fight off what remained of an enemy motorized rifle regiment.

This was a severe enough challenge to cavalry troopers: the air situation made the task even more daunting. While friendly tactical air was committed elsewhere, the enemy's weakened regiment had air support available. As many as eight Havoc/Hind attack helicopters and six Su-25 Frogfoots could penetrate Blue's fighter and Hawk defenses and engage the 3rd Squadron at one time. So Cortes and his small band found a situation not faced in battle by American troops since 1943: an enemy with a telling ability to strike at will from the air.

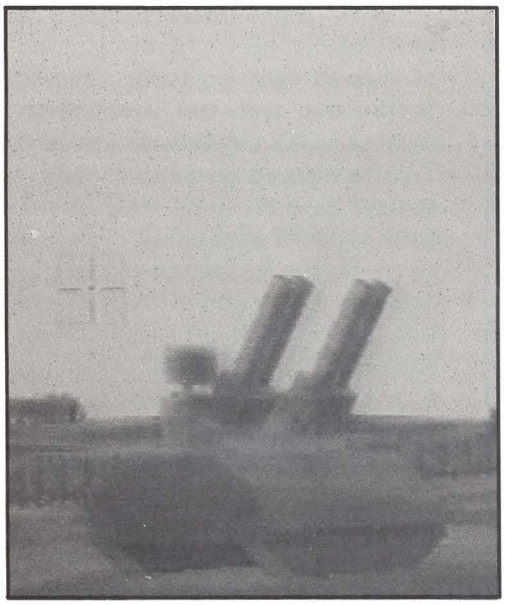
Battle Realism

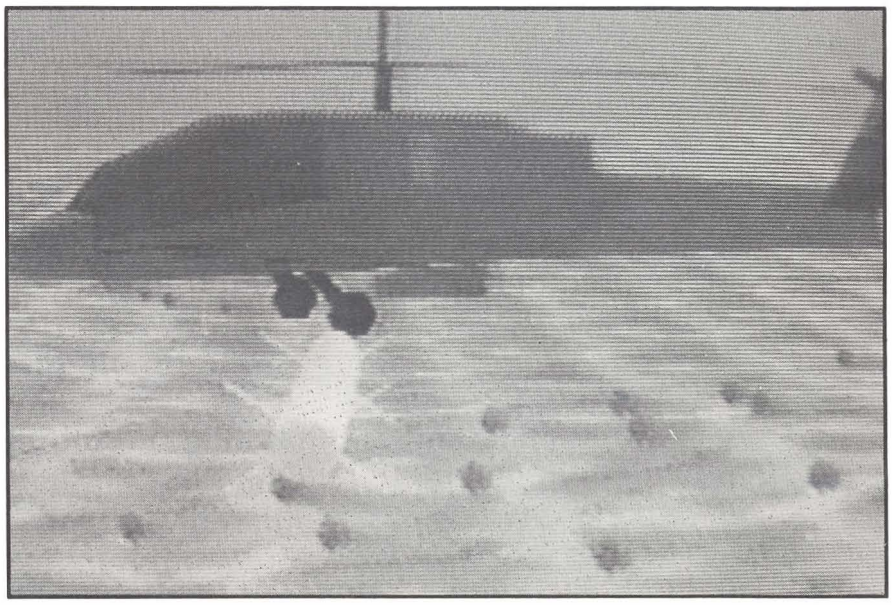
Cortes' force and that of the enemy were not on real terrain; they were fighting in the world of SIMNET (simulation network). As crew members, helicopter pilots and fixed-wing aircraft pilots entered their simulators — each with its powerful on-board computers — they immediately found themselves performing battle tasks on an electronically created visual battlefield. By placing the opposing forces on a simulation of the real world terrain, and by portraying the full range of modern weaponry and their battle effects, the SIMNET world permitted battle action far closer to actual combat than a field exercise. The essence of the simulation is that the fighter is in a free play, kill-or-be-killed battle situation against a real, thinking, fighting-to-win enemy at every echelon.

SIMNET for training (SIMNET-T) is now beyond research and development. Originally a Defense Advanced Research Projects Agency R&D investigation in pure computer science, it is being transferred to the Army for troop training at stateside and U.S. Army Europe stations. Its advantages are widely known in the Army, and are beginning to be known in the Air Force and Navy. At Fort Knox, it is the cornerstone of the Armor Center's Combined Arms Tactical Training Center. Further, the Army procurement process is underway to field this technology for units as the close combat tactical trainer (CCTT).

SIMNET for development (SIMNET-D) is today only at Forts Knox and Rucker. Like SIMNET-T, it permits the realistic exercise of tank and other fighting crews in battlefield teamwork, before they ever go to the field. While SIMNET-T simulates existing weapon systems, organizations and C^2 capabilities, SIMNET-D allows rapid development of *future* weapons systems from the required operational capability (ROC) through pre-planned product improvement. By constructing numbers of future systems as simulators, it has proven possible to equip and organize whole units. By networking these future systems and units with the SIMNET-T current force, the combined arms warfighting effectiveness of future units or systems can be compared directly with the baseline force.

It was in this exacting environment that the commander of the ADA Center, assisted by the commanders of the Armor and Aviation Centers, decided to evaluate the capabilities of both the LOS-F-H





and NLOS components of the FAAD system. Only the FAAD C^3I, the Stinger-based line-of-sight rear (LOS-R) (Avenger), the Bradley air defense sight reticle and the M-1A1 120mm air defense round would be missing.

Because SIMNET facilities are located at Forts Knox (ground) and Rucker (fixed- and rotary-wing), the commandants of these two schools were able to participate fully in the development of doctrine, tactics and techniques needed by their forces to employ the modernized systems.

Assisted by representatives from the Air Force's Tactical Air Command (TAC) and U.S. Air Forces Europe, they were also able to work with the ADA community in the evaluation of ADA weapon systems, force design and emerging tactics and doctrine in the Armor Center's AirLand Battle-Future Laboratory.

The essence of the simulation is that the fighter is in a free-play, kill-or-be-killed battle situation against a real, thinking, fighting-to-win enemy at every echelon.

Thus, for this battle, all parties were in a SIMNET-D situation. Although not yet fielded, the weaponry of Cortes' supporting air defense platoon, manned by the soldiers who might use it in battle, was teamed on the battlefield with the cavalry troopers to "fight the future." Most innovative was that the commanders of the Armor and Aviation Centers, assisted by combat pilots from the Air Force's TAC, were part of the FAAD system evaluation and development team.

Through combat vehicle vision ports and aircraft windscreens, the simulator's computer imagery projects the actual battle scene — the terrain with its hills and draws, streams, roads and vegetation, with friendly and enemy crew-serviced fighting vehicles in action, and with the sights and sounds of battle. Using lifelike controls in their crew compartments and cockpits, crew members and aviators "move" or "fly." They communicate. In teamwork, controlled by commanders and staffs using exact replicas of battalion level C^2 and logistical facilities, they maneuver and engage the enemy. When they make mistakes, they suffer — and learn.

The computer-equipped simulators are linked in local area and long-haul nets. Each simulator knows everything there is to know about itself and receives relevant information from all the other simulators of interest. Because each simulator communicates with all others, the crews fight as they would in war. There are no fixed scenarios. Rather, the brilliant and the dumb, the chance and the planned, all coexist in a free-play, force-on-force fair fight. By allowing the creativity of the soldier to be applied to the fight, the limits of each new component early become evident. When this happens, doctrine, tactics, organization and training effectiveness are reliably based on the actual dynamics extant on the battlefield, uncontaminated by artificial limitations attendant to peacetime field exercises.

Used in wider application in development, and in training above the platoon level, SIMNET provides a semi-automated forces (SAFOR) capability to routinely generate the required force levels necessary to represent a valid threat.

This sequence shows a missile engaging an attack helicopter.

This means that the crews or pilots of all systems are not present, nor are their immediate commanders (although they can be), and that software represents the behavior of those not present. The battle entities (tanks, helicopters, etc.) "see" and "engage" as they would if manned. With semi-automation, a human operator interrupts, modifies or overrides any automated behavior with a user-friendly (it talks Army) workstation.

Cortes and his task force were in simulators at Fort Knox; his ground OPFOR was also at Fort Knox.

Through a long-haul network, Army and Air Force aviators from Fort Rucker flew OPFOR helicopters and fixed-wing air. All were fighting on the same battlefield.

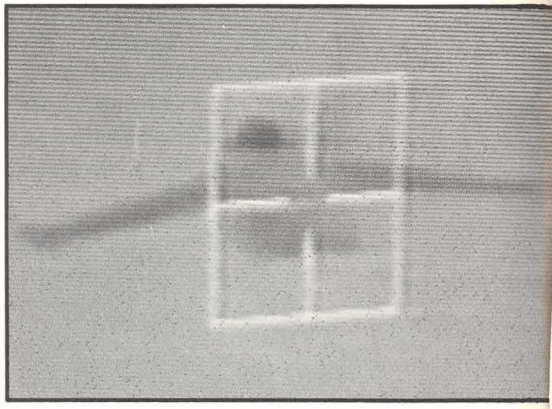
LOS-F-H and NLOS

In the capable hands of Lucas' platoon from A Battery, 2-6th ADA, these emerging air defense weapons were fought to win. As in real war, the troops learned and adjusted as they fought.

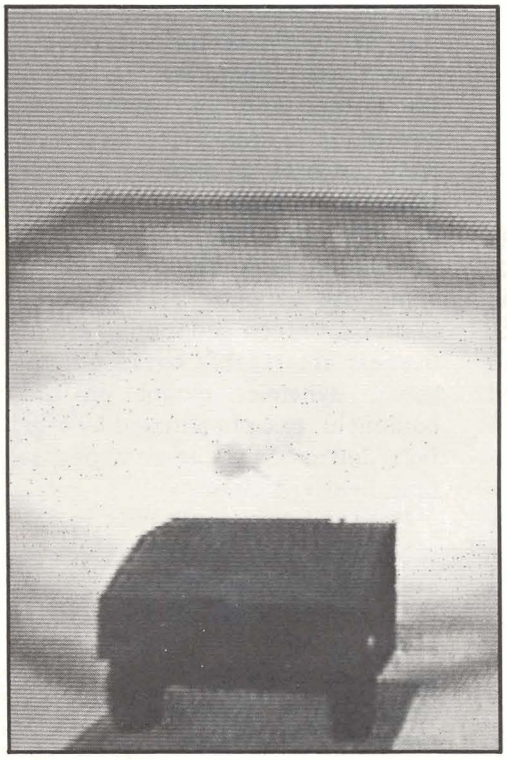
The new weapon systems being readied for the conduct of force development, test and evaluation (FDTE) at Fort Hunter Liggett, have remarkable capabilities. On a Bradley chassis, with eight ready-to-fire missiles, each of the four LOS-F-H fire units can engage ground and air targets at ranges greater than 8,000 meters, well beyond the enemy attack helicopters' guided missile range. Consistent with their system requirements, the fire units could net their radars, which are capable of detecting aerial targets at 20 kilometers and more. Each fire unit has daytime television and FLIR (forward looking infrared) optical systems that allow visual target acquisition to ranges well beyond the 8,000-meter reach of the LOS-F-H missile. An invisible laser beam guides the Mach 3+ missile to intercept, where the fragmentation warhead destroys the target.

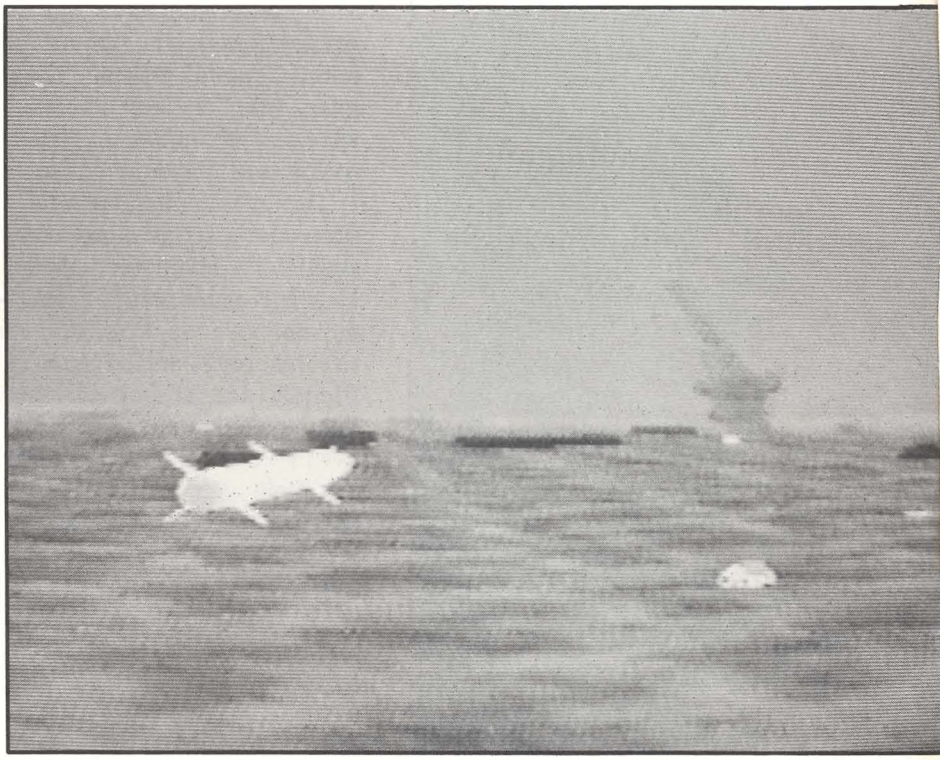
Trailing a fiber-optic thread for image transmission and missile control, the NLOS missile flies to the target area and looks around. At ranges even greater than that of the LOS-F-H, the NLOS missile transmits detailed TV views of the battlefield to the fire unit. On command, the missile can then be directed to kill ground and air targets. It was these FAAD weapon systems, the production LOS-F-H and developmental NLOS systems, that created the revolution in combined arms warfare at Fort Knox in September 1989.

SIMNET-D's architecture reproduced the behavior of these radars



Air defense missile homes in and kills threat fighter-bomber.

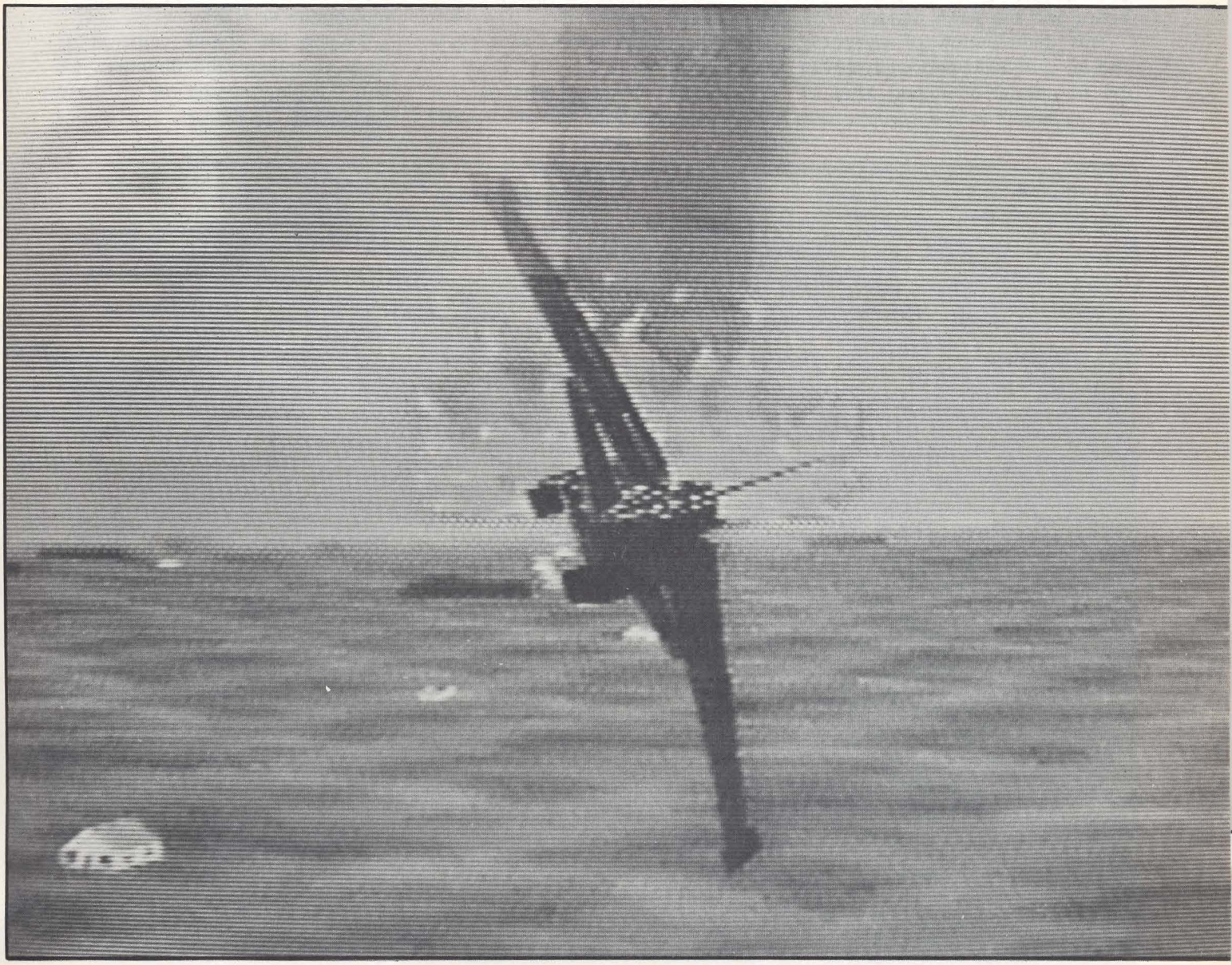




and sighting devices, along with the missiles' flight characteristics and warhead effects. To depict the combined arms battlefield, the Armor, ADA and Aviation Centers, the 3rd Cavalry, HQ TAC and SIMNET provided the following:

- The 50- x 50-kilometer digitized terrain used for the conduct of the fight.
- High-fidelity emulation of the LOS-F-H chassis, radar with netting capability, E-O suite, missile fly out and fuzing, and POSNAV equipment.

The simulator's computer projects a battle scene complete with terrain, friendly and enemy crew-serviced fighting vehicles in action, with the sights and sounds of battle.



· A manual SHORAD control system (MSCS) and emulated corps and Air Force radars needed to implement the early warning broadcast net (EWBN).

· Manned and SAFOR maneuver forces (Red and Blue).

· Threat aircraft, organization and pilots.

The U.S. Army Air Defense Artillery Board from Fort Bliss performed data analysis based on data collection and reduction by the SIMNET-D staff. Collective and systems' measures of effectiveness (MOE) were specified by the ADA Board and the ADA School.

This combination of weaponry and its command and control with the traditional combined arms of the 3rd Squadron and its supporting artillery — orchestrated by Cortes, the combined arms battle commander, and his people — produced a demanding proving ground for emerging air defense systems.

Emerging Lessons

The seven days of battle were in truth 13 battles in a series, normally two per day. The experience was like that of "Duffer's Drift" — except that Cortes and company were not dreaming. They were learning by fighting. And each day they got better at fighting. Lessons learned came in three well known levels:

· Basic CMTC/NTC-type lessons that troops have to learn again and again.

· More advanced lessons that well-trained troops can absorb and thereby gain increased competence.

· Lessons of truly advanced teamwork that, when mastered, mark only the best of fighting units.

Cortes' task force swiftly got through the first level of lessons. In an early after action review, the squadron S-3, Lt. Dolan, described a couple of these:

"At squadron, we were seized at first with the problems of developing teamwork in terms of maneuver, and our own tank and TOW gunnery. So we did not place enough emphasis on planning for supporting fires, close air support, attack helicopters or ADA.

"When the enemy came at us from an unexpected direction, we had not planned the use of these supporting capabilities. For exam-

ple, on withdrawing from engagement areas, we were open to air attack from our flanks. Not having planned for air defense, we were hit by enemy attack helicopters taking advantage of the covered and concealed routes into our flanks and rear. We had not coordinated with our ADA and were slow to react."

The Cortes force quickly graduated to the second level of lessons learned. Among these were the familiar ones of timing, synchronization, focusing combat power, teamwork through mission orders and information exchange. For example, in his AAR, Dolan stressed the "importance of spot reports to ADA from maneuver elements, and to maneuver elements from ADA."

The third level of lessons learned is where the possibilities of air defense weaponry in the combined arms fight begin to get exciting.

The cavalry's maneuver units (M-1s and M-3s) found that their fires could be cued by the ADA fire unit leaders, based on the latter's radar and electro-optical sightings and reports from MSCS. Cavalry leaders began seeking that information.

Responding to that need, the ADA platoon began to provide maneuver units the superb battle information that came from LOS-F-H radar and E-O sights and from the NLOS "eye in the sky." Spot reports from ADA drove the cavalry's reconnaissance view outward from its normal three or four kilometers to as much as seven or 10.

Equally important, the ADA squad leaders rapidly developed the skills attendant to calling for indirect fires to support the troop commanders' scheme of maneuver.

Timely information from the ADA platoon's targeting assets helped the cavalry win the counter-reconnaissance battle: ADA equipped with the LOS-F-H and NLOS systems can alert the squadron command post of enemy air and ground actions earlier and at greater ranges. When associated with LOS-F-H and NLOS, the cavalry now has far better eyes and ears.

There are no fixed scenarios. Rather, the brilliant and the dumb, the chance and the planned, all co-exist in a free-play, force-on-force fair fight.

Links between ADA and fire support C^2 can assist the "redlegs" in target acquisition; indeed, NLOS can attack enemy artillery batteries as a form of "ADA counter-battery!"

As is normal in fighting, some preconceived notions faded; they just didn't work. For example, the limited argon gas at platoon level, used for cooling the missile IR seeker, forced the fire unit leader to "prep" his missile just before firing, and to avoid "deprepping" as much as possible.

While LOS-F-H and NLOS are nice to have against ground targets (in several instances, LOS-F-H fire units were forced to engage and destroy enemy tanks at ranges out to 6,000 meters in self-defense), against air targets these weapons are *vital*. Protected by them, the maneuver force can get on with the job of fighting. Without that protection, maneuver units must always think of hiding from the air.

As a result, maneuver commanders and staff who never before paid much attention to their Stinger-, Vulcan- and Chaparral-equipped ADA support learned to protect and support their LOS- and NLOS-equipped ADA as a first priority when forced to operate against manned, modern attack helicopters and close support aircraft.

NLOS is critical in making masked enemy helicopters vulnerable; it also releases artillery VT and mortar time-fuzed rounds for the attacking Abrams/Bradley force. But NLOS must attack the Havoc quickly, guiding its deadly missile onto the target with disturbing regularity.

All these lessons were learned rapidly and vividly — and inexpensively, compared to an exercise or the real thing. The participating units "fired" about $81.5 million in ammunition during the seven days of war.

Meanwhile, the OPFOR was learning its own lessons, many of them applicable to Blue. As OPFOR applied these lessons in the next day's fight, the Blue side was itself forced to react, and vice versa. As the battles progressed from day to day, and indeed during one day's fighting, the two sides notched each other up on an increasing scale of proficiency.

Lucas described some Red and Blue reciprocal "level three" lessons:

"Once we got into the fight the enemy pilots were forced to stay low, about 50 feet above ground level or lower. They used every bit of mask they could find. These acts of self-preservation really reduced the enemy air's ability to find 3rd Cavalry elements, even when they were moving!

"The enemy Su-25 and Havoc drivers learned to work together . . . fixed wing came in with the leader aircraft low and fast, five kilometers in front of the follow-on fight. Then, when we radiated, we became the targets. But I ordered my fire units to go passive. Sgt. Burns assumed the role of master; his radar radiated long enough to get a track and to pass it to another fire unit. Once the others were cued, they engaged."

OPFOR aviators added their own comments:

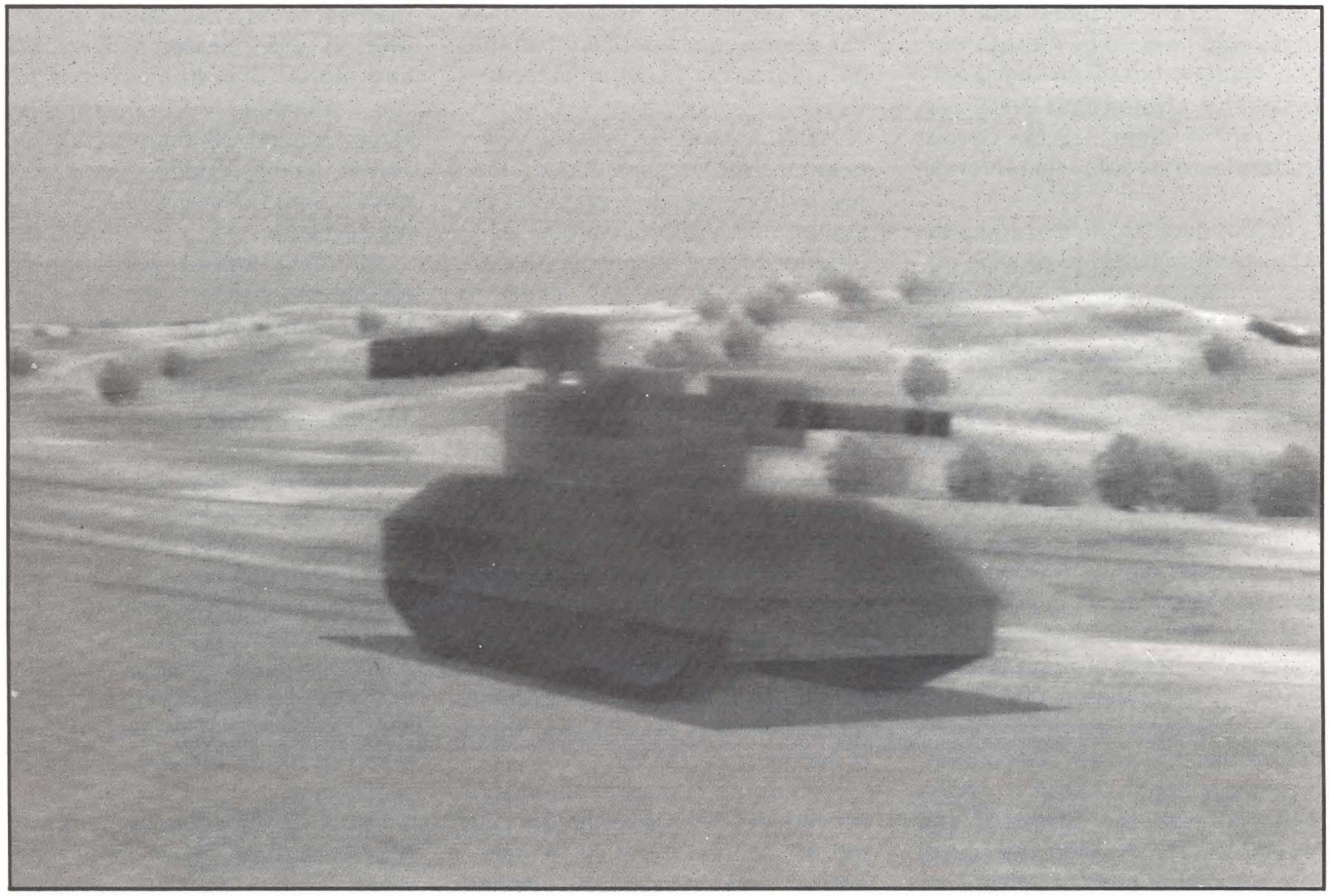
"Attack helicopters must work with tactical air, or FAAD systems kill both every time . . . .

"The radar warning receiver becomes all important. The rapidity with which the LOS-F-H systems can illuminate you with one system and kill you with a missile at seven kilometers from another system, from an entirely unexpected direction, is so intimidating that we actually had one pilot so conditioned to take violent evasive action that, when illuminated by LOS-F-H radar, he flew into ground.

"Once ADA is out, enemy pilots were firm in their belief that it becomes very easy to destroy moving armored vehicles with the guided munitions available to modern attack air systems.

"We started out adhering to doctrine, training and tactics. As LOS-F-H and NLOS got it together, we enemy pilots tried everything we could think of. But because of the combinations of line-of-sight, non-line-of-sight and passive target engagement, we were never able to suppress ADA and get free access to the maneuver, C^2, logistics and fire support of the 3rd Squadron . . . .

"We quickly learned the dead zone limitation of LOS-F-H, and used every wrinkle in the ground to get inside that dead zone, and then to launch determined attacks on the ADA fire units. Those guys need a cannon to cover the dead zone. Without one they learned very quickly to coordinate their movements with the Bradley crews and through the EWBN. They also learned to use the situational awareness available on LOS-F-H radar operator scopes to cue Bradley gunners to our approach."



The culmination was Cortes' final day. As he shifted his force from defense to attack, he exploited his supporting ADA platoon like a seasoned pro. In other words, he learned to fight the future in the present at Fort Knox. His ADA platoon responded, all lessons learned.

Conclusions

The battles and the combat evaluation of those battles described above really happened. They were not war, but they were very much like war. The 3rd Squadron and the 2-6th ADA thus became the only units to fight the AirLand Battle under heavy, sustained air attack in more than 45 years. Other people have opinions about that kind of war, but these people actually did it.

The basic lesson learned was this: properly employed, with trained crews, in close coordination with the maneuver and fire support, LOS-F-H and NLOS are extraordinarily effective. They are essential components of the combined arms team. Once the cavalry and ADA leaders learned how to fight with these weapons, they forced enemy air to fatal compromises. Fighting for their own survival, enemy air became much less effective.

During early missions, before they learned to work together and to employ the ADA systems effectively, Red air took out 26 or more tanks, fighting vehicles and/or LOS-F-H fire units. That's 75 percent of Cortes' force! When LOS-F-H and NLOS were on the battlefield, closely tied to the 3rd Cavalry's scheme of maneuver, tank and fighting vehicle losses declined to five by mission 13! In other words, effective air defense decreased the cavalry losses due to air from 75 to 14 percent. This allowed the ground attack to continue. The ADA contribution was the difference between victory and defeat.

Lesson learned: When properly employed, with trained crews, in close coordination with the maneuver and fire support, LOS-F-H and NLOS are extraordinarily effective.

These weapons proved to be more than the traditional air defense, however. Their capabilities for battle information collection and dissemination multiply the effectiveness of the other members of the combined arms team. How do we know this? Because SIMNET exercises these forces, and can exercise forces like them, in a realistic battlefield, with realistic combat outcomes and realistic synergy of all fighting and sustaining means in a soldier-dominated environment.

The weapons system and the terrain were simulated, but the soldiers were not. Their operational tempo, decisions, tactics, techniques and procedures were their own. They simply employed the advanced vehicles and munitions which SIMNET simulated as they would in war.

Cortes' and his soldiers' experience thus offers another profound "lesson learned." Their performance in seven days of battle showed that, with SIMNET, we can fight the future and learn. Developing systems can be tried and evaluated in a combined arms context under trained leaders and with rained soldiers, against a thinking, creative enemy who is fighting to win — with immense implications for U.S. forces' doctrine and tactics, force design, training and leader development, and weapons acquisition.

As an Army, we must think through how to best employ this revolutionary new capability to enhance current mission readiness and future systems development.

Lt. Gen. John H. Cushman, U.S. Army retired, has commanded the 101st Airborne Division and has been the Commander, Combined Arms Center, and Commandant, U.S. Army Command and General Staff College. He retired in 1978 after two years in command of I Corps (ROK/US) Group, the field army formation defending the western sector of Korea's DMZ. Since 1978, Cushman has been an author and consultant in the fields of warfare simulation and the operations and command and control of theater forces.

Lt. Gen. Frederic J. Brown, U.S. Army retired, commanded a tank company in USAREUR, a cavalry squadron in Vietnam, an armored brigade in CONUS, and was chief of Armor and Cavalry for three-and-a-half years. He is currently a consultant for the Institute for Defense Analyses.

Maj. Gen. Thomas C. Foley is commanding general at Fort Knox and the present Chief of Armor and Cavalry.

ADA FORUM

Dining-In/Dining-Out

In this issue I will respond to several questions about the ceremony of Dining-In/Dining-Out.

A combination of our "command performance" and "unit party," dining-ins had their beginnings in the British officer's mess system. In today's American Army this ceremony translates to an evening designed to boost unit morale. Dining-ins are appropriate for officers and noncommissioned officers alike. Some units also have combined mess nights.

Compare the dining-in to a military reception, as far as its purpose and function are concerned. Therefore, when invited, consider your attendance obligatory. Your absence should occur only for those reasons that excuse you from any military formation. The term dining-in refers to a formal military dining ceremony, while dining-out refers to a formal military dining ceremony with spouses.

"Black tie" is the appropriate dress for a formal dining-in and is the designation used on invitations. Civilians wear the "tuxedo," while military personnel wear the black bow tie with one of five appropriate uniforms: Army Blue, Army Blue Mess, Army White, Army White Mess or Army Green with a white shirt. The "black tie" designation also implies the wearing of miniature medals on the Army Blue Mess or Army White Mess uniforms and the wearing of ribbons or miniature or regular medals on the Army Blue or White uniforms and the wearing of ribbons on the Army Green.

A dining-in has a dual nature. It is first a dignified formal affair and second, an opportunity for "let-it-all-hang-out" unit camaraderie. The former includes strict observance of the rules of etiquette coupled with a dinner of the most delicious foods available. The latter is robust fun, a double standard evident from the earliest time. Appreciate this dichotomy in light of an assignment at some godforsaken outpost on the verge of civilization.

Dining-in is not a ceremony under the auspices of FM 22-5, although some of the actions are accomplished using FM 22-5 as a guide. Nor is it mandated by Army regulations although parts of several regulations apply. Dining-in is an Army custom and, as such, is perpetuated through letters of instruction and word of mouth.

The presiding official is designated the President of the Mess and it is his responsibility to oversee the entire organization and operation of the dining-in. He sets the date and appoints, by letters of instruction, persons or committees to take care of the arrangements, food and protocol. The president also appoints Mr. Vice.

If the formal dining-in includes a receiving line before the informal or cocktail portion of the affair, follow the rules of etiquette for the conduct of the receiving line.

Arrive some minutes prior to the time announced to check your headgear and coat if appropriate. At a dining-in conducted by a large organization, you may proceed through the receiving line at staggered time intervals; for small organizations, you may proceed through the receiving line immediately upon arrival.

During the cocktail portion of the dining-in, talk with as many of your comrades and other guests as possible, remembering that the cocktail period is for lighthearted conversation and entertainment. You may smoke during this period, but do not take a lighted cigarette or cigar into the dining room, nor take a cocktail to the dining room. However, it is best to take some money with you.

In lieu of cocktails, some organizations use this period to incorporate an additional ceremony into the dining-in, through the elaborate mixture and tasting of "Artillery Punch" or other beverage in the presence of the entire assemblage.

To prevent confusion and endless wandering, prepare a diagram of tables and seats showing the place of each guest for reference before entering the dining hall.

At the formal dining-in, tradition requires use of a head table or speaker's table. The President of the Mess sits in the center, with the most distinguished guest at his right. The next most distinguished person is on his left, and so on alternately across the head table until all are accounted for in order of relative rank or importance.

At a dining-in it is customary to display appropriate national colors and distinguishing flags in the "flag line," arranged in a centered position behind the receiving line. In the dining area the command sergeant major is responsible for the formal posting of the colors behind the head table and their removal at the termination of the evening.

After the invocation, the President of the Mess seats the mess and proceeds with welcoming remarks which set the tenor for the formal part of the ceremony. The President of the Mess remains standing while speaking and upon conclusion directs that dinner be served.

The President of the Mess uses the gavel to signal members of the mess. Three resounding raps require the attention of all members, whether standing or seated. Members will rise and stand in place at two raps of the gavel. One rap signals seats.

If a member has something to say during dinner, he stands and asks to be recognized by saying, "Mr. Vice, I have a Point of Order." Mr. Vice responds by calling the individual's rank and name, at which time the member, in a polite and forthright manner, cites his point of order. Mr. Vice may then solicit the recommendation or action of the President, or take appropriate action on his own.

In some messes, the tradition of chiding or poking good-natured fun at fellow members of the mess through limericks and ditties is practiced. This is a form of self-generated entertainment during the dinner hour and serves to enhance camaraderie and unit esprit while remembering the formality of the occasion. The procedure is for the member who wishes to propose a limerick to first secure permission from Mr. Vice and then present his limerick. A group or a person, upon receiving a limerick, is honor-bound to refute the remark prior to the close of the dinner hour, least all present believe the remark to be true.

The offering of ceremonial toasts is a traditional Army custom at a formal dining-in. Unit traditions and the desires of the commander dictate the procedures used. The order and subject of each toast is decided upon in advance and the presiding officer and guests are advised of actions expected of them. Toasts to the President of the United States, the U.S. Army, the division, regiment and unit are the most frequent. Remember, toast only an office or an institution, never an individual. Never embarrass yourself by toasting with an uncharged glass. And what about members who abstain from drinking? A simple rule of protocol is that they touch the glass to their lips to complete any and all toasts; no consumption of the beverage is required.

To indicate when smoking is authorized, a single candelabra with new white candles or a clear glass kerosene lamp is used. Place the candelabra or lamp on a lone table visible to the entire mess. If Mr. Vice is seated at a separate table in view of all, the "smoking lamp" is positioned on his table. When the President of the Mess announces that the smoking lamp is lit, the candles or lamp is lit.

The formal portion of the dining-in should be just that — "strictly formal." However, there is wide latitude for the conduct of informal activities. Discourage events or games which give evidence of irresponsibility and lack of self-discipline. It is not necessary to be destructive or to have fun at the expense of others for the affair to be a success. A wide range of games and activities are available, being limited by common sense, good judgment and imagination.

The President of the Mess levies fines. Fines are collected by Mr. Vice according to the list of violations and fines in the letter of instruction. Do not require special items to be worn or in possession of the members that must be specially purchased for the dining-in.

During the evening each member attempts to pay his respects to the guest of honor. After the mess is adjourned, members should remain until the guest of honor and the President of the Mess have departed. Mr. Vice should be the last member to leave.

A well-executed dining-in promises an evening that will create a unified NCO body and a team spirit born in the glow of tradition and camaraderie — the most honored part of military life.

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

ADA's New Space Age Mission

ASAT

The Year: 2000 AD

The Place: Battery Command Post Bravo

The Unit: B Battery, 1st Bn, 17th ADA

The Mission: Space Control (Anti-Satellite)

by Mr. Pete Olson

It's 0300 hours. The battery control center is quiet. SSgt. Wilson works on his Army extension course, SFC Shaw studies her university texts and the shift commander, Capt. Thomas, sits back and enjoys his third cup of hot steaming coffee. The red phone rings unexpectedly. The commander answers and hears: "This is a RED QUAIL exercise. Authenticate the following message . . . "

At the same time, both command operation/fire control consoles receive RED QUAIL target data and the exercise is underway. The fire control computers immediately process the RED QUAIL targets (hostile satellites) using the provided engagement constraints and compute the necessary firing solutions (launch time, launch azimuth, safe flyout zones, end-game engagement parameters, airspace warning instructions and principal/backup missile assignments). The computers automatically check their results (vote) and indicate data processing agreement to the console operators.

Upon verification/authentication with the Army Space Command Operations Center (ARSPOC), firing is manually enabled. At launch time, the embedded simulator indicates missile failure and the firing computer issues launch command to the backup missile. Exercise complete. Sixty minutes later the exercise command scores a direct hit on a satellite.

The preceding scenario describes how Air Defense Artillery might conduct its new space-age mission — anti-satellite operations — after the fielding of a kinetic energy ASAT system. The fact that the Department of Defense (DoD) recently approved funds to develop the kinetic energy interceptor, despite plans to cut defense spending, testifies to the importance of the new mission.

The Satellite Threat

Satellites have been perceived as a threat since the Soviet Union first jolted the United States out of its technological complacency by launching Sputnik I. Today, the United States has the lead in satellite and ASAT technology, but the Soviet Union has the only operational ASAT weapon system.

The consequences could be disastrous. The combatant who first fields a workable ASAT system has the ability to, quite literally, render its opponent "deaf, dumb and blind."

Today, the commercial world relies on satellites for a variety of commercial and military applications, including navigation, communications, television broadcasts, weather forecasting and data transmissions. Military forces also use orbiting satellites to obtain information on their opposition's order of battle, including the identification, location and operational status of individual units.

Threat military intelligence analysts can use the information provided by their satellites at various levels of effectiveness to —

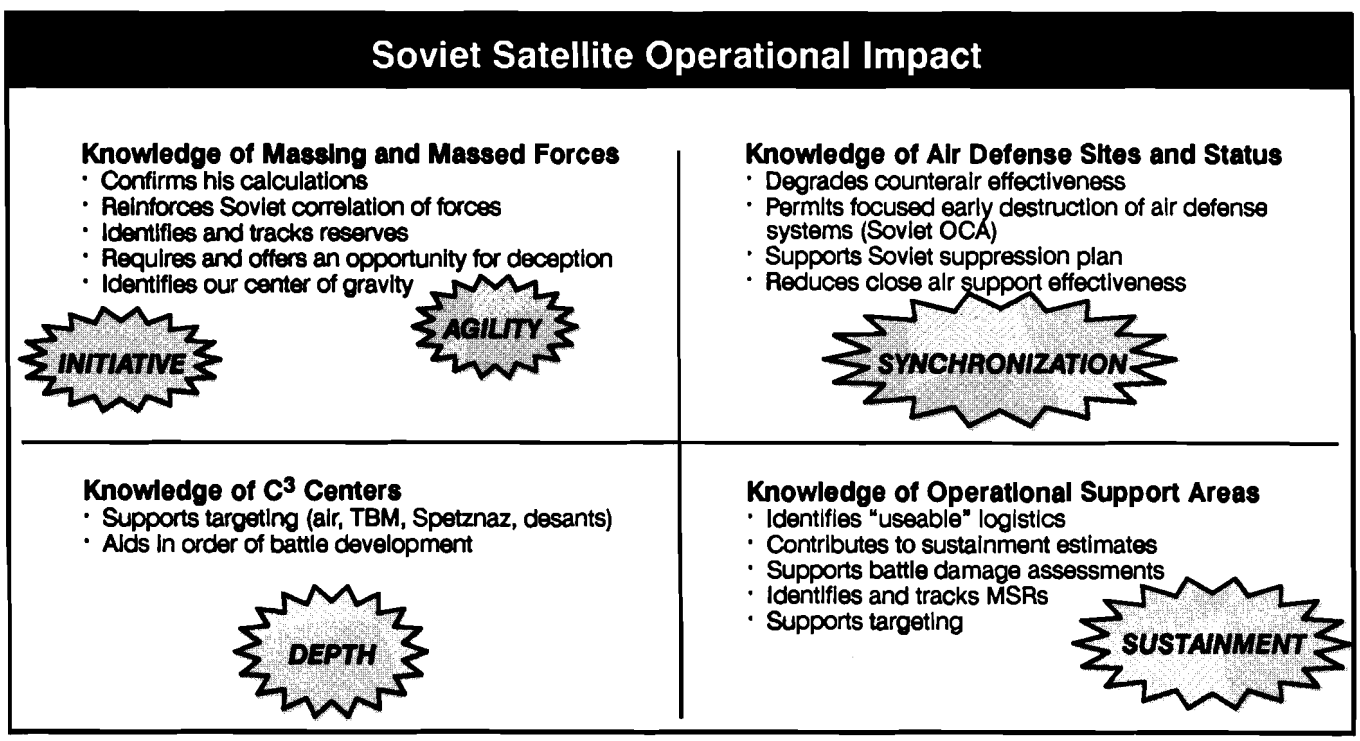
- detect U.S. units massing for an attack or counterattack;
- locate U.S. fleets and major surface ships and coordinate submarine and air attacks against them;
- pinpoint air defense sites, determine their operational status and provide air planners the information they need to plan air attack routes which avoid heavily defended areas;
- target command, control, communications and intelligence (C^3I) centers;
- evaluate ports and determine their sustainment and reinforcement capabilities; and
- perform strike and attack assessments against fixed facilities such as air bases.

Threat satellite capability will improve both in resolution and timeliness over the next decade, possibly keeping up with or exceeding our abilities to passively counter their system.

Soviet ASAT

The Soviets possess the only currently fielded ASAT system. An artist rendering of a Soviet ASAT attack appeared in the 1983 edition of DoD's *Soviet Military Power*. The Soviets first tested their co-orbital ASAT in 1968.

DoD has stated that there are possibly two laser test facilities at Sary Sagen, the Soviet's principle anti-ballistic missile research site, that could be used against U.S. satellites. "The Soviets could deploy anti-satellite lasers to several ground sites in the next 10 years or they could deploy laser-equipped

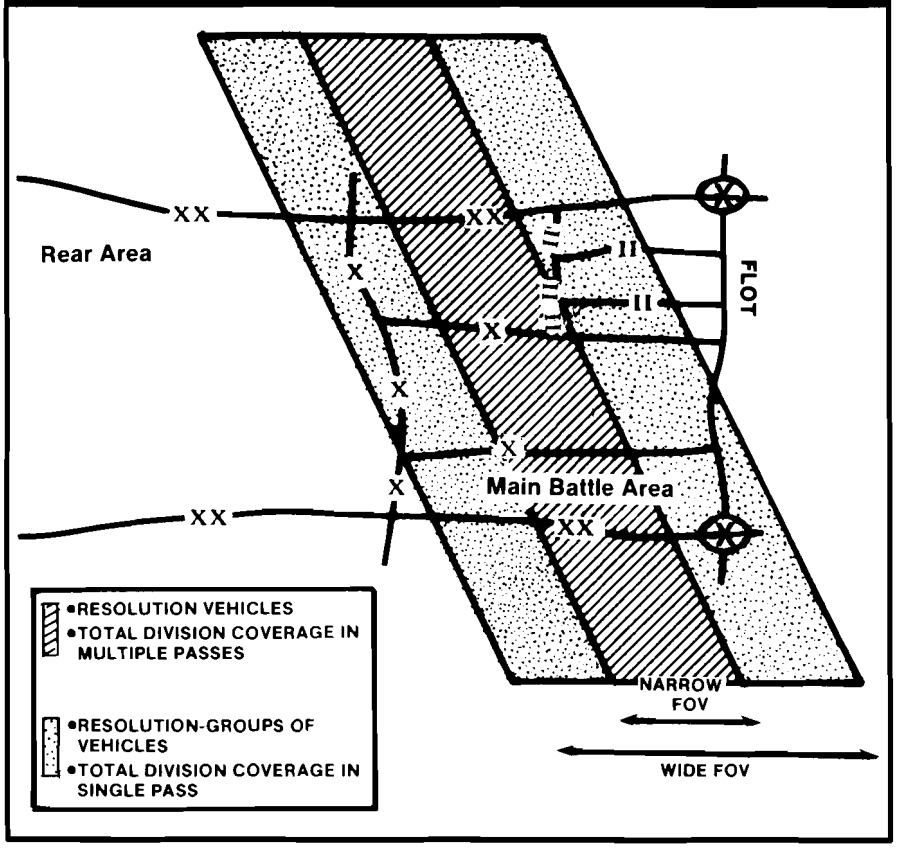


satellites, either available for launch on command or maintained in orbit, or could deploy both," warned *Soviet Military Power*. The Soviet ASAT system, operational since the early 1970s, provides them the capability to negate our military intelligence as well as our commercial satellites. They can do so without fear of retaliation.

The chart at left illustrates the Soviet satellite threat to the division. Satellites compromise the AirLand Battle tenets of agility, initiative, synchronization and depth by allowing the threat to closely track our maneuver units, monitor our command, control and communication (C^3) centers, pinpoint air defense locations and analyze our support and sustainment base. The threat can operate inside our warplanning cycle and respond before we can execute operations effectively.

Low earth orbit satellites make an orbit around the Earth approximately every 90 minutes. During that time, the Earth rotates 22.5 degrees or approximately 1,600 miles at the equator. The quality of resolution varies widely depending on the field of view. For a given optical system, the larger the field of view, the poorer the resolution (see chart bottom left).

Satellite Threat to Division



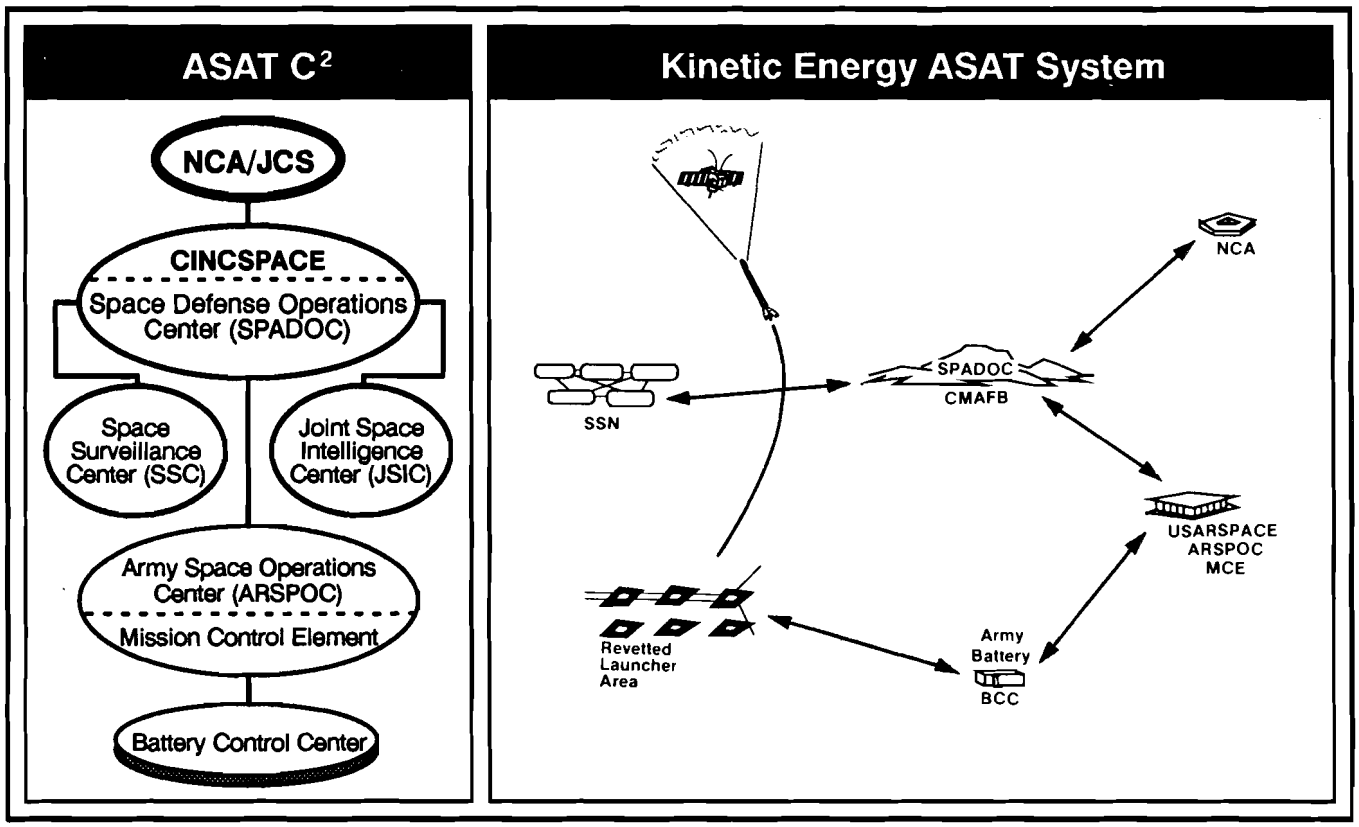
Land-Based ASAT System Coverage

- Any single base can have two opportunities to engage each leo satellite daily
- Two or more bases provide an operational hedge for continuity of operations
- Proposed bases support desired first revolution intercepts

ASAT War Games

In considering the military utility of the ASAT system, the Joint Cost and Operational Effectiveness Analysis team used both qualitative and quantitative methods. An open seminar war game considered the military worth of a U.S. ASAT system for three scenarios: Airland Battle in Central Europe, Naval Operations in the Northwest Pacific and Contingency Theater in Southwest Asia. Analyses drawn from computer simulations then quantified the subjective considerations from each war game.

AirLand Battle Campaign — Central Europe. While ASAT made contributions during each phase of the campaign, its greatest value appeared to be its ability to mask Blue preparations prior to the counterattack against Red forces. By depriving Red of his space assets, ASAT helped conceal the



movement of reserve forces. Follow-on analysis revealed that Blue could expect extended periods of concealment before Red could recover its intelligence collection with the employment of other/replacement surveillance assets.

The other quantitative measures that emerged from the European scenario analysis related to the entire campaign. Blue ASAT denied Red his normal intelligence from space systems. This caused the Red commander to exhibit greater uncertainty on where and when to commit his second echelon forces. The result was a more favorable force ratio for Blue at the point of attack and better performance in stopping the Red attack.

Naval Operations — Northwest Pacific. The wargame participants agreed that ASAT provided a significant contribution to Blue success in the naval scenario. The loss of targeting information to Red submarines for use in cruise missile attacks was especially important. Quantitative analysis showed that submarine attacks were delayed until Red could move within radar or acoustic detection range. This gave Blue time to conduct further anti-submarine and counterair operations. As a result, Red was able to launch fewer attacks.

Contingency Operations — Southwest Asia. The Southwest Asia contingency scenario showed that Blue benefits from ASAT deployment. ASAT reduced the threat to the lodgment and supporting naval forces and introduced uncertainty into the Red planning process by denying critical intelligence.

An ASAT system would also serve as a deterrence factor. Hostile nations are unlikely to attack our satellites if they know the United States could respond in kind.

Concept of Operations

The Joint Chiefs of Staff have approved two requirements documents for the ASAT system: the Multi-Command Required Operational Capability for Space Control and the Mission Need Statement. Both the Unified Space Command (USSPACECOM) and the U.S. Army Space Command (USARSPACE) have published ASAT concept of operations papers. The U.S. Army Training and Doctrine Command (TRADOC) has approved and published the Kinetic Energy Anti-satellite Operational and Organization Plan developed by the U.S. Army Air Defense Artillery School (USAADASCH). These documents form the basis for the ASAT concept of operations.

The ASAT battle would start with an order from the National Command Authority to engage a specific satellite or constellation of satellites, or to execute a specific operational plan. This plan would be passed to the SPACECOM Space Defense Operations Center (SPADOC).

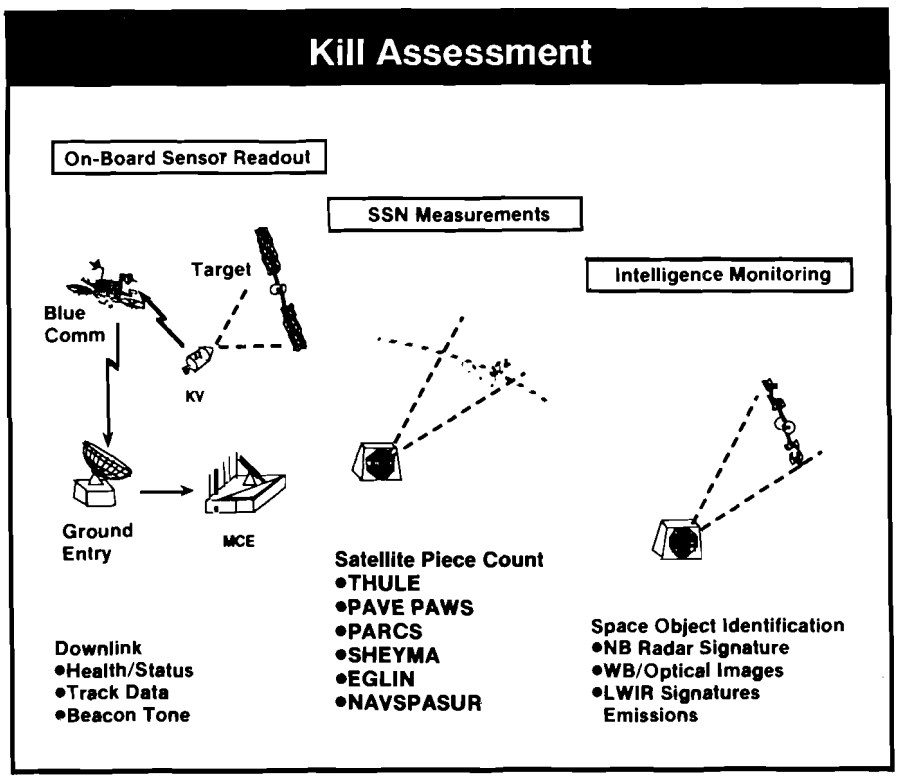
SPADOC, located at Cheyenne Mountain Air Force Base, would first check the target's location, predicted orbit path and location of friendly resident space assets. It would then generate mission engagement planning data and execution requirements and pass them to the Army ASAT Mission Control Element, which will probably be collocated with the ARSPOC at Fort Carson, Colo.

The Space Surveillance Network (SSN), a collection of dedicated and shared sensors (radars and optical trackers), detects and tracks space objects (satellites, boosters, missiles, debris and junk). Each time satellites pass over these sensors, their locations and predicted orbits are updated for acquisition or engagement by other sensors or interceptors.

Kill Assessment

Since the orbital tracks of low earth orbit satellites move about 22.5 degrees every 90 minutes, any one ASAT site having sufficient missile range to cover about 23 longitudinal degrees will be sufficient to engage each satellite about twice a day on the average. If higher rates of engagement are desired, additional sites or significantly increased missile range are required.

In a traditional air defense forward area air defense unit, the crewman usually sees the missile kill or miss the target. In high- to medium-altitude air defense (HIMAD) units, the radar tracking the target usually provides information for an immediate kill assessment. However, the ASAT missile will be launched in a fire and forget mode at a point in the sky to coincide with the passing of a satellite. This means ASAT soldiers will not witness the destruction of the satellite. Instead, the SSN will check the satellite's physical characteristics and the status of an onboard missile beacon after the scheduled impact time, and use other intelligence gathering devices to determine if the mission was successful or if the target satellite continues to function.



ASAT Sites

Two ASAT sites, one in the Hawaiian Islands and one on Georgia's or Florida's Atlantic coast, were originally proposed. Budget austerity has since reduced initial phase planning to one launch site with significantly less manpower projected for manning and operations. The actual site will be determined after an exhaustive site survey considering defense effectiveness, environmental impact, range safety, availability of logistics support, real estate cost, labor cost and security.

ASAT Battalion

A representative ASAT battalion designed and based on current Army tables of organization and equipment development rules has a headquarters and headquarters battery and two firing batteries. The battalion structure will be modified as additional manpower personnel integration (MANPRINT) and mission functional analyses are completed as the system design matures. In addition to structural alterations, changes may be made to manning. National Guardsmen, DoD civilians or contractor personnel might man the batteries. The command and control centers at the ARSPOC and battery control center, however, will be manned by full time active duty soldiers.

The missile crewman and C^3 operators will probably have a current ADA MOS with an additional skill indicator due to the low population density — perhaps no more than 75 — of ADA ASAT soldiers.

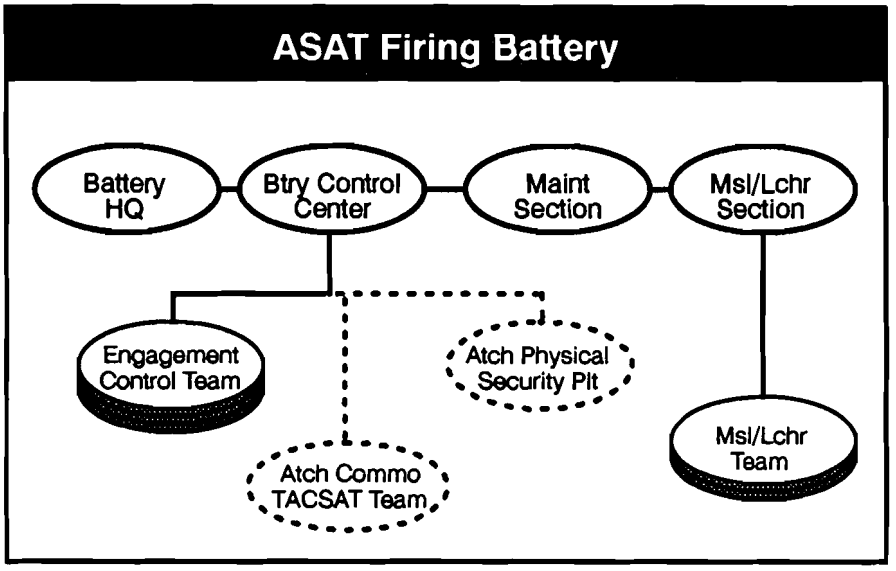
The ASAT firing battery will probably be developed along the lines of the fixed Nike Hercules sites deployed during the 1960s and early 1970s in the continental United States. The firing batteries will feature launcher, fire control, administrative and motor pool areas.

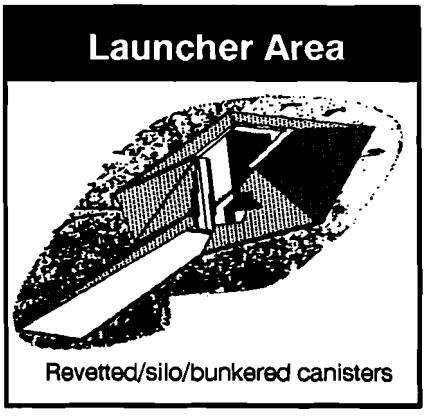
The launcher and launcher area design are being re-evaluated. One

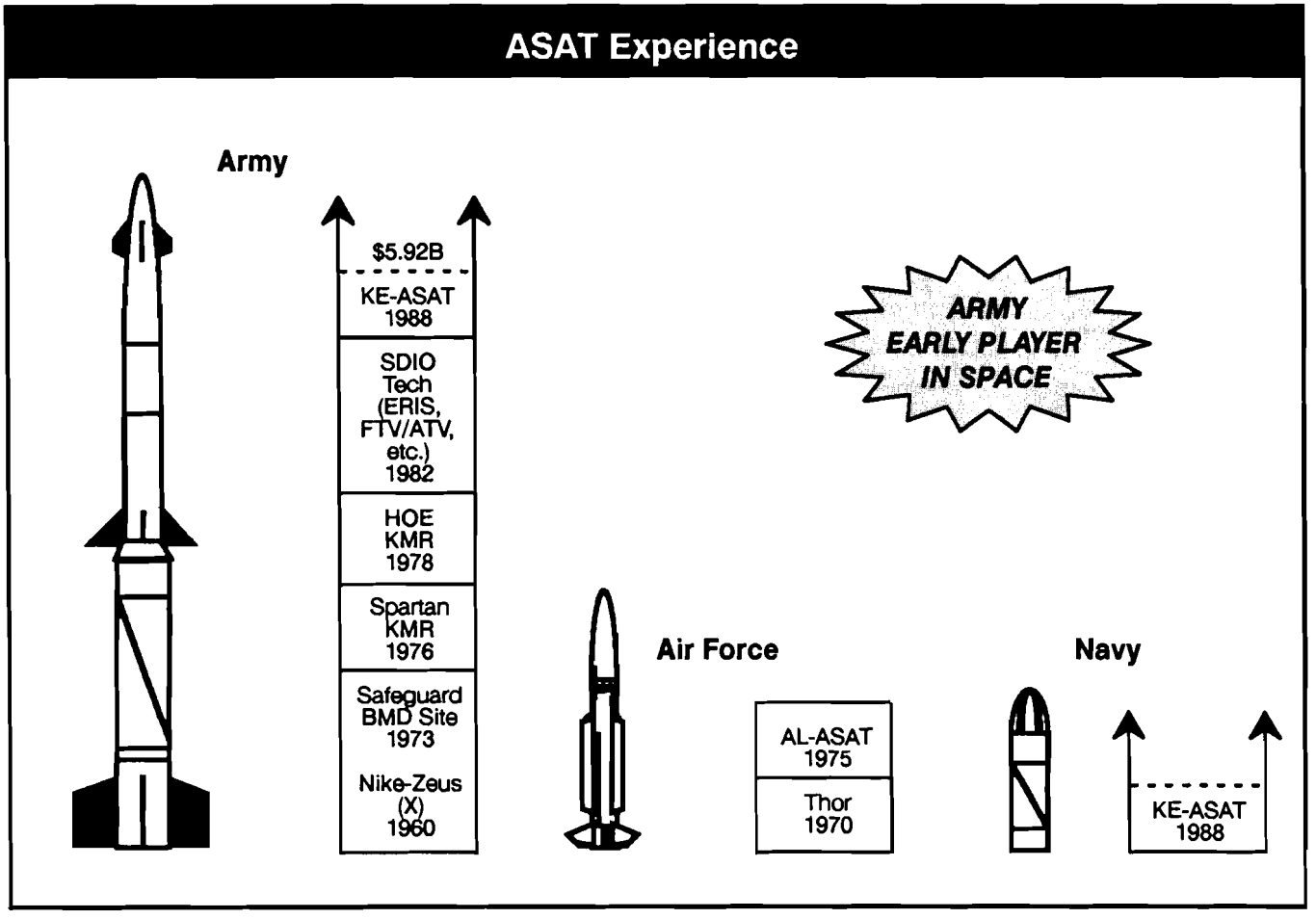
concept proposes revetted launcher areas with certified missile rounds loaded into a six-pack container. The revetted area would provide protection against small arms fire and debris from high explosives impacting in the immediate vicinity. The missiles would be transported and emplaced by a special purpose vehicle or a flatbed trailer and crane.

Program Development

One reason that the Army has the program lead for ASAT is its past role in ASAT development and the development of technologies use-







able in the ASAT program.

The role that TRADOC and USAADASCH will play in ASAT development is similar to the roles they have played in the development, acquisition and fielding of all air defense weapons. The material developer, however, is not the U.S. Army Materiel Command but the Strategic Defense Command. The user is also a new organization, USARSPACE, headquartered in Colorado Springs, Colo.

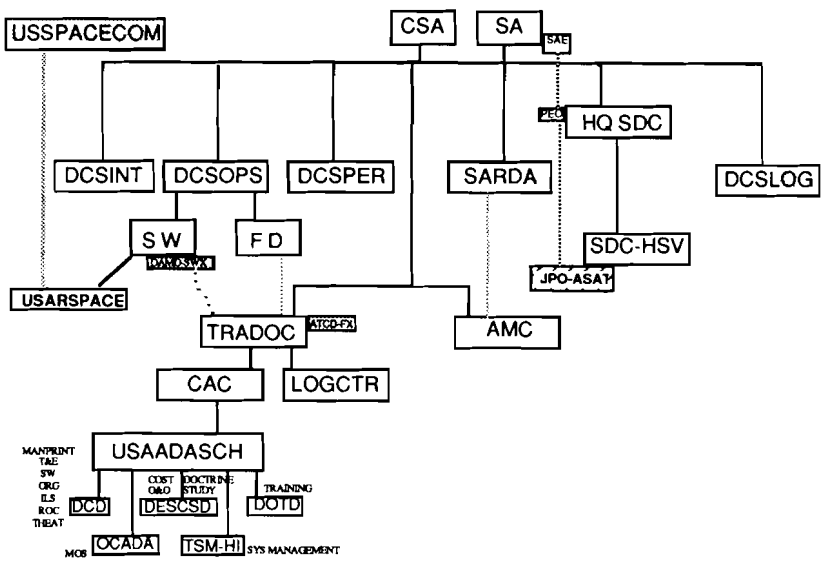
The functions and products assigned USAADASCH are indicated in the following chart. The TRADOC system manager for HIMAD currently has responsibility for TRADOC total system management of ASAT. The other USAADASCH directorates (Directorate of Combat Developments, Directorate of Evaluation, Standardization, Concepts and Studies and Directorate of Training Development) will develop ASAT combat, doctrine and training products.

The Joint Program Manger for the ASAT system is Brig. Gen. J. Morgan Jellett, who has the responsibility of ensuring both the Army and Air Force programs produce effective components on schedule. The ASAT Joint Program Management Office is in Huntsville, Ala.

The ASAT acquisition strategy has evolved into a phased development and fielding program with a more austere initial phase than originally planned.

As ASAT progresses through the acquisition cycle, the concept and design will mature and "how to fight ASAT" will become clearer.

Army ASAT Organization



The Future

The Army's involvement in high technology will continue to increase. Today, Air Defense Artillery is establishing the basis for space control. Tomorrow, air defenders may discover that space-based ADA assets are essential for target detection, identification and C^3 as we move into the 21st Century.

Mr. Pete Olson is the deputy TRADOC system manager for HIMAD, Fort Bliss, Texas.

Brig. Gen. Jellett to Manage ASAT Program

Army Brig. Gen. J. Morgan Jellett will manage a 60- to 70-person ASAT Joint Program Office to develop the surface-based kinetic energy ASAT. The joint-service office is located in Huntsville with Strategic Defense Command (SDC) to take advantage of the existing Army organizational structure and the technical expertise available in the ongoing Ground Based Interceptor Program.

Prior to this assignment, Jellett was a command director for the North American Aerospace Defense Command Combat Operations, Cheyenne Mountain Complex, Colo. Before being selected for brigadier general in July 1987, he had served as project manager for SDC's Airborne Optical Adjunct and, before that, as deputy program manager for integration in the Missile Command's Air Defense Programs Office.

Since this article was written, the ASAT acquisition strategy has evolved into a phased development and fielding program with a more austere initial phase. Only one initial firing site is planned with significantly less manpower projected for manning and operations. ARSPOC will accomplish technical fire direction. Launcher design and areas continue to be re-evaluated.

THE *Testing* RIGHT *Procurement* STUFF!

by Mr. Tom Doyle and Mr. Bruce Houser

Several recent articles (M. D. Rich, *L.A. Times*; G. Boehnert and D. Howie, *Defense News*; F. Reed, *El Paso Times*; J.Colvard, *The Wall Street Journal*) describe the present weapons acquisition and weapons testing process, identifying critical faults and offering possible solutions to the often-confused weapons acquisition process.

The authors make good sense to many involved in operational systems testing. We who work directly in operational testing experience much of what the authors have identified: inflexible test scheduling, lack of adequate test instrumentation, inadequate technical tests of weapons' system and subsystem designs, marginal test ranges, poor government and contractor management decisions, unrealistic targets and threat, and hardware and software user unfriendliness, among others. This article specifically addresses the technical information (generally referred to as "data") used to make procurement decisions.

The testing phases, classified as technical or operational, are the critical points during a system procurement cycle. The tests demonstrate if the system really works as required. Testing is critical because it is the relatively objective part of procurement — no salesmen, no veneer. The system under test must prove that it functions effectively and reliably because of its technically good design, mission suitability, soldier use and relative ease of operation and maintenance.

If we do our testing job well, we theoretically promote "good" systems and re-evaluate or eliminate "bad" systems. Testing, in dollars and time, translates into money well spent to prove good systems, and money not wasted to promote bad systems. How does testing accomplish this?

The basic issue of interest is the actual goal of a test. The actual goal of a test (operational or technical) is to collect the right kinds of "data" to answer the test issues. The phrase of importance is, "to collect the right kinds of data." The right kinds of data are information required to validly explain what, where, when and how the test activities transpired during the test trials.

The right kinds of data provide a composite picture of truth. Deriving the truth requires the right blend of the X number of verified data fields that construct this composite picture. Each system under test is unique, so there is no global standard for the right data. However, knowledgeable, capable technicians know what the test issues are and can determine from their analysis plan the best kinds of data to address the test issues. The right kinds of data create a predictable, controllable chain reaction: better data = better analysis = better decisions.

This organized body of understandable, logical, supportable information assists in answering the question *why* (or *why not*) this system?

Many pretest and test meetings and briefings within the Army deal almost exclusively with the administrative or physical function of testing: the organizational structure, the numbers of computer terminals and the placement of latrines. These types of items are elements of the resource document, the Outline Test Plan, and are typically sorted out long before test initiation. However, we begin to detect early-on that one of the greatest problems in testing is that the participants, generally the Test Integration Working Group or other splinter groups, seldom take time to research and read applicable test documentation.

Possibly due to government assignment policy or rapid changes and turnover, few government personnel have a working knowledge and understanding of test and evaluation (T&E) methodology and procedures.The tester's documents developed during the T&E cycle (the independent evaluation plan, the test design plan and the detailed test plan) in no way ensure that the data will be collected, let alone that the *right* kinds of data will be collected. Consequently, when the pilot test and record test trial data are deficient or nonexistent, the test proceeds (scheduling is paramount), fingers point and the test customers (i.e., the system user community) do not receive the product they deserve.

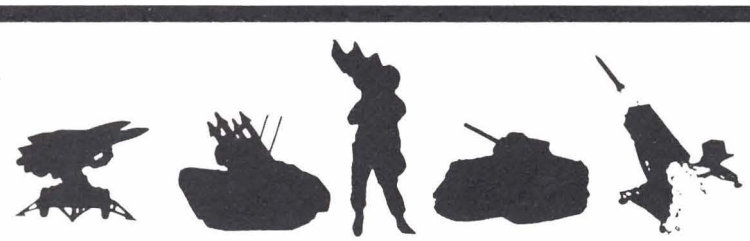
It is the quality and, to a lesser extent, the quantity of the data that is critical to valid testing. Yet to many Army and contract testers, this is a forgotten or taken-for-granted notion. The description of the data-gathering process is generally a block diagram of the data processing "flow," usually a "vanilla" hearted diagram without serious thought and research to relate it to system specifics. Again, an organizational representation is stressed. Granted, it is obviously important to have an organizational structure in place for a test. But this is the part of the test with which the Army is most familiar. It is the detailed part, the data collecting-reducing-analyzing part, that is not at all easy or obvious.

When the discussion turns to "the data," it is generally assumed that by virtue of verbalizing the term data, it exists or is valid independently of observation. In addition, any data that doesn't fit into a traditional two-dimensional data matrix is often ignored. It's no longer data because it defies the physical structure. It simply becomes nonessential. For example, much of the data collected on a system under test involves how the system, man and machine, interface. These data are referred to as performance events (e.g., detection of a target) and are often, in reality, not composed of a discrete event such as simply visualizing the location of a prospective target, but involve multiple machine functions and operator behaviors. Detection might involve the equipment's ability to defeat electronic jamming or see through smoke, while the operator must interpret radar clutter and locate real priority targets. This particular detection event is typically represented as an event time (time of detection occurrence) that cannot begin to explain the *quality* of the detection performance. Therefore, a detection event time is recorded into the typical two-dimensional (observation by data fields) data matrix, and the "real" detection performance is not captured because it cannot be described or explained within the digits and colons of time. What is lacking in this case is the information (data) required to determine what effect the system had on achieving its goal of target detection. Add to this a similar poverty of information regarding other significant events such as target acquisition and tracking, and the data void becomes large indeed.

The articles mentioned earlier address part of the solution to this data dilemma. Qualified technicians need to make the technical decisions, and the military needs to train, support and promote military personnel in technical roles. Yet, the most important ingredient in the testing process is a passion to fulfill the goal of the test. What is required, if you will, are more compulsive data enthusiasts. Not pure egghead types, but people compelled to insist on collecting the right kinds of data because they understand its meaning and relevance. The modeling and simulator people, as well as the testers, need to be much more involved. Due to the high cost in dollars and manpower to conduct field testing, increased emphasis needs to be placed on the use of modeling and simulation. Field tests, in certain situations, are needed to validate a modeling or simulation. But the combined field and laboratory efforts could certainly augment the knowledge base of the system under test. The modelers and simulators need to insist on having the right types of data to validate their models or simulators. Data can't be properly analyzed or used without some knowledge of how it was collected and what it means. People desiring good data need to roll up their sleeves.

The right data for decision-making is vital. Basically, dollars are not the primary issue — military and civilian lives depend on properly tested systems that are procured based on the support of the right kinds of data.

Mr. Tom Doyle and **Mr. Bruce Houser** are with the Test and Evaluation Group of Management Assistance Corporation of America, White Sands Missile Range, N.M.



VAPOR TRAILS

Fire on the Mountain

Nestled in the desolate mile-high lava saddle between two volcanic peaks on the "Big Island" of Hawaii is the Army's famous Pohakaloa Training Area (PTA). Here, for 14 days, the 62nd Infantry Division's Aim High Battalion, the 1st Battalion, 62nd Air Defense Artillery, executed its most audacious, fast-paced and realistic air defense live-fire and maneuver training exercise yet — Bell High 3-89.

First of all, because PTA is located 250 miles southeast of Schofield Barracks on Oahu, a separate island, the battalion conducted sea and airlift of equipment and soldiers. The battle readiness of each battery was evaluated as they prepared, outloaded and received equipment for their ARTEP. Most of the equipment was shipped by barge and the soldiers were deployed tactically on a charter flight. Two Air Force C-141s were used to exercise the emergency air deployment capabilities of one Stinger section and one Vulcan platoon. Each unit deployed and redeployed as a separate battery.

After arriving on Oahu, each battery experienced an intense one-week ARTEP designed to stress their battery's combat and combat support capabilities in a realistic training situation. The ARTEP was built using situational training exercises from the gun/Stinger battery mission training plan. The ARTEP integrated evaluation of tactical Vulcan/Redeye live-fire and battle drill assessments for Vulcan squads and MANPAD teams. The ARTEP tasks evaluated were combat sustainment, defense of a critical asset, convoy, air assault operations, Vulcan gunnery (day and night; both aerial and ground) and tactical Redeye live-fires.

Integrating combined arms and combat support elements into each ARTEP also increased the realism for each battery. Throughout the week, each Vulcan platoon air assaulted twice and live-fired aerial and ground targets in a critical asset defense and in "action on wheels" during a convoy defense. Battery M-60 teams conducted small arms for air defense (SAFAD) during the Vulcan live fires. An engineer small emplacement and excavation vehicle was attached and provided support in preparing foxholes and gun emplacements. Each Vulcan platoon live-fire was completed as one of four separate missions (night and day ground, night aerial, critical asset and action on wheels). Each time, the squads and platoons were evaluated on their Vulcan battle drills and their aerial gunnery qualification.

An infantry company was training separately at PTA. The 1-62nd ADA coordinated some combined arms training and the infantry company provided M-60, SAW and M-16A2 SAFAD integration into the Vulcan shoots. One live-fire mission was a hasty ground defense to support the infantry. An infantry company had just cleared an objective and called for Vulcan ground support in their defense. After coordination and approval, the Vulcan platoon went into the recently

secured area and emplaced and prepared hasty defensive positions to ward off a ground attack.

After the engagements, some infantry soldiers fired off a few rounds to experience the Vulcan's kick and cloud of smoke. Our Vulcans performed similar ground support missions during past Team Spirit exercises in Korea.

Two UH-60s provided both lift support and aerial OPFOR for the Vulcans and Stingers. When not lifting the Vulcans, the UH-60 crews conducted aerial evasion training against the air defense. The Vulcans would track and radiate and the UH-60 would detect radar lock. The Stingers interrogated with IFF and the UH-60s would receive IFF and also be alerted. This was valuable training for the pilots, since they knew when they were seen and possibly engaged by ADA. An OH-58 provided the commanders and evaluators an aerial perspective of each unit's camouflage. Many squads and teams were never detected from the air. Pilots were often heard to whisper, "Did you see that one . . . we were right on top of them before we saw them."

"Yeah! But they probably saw us much sooner and fired first!"

All Redeye live-fire was integrated into the Vulcan shoots. The noise and the smoke from the guns and from the SAFAD created a new and all-too-real environment for the Redeye gunners. The gunners were further challenged by the placement of the BAT launchers. They were masked by a hilltop some 600 to 900 meters either left or right of them. With only a one-minute countdown (used for early warning) and knowing their range limits, the gunners and team chiefs alone had to acquire, track, receive good tone and engage their targets. Two of the four Redeyes launched were kills. From the beginning, CSM Gary Cabato said that the Redeye gunners were not going to get "freebee" shots as in the past. Each gunner was previously selected for his proven skills from exhaustive written performance-oriented battle drill assessments and arduous moving target simulator engagement testing. Under these realistic conditions, the CSM was pleasantly surprised that a 50-percent kill rate was still achieved.

The location and situation for the Vulcan gunnery also placed realistic and tough new standards for the Vulcan squads and platoons. The tradition of on-line guns within arms reach of each other was shattered during this exercise. The terrain was hilly, on a relative line for safety, 75 to 100 meters separated each gun, and intervening hills masked the gun positions. The squads were isolated as they would be in combat. The platoon leader's HMMWV on a hill to his gun's rear could see most of the guns, but was separated by some 100 to 150 meters. All communications were through the platoon net and each squad or platoon leader commanded his squad or platoon during the live-fire phase. Ammunition reloads and resupply were tactically done with 20mm TFT and 20mm HEIT-SD. When the inevitable gun jams occurred, the squad or platoon followed the tactical standing operating procedures to report and request a Vulcan maintenance contact team that was standing by on the range.

For 14 days the Aim High battalion brought Fire on the Mountain — Vulcan and Redeye live-fire — to PTA. The leaders, soldiers and their equipment endured a fast-paced realistic ARTEP that made each soldier . . . Run Boy Run!

– Capt. Medardo T. Dela Cruz

Chaparral Battalion Females

One of the last male strongholds in air defense artillery has given way. The 2nd Battalion, 2nd Air Defense Artillery (Chaparral), Fort Hood, Texas, has welcomed its first two female soldiers.

Pvt. 2 Misty Cox, a petroleum supply specialist, and PFC Naomi Willey, a Chaparral/Redeye repair technician, both assigned to the Headquarters and Headquarters Battery, began work amid little fanfare.

"They just treat me like one of the guys," said Cox, adding that she doesn't feel like being one of the first females in the battalion is anything special.

Assignments to the Headquarters and Headquarters Batteries of Chaparral battalions were opened to females last fall in a decision by former Secretary of the Army John O. Marsh Jr. The battalion was notified last June that they would receive their first two female soldiers this fall.

"We knew they (females) were coming," said 1st Sgt. John Fejerang, "so we prepared ourselves."

Preparations included designating a room and bathroom for the women and educating male soldiers about proper conduct now that women would be in the barracks.

"They're all soldiers," said Fejerang. "They'll pull their own load, without being unreasonable. We want to give them the chance to excel."

Down at the motor pool where the two soldiers work, life hasn't changed much. Cox's supervisor has worked with women before and hasn't had to make any special adjustments for her.

"I hate to say this but, in some ways, female soldiers are easier to supervise," said WO 1 Dale Young. "They tend to follow directions better."

Whatever the case, Cox and Willey are happy to be part of the team.

— **Pamela Keeton**

Task Force Panther

Hawk, Patriot and Chaparral units from the 11th Air Defense Artillery Brigade and airborne warning and control aircraft from the Air Force proved too much for opponents as Task Force Panther plowed new paths for air defense last fall. The massive air defense gauntlet converged on the small town of Mena, Ark., for Coronet Sentry, an Army-Air Force air defense exercise.

Task Force Panther consisted of the 2-7th ADA, a Patriot unit from Fort Bliss, Texas; the 2-52nd ADA, a Hawk battalion from Fort Bragg, N.C.; the 1-2nd ADA, a Chaparral unit from Fort Stewart, Ga.; and the Air Force's 552nd Tactical Air Wing from Tinker Air Force Base, Okla.

The 2-7th ADA contributed three firing batteries, the headquarters battery and the 507th Maintenance Company, augmented by soldiers from HHB, 11th ADA Brigade.

The task force provided air defense around Mena to defend the town's strategic assets, defeat suppression of enemy air defense attempts, maximize emission control procedures and assure the maximum use of the Mena air strip.

— **SFC Richard T. Glenn**

1-138th Live Fire

The 1st Battalion, 138th Air Defense Artillery, Indiana Army National Guard, fired its first annual service practice this past winter at Fort Bliss' McGregor Range. The ASP was a first for both the battalion and the National Guard — the first time a Stinger ASP took place during inactive duty training (a drill weekend).

A five-man advance party departed the 1-138th ADA's headquarters in Lafayette, Ind., in two CUCVs loaded with mission-essential equipment. Two-and-a-half days and 1,600 miles later, the men and vehicles arrived at Fort Bliss, Texas. The next day, an eight-man contingent flew in to augment the advance party. These personnel spent the next four-and-a-half days coordinating the logistical and operational requirements for the live-fire.

Eight MANPAD teams each fired one Redeye with a final tally of one direct hit, five tactical kills and two misses (one caused by missile failure). The unit's live-fire, however, proved more successful than mere score cards can indicate. The ASP proved that the 1-138th ADA can arm, fuel, fix and man the air defense battlefield operating system to support the commander's intent, demonstrated that the National Guard is capable of training its soldiers to standard in a relatively short amount of time, and served as proof that the 1-138th ADA's high flexibility and ability to plan and execute complex real-world missions in far-away places.

— **Maj. David L. Keys**

Roving Sands '89

The secret to success on the battlefield is peacetime training. And if the results of joint field exercise Roving Sands is an indicator, the soldiers of the 11th Air Defense Artillery Brigade can hold their own in any wartime situation.

To test its warfighting capabilities, the brigade put more than 8,000 soldiers, airmen and Marines in the desert for the largest air defense exercise ever conducted in the continental United States.

Conducted at various locations throughout West Texas and New Mexico, Roving Sands '89 marked the first time all six of the brigade's battalions joined forces for a field training exercise.

The 2-52nd ADA, a Hawk battalion from Fort Bragg, N.C., and the 1-2nd ADA, a Chaparral unit at Fort Stewart, Ga., both deployed to Fort Bliss, Texas, home of the 11th ADA Brigade, by air and rail to join their sister battalions in the exercise.

Meanwhile, the 5-62nd ADA deployed from its Fort Bliss home to Roswell, N.M., where the Vulcan-Stinger battalion joined the New Mexico Army National Guard's 7-200th ADA (Hawk) and 1-200th ADA (Chaparral) to defend the municipal airport.

The brigade's other Patriot unit, the 3-43rd ADA, although fresh from a 30-day exercise in Nevada, was tasked to provide control and evaluation of the 2-7th ADA's ARTEP conducted in conjunction with Roving Sands.

Support for the exercise came from the 13th Ordnance Company which provided general support maintenance to the Hawk and Patriot units; the 2nd Platoon, 507th Medical Company, which offered medical evacuation; and the 89th Chemical Company, 3rd Armored Cavalry Regiment, which gave detailed decontamination assistance to units as part of the nuclear, biological and chemical tasks contained in the exercise.

To make the exercise a truly joint effort, Air Force units from Cannon, Holloman and Kirtland Air Force Bases in New Mexico; Carswell Air Force Base, Texas; and Tinker Air Force Base, Okla.; and Marines from El Toro and Camp Pendleton, Calif., and Yuma, Ariz., were moved into the exercise area.

The objective of the exercise was to perform contingency mission training in a realistic joint field training exercise, using a combined arms setting which challenged the battle staffs to function as teams and, at the same time, challenged every echelon to apply survival skills in changing situations and conditions.

These survival skills ranged from individual mission-essential tasks such as NBC training and weapons qualifications to unit-level skills which included live-fire exercises of every weapon system in the brigade.

As the sun set on Roving Sands '89, everyone agreed that the largest air defense exercise ever was a "smashing success" and began planning for its follow-up, Roving Sands '90, in May.

– SFC Jim Austin

New Chaparral

The last two batteries at Fort Hood, Texas, to receive the new M-48A2 Chaparrals are putting them through their paces.

The 2nd Platoon, B Battery, 2nd Battalion (Chaparral), 2nd Air Defense Artillery, took the new weapons system to Fort Bliss, Texas, to support the 3rd Armored Cavalry Regiment during training exercises there. Both units were preparing to go to the National Training Center.

"We provided short-range air defense for the 3rd ACR Regimental Service Support Area," said 1st Lt. Todd Childers, platoon leader. "And we provided air defense for route and march movement along with the 5-6th ADA, 11th ADA Brigade, Fort Bliss."

The improved Chaparral is equipped with NBC overpressure capabilities that enable it to operate in an NBC environment and with the forward-looking infrared (FLIR), a device that picks up heat sources, allowing the unit to identify targets at night or during inclement weather. It allowed the 2nd Platoon to perform its mission on a 24-hour basis for the first time.

"This made it more challenging," said Childers. "We had to work around rest plans to carry out our mission."

The four-man Chaparral crews operated around the clock for more than 10 days at Fort Bliss. Rest plans ensured that the crews did not suffer fatigue and jeopardize the mission. Weather also presented a challenge for the unit.

"It rained a great deal," said Childers. "But that is good training for the FLIR because it's designed for use in inclement weather."

C/2-2nd ADA, is the last unit to field the improved Chaparral and, according to platoon sergeant SFC David Doggett, they can't wait to put the system through its paces.

– Pamela Keeton

From the 54th CA to the 5-5th ADA

From Coast Artillery t

by Dr. John Wands Sacca

The traditions of ADA NCOs and soldiers lie firmly rooted in the history of the Coast Artillery. The years between the end of the Civil War and the beginning of the Great War witnessed the introduction of new technology and improved weapons systems in coast defense that required the creation of NCOs who would perform duties as technical specialists and supervisors. While most of the U.S. Army attended to the mundane duties of garrison and field service that had changed little in decades, Coast Artillerymen found themselves on the cutting edge of modernization.

One of the most fundamental differences between the NCOs and soldiers of ADA and all other branches is their frequent need to adapt themselves to new weapons systems, new equipment and new tactics. Change, for them, is a fact of life. An example of the need for

o Air Defense Artillery

such change occurred at the turn of the century, when the 54th Company of Coast Artillery (current designation, 5th Battalion, 5th Air Defense Artillery) was assigned the exclusive duty of training NCOs and soldiers in the use of submarine mines.

The Corps of Engineers developed the submarine mine (commonly known as the torpedo) for use in harbor defense. Mines have changed little since the turn of the century. The two basic types are mechanical mines (detonated by contact) and remote contact mines (operated by electrical circuit from shore). Even the primitive contact mine is still a formidable weapon — more than 20 such mines have, in recent history, been swept from the Persian Gulf by the U.S. Navy after commercial shipping was disrupted and disabled by their presence.

Coast defense NCOs and soldiers prepare a submarine mine at Fort Totten, N.Y. (1904 photo courtesy of National Archives)

The Torpedo School

In 1869 the Battalion of Engineers stationed at Willets Point, New York Harbor, assumed the task of developing a torpedo system as part of the system of coast defense. Experiments with high explosives led to the development of submarine mines. By 1875, President Ulysses S. Grant extolled the submarine mines as "the most effective and cheapest auxiliary for the defense of harbors, and also in aggressive operations, that we can have." In 1880, the Commanding General, William T. Sherman, issued an order giving official recognition to Willets Point as a torpedo school, later to be renamed the School of Submarine Defense. Given the great expense of the heavy artillery used in coast defense, the comparative cheapness of the mines impressed both politicians and taxpayers.

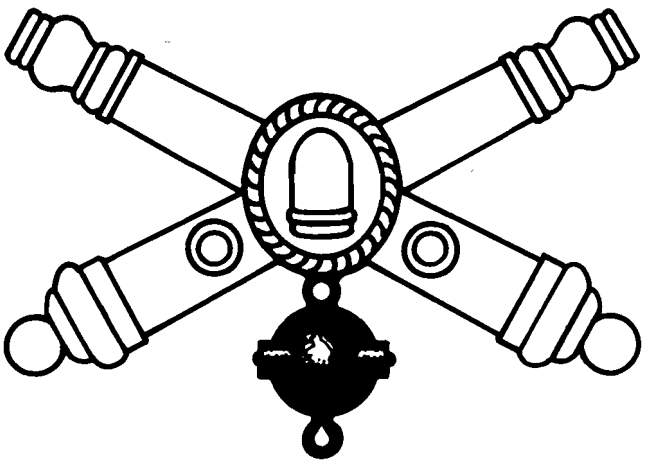
Branch Rivalry

1898 saw the beginning of the war with Spain and the renaming of Willets Point as Fort Totten. The Spanish-American War forced Congress to face up to the woefully inadequate state of the coast defenses. As a result, in 1901, 126 Coast Artillery companies were authorized, each company being designated numerically from one to 126. The war also revealed defects in the harbor mining system. While engineers tried to remedy these faults, the artillery "began to agitate for the transfer to them of all the submarine mine business," recalled one embittered engineer, "urging that it was so intimately connected with the gun defense of a harbor that it should pertain to them." Although the engineers had developed these weapons, their time as the sole employers of the mines had run its course.

To the delight of the artillerymen, the Torpedo School transferred from the care of the engineers to that of the artillery as a consequence of an act of Feb. 2, 1901, which charged the Coast Artillery with the care and use of the fixed and movable elements of land and coast fortifications to include the submarine mine and torpedo defense. A future chief of artillery, Maj. Arthur Murray, Artillery Corps, was appointed Commandant of the School of Submarine Defense. The rivalry over control of the submarine defense system between the engineers, charged with the construction of coast fortifications along with research in submarine weapons, and the artillerymen, caretakers of the great coast guns, was finally decided; hereafter, to the artillery belonged all the weapons of coast defense.

Submarine Defense

In 1902, the closing of the Engineer Depot removed the last vestige of the Corps of Engineers from Fort Totten. Five companies of Coast Artillery moved in. Among them was the newly redesignated 54th Coast Artillery Company, formerly H Battery, 5th Regiment of Artillery. The history of H Battery began in 1861, a few months after the



Coast Artillery mine planter insignia

opening shots of the Civil War, when the unit organized as a part of the Regular Army at Fort Greble, Pa. H Battery would participate in 24 campaigns before war's end.

At Fort Totten, the 54th Company was singled out from among the other 125 Coast Artillery companies for a unique and demanding assignment. Special Orders No. 240, War Department, Adjutant General's Office, dated Oct. 17, 1901, appointed the commanding officer of the 54th Company, Capt. George F. Landers, Artillery Corps, as instructor of the Department of Electricity, Mines and Mechanism at the School of Submarine Defense, and placed him in charge of all submarine mining materials in the Artillery District of East New York. His company would work exclusively with the new weapons system. General Orders No. 9, dated Jan. 27, 1903, gave the 54th Coast Artillery Company a special designation by the War Department as the "Torpedo Company," and its strength increased from 109 to 140 men with the addition of 31 privates. When prepared in submarine mining, 33 1/3 of the company's enlisted strength transferred to other posts to care for and operate the submarine mining material.

By assigning the 54th Company the duty of special training in submarine mining and training other men in their use, the Coast Artillery responded to the need to create the technically and tactically proficient soldiers necessary to the operation of the mining defenses of harbors. The engineers, lacking qualified personnel, had placed the mining material under the care of civilian electricians paid from the appropriations of the Engineer Department. The artillery would have none of that. On Oct. 13, 1901, the Commandant of the Artillery School called publicly in the pages of the *New York Times* for the replacement of these civilians by noncommissioned officers of artillery. To place the newly acquired weapons system under the care and operation of artillerymen, one company assumed the exclusive task of training in submarine mining.

Training

The men of the 54th Artillery Company found their new assignment especially demanding. The work was more technically difficult than routine coast artillery tasks, and a good knowledge of electricity was necessary to the specialty. Working with the mines was also more physically demanding. Many of the operations, one officer recalled, were "wet, dirty and disagreeable."

The 54th Artillery Company's training day consisted of two parts. Each morning, the entire company trained together. It was not possible for the entire company to train as a unit the whole day because a large number of the 54th Company's most skilled NCOs and soldiers were assigned extra and special duties with the School for Submarine Defense, where commissioned officers of the artillery and engineers were instructed in the care, operation, handling and use of mines.

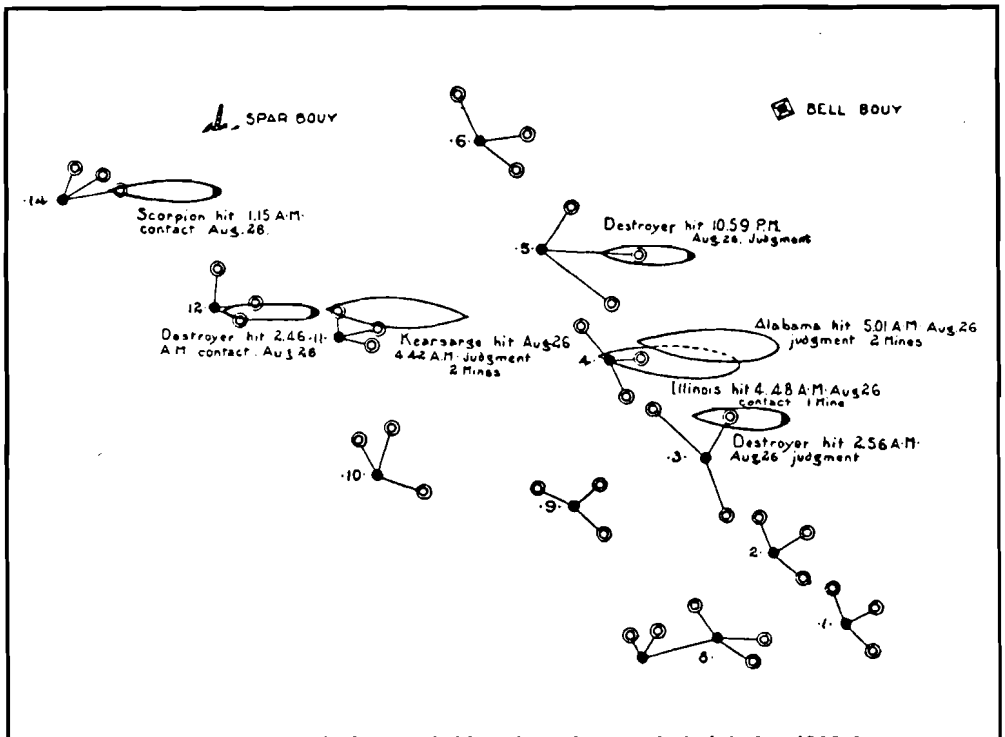
During the mornings of four of the five weekly training days, the entire company trained for just one hour: 10 minutes of calisthenics, 20 minutes of infantry drill and 30 minutes of submarine mine training. On the fifth day, the 30 brief minutes spent on training with mines was expanded to two-and-a-half hours for the benefit of the extra and special duty men.

After the extra and special duty men fell out, training continued for the rest of the company. Two-and-a-half hours daily were devoted to instruction in such topics as the use of angle-measuring instruments and plotting boards; duties in the loading room and on the water; knots and elementary cordage; care and preservation of submarine-mine material; handling of high explosives; use of telephones; and electric-light wiring. Examining boards, composed of three officers, examined the men periodically and designated members of the company as qualified first- or second-class gunners.

Soon after the submarine mining was turned over to the artillery, the branch set about to thoroughly revamp the entire system. To that end, the so-called "Torpedo Board" was organized. Given the large appropriations made by Congress to the Coast Artillery, along with the rapid developments made

commercially in electrical appliances, the board's mission was timely. So thoroughly was the mining system revised that only the casings and a few electrical devices were retained. Consequently, only officers and NCOs trained on these new mines would be familiar with them in the future.

Off the shores of Portland, Maine, during the Army and Navy maneuvers of August, 1903, this rigorous training regimen paid off. The "Torpedo Company," along with student officers of the School of Submarine Defense, represented the Army in that pioneering joint-service maneuver. The "Torpedo Company" planted and operated from shore 38 remote-control mines placed in defense of the harbor. Judges declared seven of the Navy's ships as being "hit" by the Army's mines. The men gained great practical experience as this training exercise "called for the rapid planting of mines in water from 60 to 120 feet in depth and in a current of about three miles an hour," as the after action report noted. In an era when Regular Army maneuvers were a rarity, the success and confidence the men of the 54th Coast Artillery Company experienced was not only progressive, but historic.



Relative positions of mines and ships after mines exploded during 1903 Army and Navy maneuvers near Portland, Maine.

Mission Accomplishment

In 1905, at the behest of President Theodore Roosevelt, Secretary of War Taft created a board to incorporate the latest techniques and devices into the system of coast defense. The charge from the president was "to recommend the armament, fixed and floating, mobile torpedoes, submarine mines, and all other appliances that may be necessary to complete the harbor defense with the most economical and advantageous expenditures of money." The board recommended the addition to the coast defense arsenal of fixed, floating and mobile torpedoes and submarine mines.

It would take just short of two years to train the first group of men from the Torpedo Company in submarine mining. In December of 1905, 47 men of the 54th Company were transferred to various other Coast Artillery companies. These men were replaced by 53 new men transferred from other Coast Artillery companies. The next transfer would not occur until 1907, when 20 men of the "Torpedo Company" were sent to the Philippine Islands.

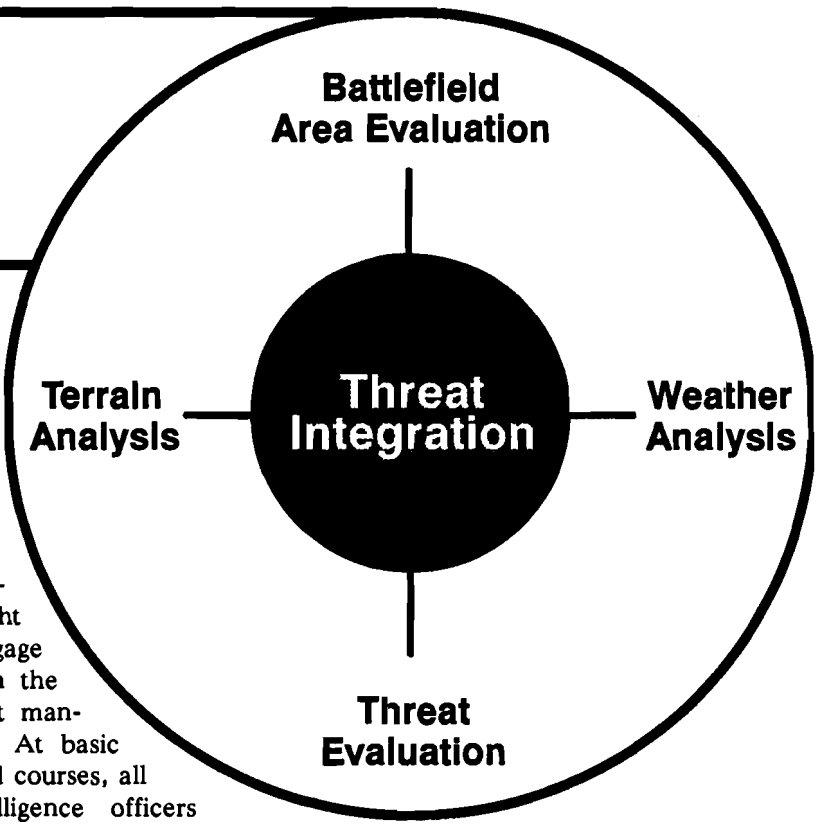
The next year, the School of Submarine Mining at Fort Totten closed and all training in the use of mines consolidated with other coast defense officer and enlisted courses at the Coast Artillery School, Fort Monroe, Va. The 54th Company's special mission in submarine mine training was accomplished.

The Tradition

The mission of the ADA soldier and NCO has changed little since the days of coast defense; only the targets, weapons and consequent tactics are different. The constants never vary. The key concept is still "defense." The weapons systems remain the most technically advanced and demanding to use. Adaptability to change has been, and will remain, the hallmark of such soldiers as they undergo the rigorous training required of their defensive craft. The accomplishments of the NCOs and soldiers of the 54th Coast Artillery Company present every ADA unit with not only a standard of excellence to live up to, but also with a heritage to be recalled with pride.

Dr. John Wanda Sacca is a warrant officer candidate with the 1157th USARF School. His Ph.D. is in history of military education at the State University of New York at Albany.

IPB
A Logical Approach



by 1st Lt. Benjamin Clayborn

A common notion prevails that it is possible to conduct very little air defense intelligence preparation of the battlefield (IPB). That notion errs. IPB, a dynamic process tailored to meet the needs of a variety of units, even ADA units, keys preparation for the next battle. It is a flexible process altered to meet the needs of offensive, rear area and, to a certain extent, air operations.

Field Circular 34-130 was the first attempt to institutionalize doctrinal IPB for areas of concern above the ground (air operations; the third dimension)at division level and higher, but was of little use to echelons below division. This paper is a guide to conducting third dimension IPB in ADA units at division level and below. It is also a tool for ADA brigade and battalion commanders and staffs to use in the decision-making process.

The IPB Process

The IPB process builds an extensive data base for each potential operational area. It analyzes this data base in detail to determine the impact of enemy weather and terrain on friendly operations, and presents this information in graphic form. IPB integrates enemy doctrine with weather and terrain to determine and evaluate enemy capabilities, probable enemy courses of action and vulnerabilities. IPB starts before hostilities begin and continues during the battle, giving the insight needed to engage the enemy in the most efficient manner possible. At basic and advanced courses, all military intelligence officers are trained in the IPB process until it is almost second nature to them — and rightly so. After all, they are the instigators and executors of the IPB process in their respective units.

The problem? Most IPB training received is two-dimensional. It is oriented, as are most facets of the Army, to the perceived ground threat, and thus is not very useful to an ADA commander. What is useful to the ADA commander, however, is the IPB process. This process, when molded to fit the commander's needs, yields results that significantly enhance his unit's ability to prepare for and win the AirLand Battle.

Background

In the late 1970s the Army recognized the need for an offensive approach to interdicting the follow-on echelons of enemy forces. This need resulted in the development of AirLand Battle Doctrine. This doctrine, in turn, sparked the need for offense-oriented IPB. Offensive IPB procedures emerged, but these procedures were not new. They were merely a refinement of the traditional IPB process.

As AirLand Battle doctrine developed, so did the IPB process. IPB grew to encompass not only offensive and defensive IPB, but also rear area, low intensity conflict and, to a certain extent, three-dimensional IPB.

Cyclical IPB Process

Like the intelligence cycle, the IPB process is cyclical in nature. All IPB functions directly affect the other four. Let's examine the IPB process step by step, and assess each step's applicability to an ADA unit.

Battlefield area evaluation. The first step, battlefield area evaluation, is the basis for analysis of weather, terrain and threat. It involves assessing enemy capabilities, friendly capabilities, weather and terrain; and determines a unit's

area of operation (AO) and area of interest. Evaluate the AO and area of interest in terms of width, depth and height (airspace).

The ground AO is a geographical area assigned the commander to conduct his mission. Based upon the factors of METT-T, the ground AO is defined in terms of width and depth and is represented graphically on a map overlay.

The air AO is similar to the ground AO, taking into consideration weapons range, radar line-of-sight coverage, refueling points, air bases, etc. However, it differs from the ground AO not only in terms of width and depth, but also in height.

In determining the air AO, define the limits of range and altitude of the organic ADA weapon systems. Based upon these two limitations, make an air AO diagram.

The area of interest is based upon METT-T and the commander's concept of the operation. It is the area adjacent to the AO and extends, based upon METT-T, past the FLOT into enemy territory.

An ADA unit's area of interest normally is much larger than a maneuver unit's area of interest, due to the great distances aircraft can cover and the speed with which they can influence friendly operations. The air area of interest includes enemy airfields, enemy surface-to-surface missile sites, forward area refuel-rearm points (FARRPS), etc. The air area of interest also extends upward to the maximum ceiling of enemy aircraft.

Terrain analysis. Terrain analysis, weather analysis and threat evaluation are the next steps in the IPB process. Conduct these steps in any order or simultaneously.

Terrain analysis is the single most useful portion of the IPB process at battalion and brigade levels. It is hard to fathom how an ADA unit can plan its general defense mission without a thorough terrain analysis.

Terrain analysis emphasizes the use of graphics to depict the effects of terrain on ground and air operations. It focuses on the military aspects of the terrain known as OCOKA: observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach (air and ground).

Based upon the unit's mission and its location on the battlefield (forward or rear), a normal ground-oriented terrain analysis is helpful to an ADA commander in determining high-speed avenues of approach, likely ambush positions, choke points and key terrain. However, you should conduct a separate terrain analysis with just the air avenues of approach: a 3DTA (three-dimensional terrain analysis).

The 3DTA graphically depicts the terrain in a way that the commander can easily picture. It identifies low-lying areas, mountain ranges and certain steep ridges.

When producing the 3DTA (unlike a normal terrain analysis), pay little or no attention to man-made obstacles, open areas, densely forested areas, roads and railroads. Highlight terrain that meets the criteria of "slow go" or "no go" because of drastic elevation changes.

Highlighted properly, major ridges and valleys will virtually pop into view. These highlighted areas (depending upon where a unit's assets are placed) may mask low-flying threat aircraft from optical as well as electronic line-of-sight.

Although the ground terrain analysis overlay identifies key terrain, the 3DTA analyst must pick out key *air defense* terrain — terrain that, if occupied, would afford either optical or electronic line-of-sight fields of fire of the highlighted areas. Label these areas "key air defense terrain." This terrain will likely become the base piece or pieces upon which the commander will build his air defense coverage.

An aircraft can fly virtually anywhere, making it difficult to predict specific air avenues of approach. The IPB process gives a pretty good indication of where enemy aircraft are most likely to fly. But everywhere above the ground is a potential air avenue of approach. Therefore, try to build an ideal air defense design. (A design in which all terrain is covered can never really be achieved. Line-of-sight blind spots, radar masking, etc., will always exist.)

One way to reduce the number of blind spots in your air defense coverage to an acceptable number is to use the terrain to the maximum extent possible. Do this by building an air defense design with key air defense terrain in mind. Position air defense weapons systems on the key terrain and then deploy other air defense weapon systems to complement them with mutual support and overlapping fields of fire. This greatly reduces the places that threat aircraft can fly undetected.

Weather analysis. During the important weather analysis phase, analyze climate and weather in the AO and area of interest to determine their effects on enemy and friendly operations. Weather affects the altitude at which threat aircraft fly, their means of navigation, ability to take off and land, load capacity, speed and range. Because of these significant effects on aircraft and friendly and enemy ground operations, give weather analysis a great deal of attention.

Threat evaluation. To successfully complete the final stage of the IPB process, *threat integration*, first conduct an in-depth threat evaluation. Conducting a threat evaluation develops a doctrinal template file. Most of this work, however, is normally conducted at echelons above division. For the purpose of this paper, the objective of the threat evaluation phase is to atune yourself with the doctrine, capabilities and vulnerabilities of the enemy. No set of guidelines exists on how to con-

duct the threat evaluation or how long it will take. It varies from individual to individual, and is never totally complete. Like the IPB process, threat doctrine is dynamic. Therefore, the threat evaluation phase must never stop. The data base will change as threat doctrine changes and as the analyst becomes more familiar with existing doctrine. Analysts must read and digest articles and source documents, attend briefings and scrutinize intelligence estimates. All of this is part of the threat evaluation phase of the IPB process. Call this phase the "get smart" phase.

Threat integration. The final step of the IPB process, threat integration, combines analysis of the enemy's doctrine, capabilities and vulnerabilities with the weather and terrain analyses to determine how the enemy might actually fight within the specific battlefield environment. The threat integration phase is very involved, with many thought processes going on simultaneously. Based upon knowledge the analyst gained during the terrain analysis, weather analysis and threat evaluation phases of the IPB process, he must answer a series of questions. These questions will differ, based upon METT-T, for every unit. To complete this step, answer the threat integration series of questions from a "Red (enemy) perspective" and in the order listed, as one question directly affects the following ones (see illustration).

The first two questions deal with the enemy's major strategic objectives and analyzing which ones to suppress and which ones to destroy. To answer these two questions, the analyst must envision himself as an enemy war planner. He must analyze which Blue assets could keep him from achieving quick success. He must then determine which Blue assets to destroy and which to suppress for a period of time. Determining how many targets to attack and, of those, how many to destroy or suppress, is based upon the Red assets available.

In the threat planner's eyes, war resembles a chess game, with each side having various pieces with different capabilities. The side that most strategically maneuvers its pieces will obviously win. Therefore, opponents destroy some "pieces" and suppress other "pieces" for a period of time.

For instance, it may not matter to a threat planner whether a strategically important Hawk site is destroyed. The only imperative for the planner is that the Hawk site be unable to fire missiles long enough for his planes to fly overhead. The enemy might accomplish this mission by sabotaging the target acquisition radar, electronic countermeasures, sabotaging key fire control cables, food poisoning or local chemical attacks.

Americans have a hard time grasping the suppression concept. We think in terms of destruction, annihilation and overrunning. We must learn to "think Red." The analyst must familiarize himself with the enemy's capabilities and with the enemy's objectives. Once he is familiar with both, he can determine which weapon or weapons the enemy will target against which particular enemy objective.

The analyst can answer the third question once he has a good working knowledge of what the strategic battle looks like. The answer is very important to the commander, because air defense weapon systems are positioned and allocated differently if a high value strategic target is located in the commander's AO. Also, use this answer as the basis for determining the number and type of aircraft that will be operating in the unit's AO.

The fourth question deals with determining the major air corridor placement. The accuracy with which you answer this question depends on the reliability of the answer to questions 1 and 2. Major air corridors are determined by strategic enemy METT-T factors: Red mission or missions, Blue assets that could jeopardize enemy success, enemy troops availability and training, terrain from enemy airfields to strategic objectives, and time needed to accomplish the mission. So, by analyzing the strategic METT-T factors, the air corridor placement

Threat Integration Questions

1. From a strategic viewpoint, what are the major objectives of the enemy air operation?
2. Which of the above objectives should I destroy, and which should I suppress for a period of time?
3. Where do the assets that my air defense unit defends fit into the strategic picture? Are these assets, from an enemy perspective, destroyed or suppressed?
4. Where are the major air corridors?
5. How much strategic importance does my air defense unit and its firing batteries have? Which units or firing batteries will the enemy destroy? Which will the enemy suppress?
6. Of the objectives the enemy will destroy, what are the most likely or feasible methods he will use to accomplish that mission?
7. Of the objectives the enemy will suppress, what are the most likely or feasible methods he will use to accomplish that mission?
8. Where and when is my air defense unit the most vulnerable to unconventional warfare?

can be reasonably postulated.

The fifth question calls for an analysis of friendly air defense units, their battlefield positions and their perceived capabilities.

For the enemy air operation to succeed, the air defense weapon systems capable of acquiring aircraft within the air corridor must be suppressed in one form or another (bear in mind that destruction is a means of suppression). In analyzing where to locate the air corridor, and identifying the location of friendly air defense units that have the capability to shoot aircraft within that air corridor, you can determine where and how your air defense unit fits into the "big picture."

Thus, if an air defense unit's position prevents it from engaging aircraft in the perceived air corridor, then the chance of high concentrations of *spetznaz*, chemical, surface-to-surface missile and heavy artillery attacks are less likely than in the case of a unit whose location is right in the heart of the perceived air corridor.

In answering the sixth and seventh questions, the analyst must take all of the perceived enemy objectives determined to this point and postulate, based upon his knowledge of enemy doctrine and METT-T, how the enemy will destroy or suppress each objective. In conducting this process the analyst must stop thinking on a strategic level and instead think as an enemy regiment or squadron commander. He must plan how he, as an enemy commander, could best move his planes from beddown locations, through an established air corridor, to an objective, and back.

The analyst must use all of the knowledge he has gained during the IPB process to determine the most likely way the enemy would attack each objective.

To answer the last question, conduct a low-intensity conflict (LIC) IPB process of the unit's AO. This is extremely hard to conduct without tapping outside resources. For information on completing an LIC IPB, contact your servicing Counterintelligence Detachment and review FC 34-130 and FM 100-20.

The final step of the threat integration phase is to graphically represent the answers to the questions. Do this in the form of an overlay — in essence, a situation/decision support overlay. The credibility of the situation/decision support overlay is directly proportional to the accuracy of the threat evaluation and terrain and weather analyses.

The first step in making the situation/decision support overlay is determining and plotting named areas of interest (NAIs). An NAI is a point or area in the area of interest where activity will either confirm or deny a particular course of action. Some common NAIs are —

- friendly forward deployed air defense locations (enemy activity at these locations could indicate enemy air avenues of approach),
- airfields and auxiliary airfields,
- FARRPS,
- major terrain features, and
- major cities.

The second step in making the situation/decision support overlay is plotting the major air corridor or corridors.

Once you have plotted the air corridor or corridors, determine and plot the air avenues of approach. Air avenues of approach are routes which provide aircraft, airborne or air assault forces a direct route from the air corridor to the target or objective. Analyze the air avenues of approach criteria before determining and plotting likely avenues of approach.

Now transcribe the results of the LIC IPB process onto an overlay. Do this on either the existing overlay or on a separate overlay.

Air Avenue of Approach Criteria

Air defense weapons placement: Avenues of approach will come within acquisition range of as few air defense weapons as possible.

Terrain: The best air avenues of approach permit maneuver and provide aircraft with terrain masking from air defense weapons from the air corridor to the objective.

Weather: Some avenues of approach are only usable in optimum weather conditions.

Mission: An air avenue of approach is dependent upon the threat aircraft's mission. An air avenue of approach for an air defense suppression mission is different than a BAI mission.

ECM effectiveness: If enemy ECM is effective, or perceived effective, in significantly reducing ADA's ability to attrit aircraft, then the avenue of approach is at medium altitude and on a relatively straight heading to the target. If, however, the enemy's ECM is not effective, they will fly at lower altitudes and attempt to use the terrain to mask them from target acquisition radar coverage.

Summary

IPB is the key to being prepared for the next battle. IPB integrates enemy doctrine with weather and terrain to determine and evaluate enemy capabilities, vulnerabilities and probable courses of action.

Specific use will vary from unit to unit, but IPB is a dynamic process. Analysts and air defense commanders need to expand upon this guide and tailor the IPB process to the needs of their individual units.

1st Lt. Benjamin B. Clayborn is S-2 of the 5th Battalion, 44th Air Defense Artillery, Spangdahlem, Federal Republic of Germany.

CAREER NEWS

The Art of OER Painting

Are you a new rater or senior rater? Are you a little uncomfortable about your responsibilities in rating your officer subordinates? Has it occurred to you that receiving Officer Efficiency Reports (OERs) is one thing, but writing them properly and doing justice to them is quite another? If you answered yes to these questions, keep reading.

OER writing, like officership, is an art form. Officers who understand this art form are able to paint the proper images of their subordinates for a prospective board member. However, officers who do not understand the nuances of the OER system may actually do a disservice to their hardworking, loyal people. I will use this article to provide my personal tips on accepted norms and how you might stylize your OERs to support the image you wish to project. For brevity purposes, I will concentrate on positive OERs. Let's start by looking at the first page of the OER.

In Part IIc of the OER you fill in your rank and position as senior rater. However, a simple rule is that higher rank generally means greater credibility. So if you have a particularly outstanding officer under your responsibility whom you senior rate, ask your rater to senior rate the individual. Explain to him your reasons. Most senior raters have no objection to accelerating a young superstar. Before requesting your rater to senior rate this individual, be prepared to provide proposed senior rater comments.

Keep it simple when you fill in the individual's duty title (Part IIIa). Use recognizable terms such as S-4 or division plans officer, and avoid vague terms like coordinator and developer. If necessary, add extra information on the duty title line (as space permits) to further clarify a duty position. For example, assistant S-1 could become Assistant S-1, Divisional ADA Battalion.

Use Part IIIc for the individual's duty description. *"The first sentence,"* report most board members, *"is what I read."* Board members read the remaining sentences if time permits, but these sentences don't have the impact of the first sentence.

Part IVa provides you with the opportunity to rate the individual's professionalism. Make them all 1's unless you have a subordinate with a problem that you must report. Height and weight, as well as an APFT pass, are obviously important. Add something about the officer's professionalism in Part IVb unless you intend to send a passive signal that this officer is not worthy of comment. Character and the ability to communicate are accepted discriminators in this area.

After reading the first page, the prospective board member has sketched a mental image of the rated officer. He has determined whether or not the rated officer is a leader type. Is he fit? Can he communicate? Examine the sample OER on the next page. What is your image of this officer?

The back page of the OER adds color and clarity to the sketch formed from the information on the front page. The critical back page determines the officer's final evaluation. Starting with Part Vb, what do the blocks really mean? You might logically interpret the far left block (*always exceeded requirements*) as an above-average officer, the next block (*usually exceeded requirements*) as an average officer and the far right blocks as different degrees of below average. However, board members interpret anyone checked in blocks to the right of the far left one (*always exceeded requirements*) as below average. Do not check blocks to the right unless you intend to discredit the rated officer. Showing improvement is not a valid notion on an OER; rather, board members see this as a less-than-satisfactory performance. Take care: your good intentions may easily hurt an officer.

Board members do not normally read the rater's narrative (Part Vc) in its entirety, so the *first and last sentences are the most important*. Use the first sentence to make a broad statement of the officer's abilities and accomplishments. My adjectives, in descending order of competency, are perfect, outstanding, superb, exemplary, excellent, good, satisfactory, fair and failed. Your actual interpretation and use of

PART III – DUTY DESCRIPTION *(Rater)*

a. PRINCIPAL DUTY TITLE BATTERY EXECUTIVE OFFICER | b. SSI/MOS 14B5P

c. REFER TO PART IIIa, DA FORM 67-8-1

Executive Officer of a VULCAN/STINGER air defense battery consisting of 114 personnel, 9 Towed VULCAN systems, 20 Stinger teams, 45 associated wheeled vehicles and related support equipment with the primary mission of deploying worldwide within 18 hours to provide air defense to elements of the First Infantry Brigade, 101st Airborne Division (AASLT).

PART IV – PERFORMANCE EVALUATION – PROFESSIONALISM *(Rater)*

a. PROFESSIONAL COMPETENCE *(In Items 1 through 14 below, indicate the degree of agreement with the following statement as being descriptive of the rated officer. Use comments in the rehearsal blocks.)*

HIGH DEGREE 1 2 3 4 5 LOW DEGREE

1. Possesses capacity to acquire knowledge/grasp concepts	1	8. Displays sound judgment	1
2. Demonstrates appropriate knowledge and expertise in assigned tasks	1	9. Seeks self-improvement	1
3. Maintains appropriate level of physical fitness 8906/Pass	1	10. Is adaptable to changing situations	1
4. Motivates, challenges and develops subordinates	1	11. Sets and enforces high standards	1
5. Performs under physical and mental stress	1	12. Possesses military bearing and appearance 71/175 YES	1
6. Encourages candor and frankness in subordinates	1	13. Supports EO/EEO	1
7. Clear and concise in written communication	1	14. Clear and concise in oral communication	1

b. PROFESSIONAL ETHICS *(Comment on any area where the rated officer's performance is outstanding or needs improvement)*

1. DEDICATION
2. RESPONSIBILITY
3. LOYALTY
4. DISCIPLINE
5. INTEGRITY
6. MORAL COURAGE
7. SELFLESSNESS
8. MORAL STANDARDS

a.2. Extremely intelligent in all assigned areas.
a.3. A physical speciman continuously scores above 290 on APFT.
a.7,14. Excellent writer, superb briefer.
b.3. Unquestioned loyalty.
b.5. Integrity and honor above reproach.

SAMPLE

these adjectives may vary, but generally follow the above pattern.

The last sentence or two should sum up the officer's overall performance and capabilities. I've given two examples (see top of the next page) of how to emphasize the first and last sentences of the rater's narrative.

The potential blocks (Part Vd) carry the rater's greatest impact on the rated officer. Like the performance blocks, the board members' interpretation of the potential blocks varies, but I'll describe the accepted norm:

· *Promote ahead of contemporaries* could vary from a perfect to an excellent officer depending on the potential comments you supply in Part Ve.

· *Promote with contemporaries* implies "promote only if the numbers allow it; screen the officer's entire record carefully."

· *Do not promote* means "show cause why this officer should stay in the service."

· *Other* only applies under special circumstances, such as retirement. See appropriate regulations before checking this box.

Only by checking *promote ahead of contemporaries* will you ensure that you do not hurt the rated officer.

Previous board members have indicated that they only read intermediate ratings (Part VI) because of their rarity. When an intermediate rating pops up on the screen, board members are naturally curious. As a rule, however, intermediate raters do not carry much weight in the evaluation process.

The senior rater is the true heavyweight in the OER evaluation. One axiom, credited to a former board

Rater's Narrative Emphasis

Example 1

First sentences: (Name) is the most outstanding officer I have ever witnessed in my 18 years of commissioned service. (Name) excels in all professional attributes. He combines flawless integrity, strong character, physical and mental toughness, superb perception, a balanced approach, profound sense of duty, abundant loyalty and sound judgment to accomplish each and every task in an outstanding manner.

Last sentence: (Name) combines the drive, discipline and intellectual powers of a born commander.

Example 2

First sentence: (Name) is the most outstanding officer I have ever known.

Last sentences: He is a complete professional who consistently sets the example and is admired by his superiors, peers and subordinates. (Name) is a natural leader and a very bright officer who accomplishes everything outstandingly.

member, states, "A rated officer cannot receive a max OER without a senior rater." The heavy discriminators in the OER are in the two relatively small blocks in the senior rater portion. Each block, the senior rater profile and the senior rater narrative, can clarify or skew the OER picture. The conscientious senior rater understands the importance and responsibility of his position. After over a decade of use, I believe a few senior rater norms have developed. The most important of these is that senior raters have decided to use either a three- or four-block distribution with the often-accepted meanings shown at right.

The essential element for any senior rater in selecting a distribution style and block is consistency. Once you've established a rating philosophy, stay the course.

Over time, however, circumstances may arise that inflate your profile. In this case, it is better to restart your profile than to unnecessarily hurt a rated officer.

Good senior rater narratives contain comments about the rated officer's outstanding duty performance.

A qualifier, such as "best" or "first," will differentiate the water walker from the above-average performer. Comments about the officer's character can weigh heavily in his favor if he is equal to his peers in all other areas. As a matter of course, include the following items in a good rating: promote immediately, send to advanced schooling now, place in the next level of command now, is a candidate to work at the highest echelons of the Army.

Senior Rater Profile

Four-Block Spread

Top block: Walks on water; one or two out of a hundred. Promote below the zone, send immediately to the next higher school, entrust with the toughest and choicest assignments.

Second block: Top officer, better than average, promote, consider below the zone, send to higher schools.

Third block: Average officer, promote with peers, consider for advanced schooling.

Fourth block: Below average, do not promote.

Three-Block Spread

Top block: Varies between a water walker and an above-average officer. Senior rater narrative becomes the discriminator with this profile.

Second block: Average to slightly above average officer depending on the narrative. Definitely promote with peers, consider for advanced schooling.

Third block: Below average; promote only if appropriate and in the best interests of the Army.

The above-average senior rater criteria are the different colors of paint you need to complete the OER masterpiece. Now sit back and view your latest subordinate OER to determine if you are sending all the correct messages to the prospective board members. The last thing a rater or senior rater wishes to do is unintentionally hurt an outstanding young subordinate.

— Maj. Frank J. Caravella
Department of Geography
U. S. Military Academy

ADATS Passes Milestone

Martin Marietta's ADATS mobile air defense system has completed the live-fire portions of the Army's initial operational test and evaluation (IOTE).

Missiles fired by soldiers of the 2nd Battalion, 6th Air Defense Artillery Brigade, between February 13 and 20 destroyed six of seven targets. Completion of the live fire testing paves the way for the force-on-force phase of ADATS IOTE at Fort Hunter Liggett, Calif., scheduled to begin in April.

The White Sands Missile Range, N.M., test included shots at fixed-wing aircraft and helicopters deploying combinations of electronic jamming, flares, chaff and smoke.

Prior to the operational firings, eight missiles were launched against a variety of targets as part of the system's technical testing, including the first missiles ever fired by U.S. Army personnel rather than company technicians.

"The system was successful six times which, combined with the excellent performance during IOTE, bolsters our confidence going into the force-on-force testing at Fort Hunter Liggett," said Fred Marion, vice president for Air Defense, Martin Marietta Missile Systems.

During the next phase, tests will be conducted in a simulated battle environment to demonstrate the system's ability to defend forward forces. The force-on-force phase of ADATS testing is expected to last for approximately two months. The

ADATS is set to begin the force-on-force phase of its initial operational test and evaluation.

results will be used to support additional procurement.

Foul Weather Tests

In earlier tests conducted at Camp Grayling, Mich., ADATS demonstrated its remarkable ability to fight in typical European foul weather.

An ADATS fire unit performed nearly 50 target acquisition and tracking exercises against fixed-wing and helicopter targets in adverse weather including rain, snow, fog and freezing drizzle.

The entire engagement scenario was demonstrated, including target search, acquisition and tracking and the missile firing sequence although missiles were not actually fired for range safety reasons.

"The successful completion of these [Camp Grayling] tests is a major step, because it proves what we have known for a long time, that ADATS can outperform the threat in foul weather," Marion said. "In every case, if the target aircraft could fly, we could find them and our laser system could penetrate the weather to allow it to accurately guide the missile."

Camp Grayling, located in the northern portion of Michigan's lower peninsula, was chosen for the test after a review of nearly 27 potential sites in the United States and Canada. Camp Grayling almost precisely mirrors the weather and terrain of the Fulda Gap in Central Europe. Besides the acquisition and tracking exercises, ADATS crews obtained detailed performance data on radar operations in European-representative terrain and "clutter."

While the tests were part of the comprehensive evaluation program for the U.S. Army's four-component forward area air defense (FAAD) system, the unit tested was built for the Canadian Forces' Low-Level Air Defense System and data will be shared with Canadian officials. The Canadian version of ADATS was used because the ADATS units built for the United States were engaged in the IOTE at Fort Hunter Liggett and because the Canadians had a need for the foul weather test data.

The ADATS is the central line-of-sight forward heavy component of the U.S. Army's FAAD system. Four ADATS production units have been engaged in aggressive testing and evaluation since Martin Marietta made on-schedule delivery during the first half of 1989.

Contractors Invited!

ADA Commanders Conference

The 1990 ADA Commanders Conference has been scheduled for June 12-14 at the U.S. Army Air Defense Artillery School, Fort Bliss, Texas. The conference attracts approximately 500 field grade and general officers to Fort Bliss each year.

This year's conference will focus on the synchronization of ADA assets with the combined arms team in a variety of combat scenarios including corps, heavy and light division operations. Other topics include ADA operations during Operation Just Cause and force packaging for contingency operations.

In an effort to increase the number of displays which proved popular at last year's conference, the ADA School and the Air Defense Artillery Association are welcoming defense-related contractors who wish to display their products and services.

This year, for the first time, contractors are invited to attend the formal briefings as well as selected social events incidental to the conference.

Displays, subject to the approval of the commandant, may include air defense weapons and related technology and personal services available to ADA soldiers.

Displays will be set up in the hallways and meeting rooms of the Fort Bliss Headquarters Building, where most of the conference activities will take place. No direct solicitation may take place.

Contractors interested in attending this year's conference or reserving display space should contact the ADA Commanders Conference action officer at 915-568-5138 or 915-568-4133.

Contractors who wish to place advertisements in the *Air Defense Artillery Yearbook*, a showplace publication published in conjunction with the conference, should contact Ric Reaghard of Capital Military Publications at 512-250-9023 as soon as possible.

Some Things Just Don't Measure Up To Expectations

. . . But Our Visa Card Does.

You know what you want in a credit card. Compare and you'll find that other cards just can't size up to ours.

- **Low, fixed 14.9% A.P.R.**
- **No annual fee.**
- **25-day grace period for credit card purchases.**
- **No PFCU fee on cash advances.**
- **No need to cancel when you move.**
- **Flexible monthly payments.**
- **Toll-free member service.**

Apply Now.

For a full measure of benefits and services, complete the coupon and drop it in the mail or call us toll-free today!

800-247-5626

☐ Yes, I'm interested in applying for a Visa. Please send me an application.

☐ I am not a member of Pentagon Federal, please send me a membership application.

NAME

ADDRESS

CITY STATE ZIP

( ) DAYTIME PHONE ( ) EVENING PHONE

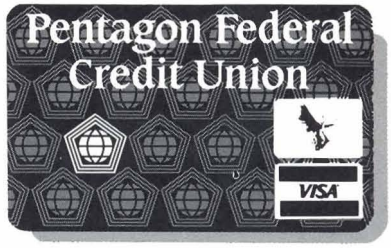
GRADE/RANK BRANCH OF SERVICE

Send to: Pentagon Federal Credit Union
Attn: Rose Zarecky
Box 1432, Alexandria, VA 22313-2032

687ADA

Pentagon Federal Credit Union

Box 1432
Alexandria, VA 22313-2032



You must be a member of Pentagon Federal to qualify for this card. The following persons and their families are eligible for membership: all active, reserve, retired or National Guard Army or Air Force commissioned or Warrant Officers; active duty or retired Army or Air Force enlisted personnel who are not eligible for membership in another credit union; and employees of the Pentagon. Other DoD personnel may be eligible; contact us for details.

We do business in accordance with the Equal Credit Opportunity Act. © 1990, Pentagon Federal Credit Union

NDI MULTICHANNEL UPGRADE
FOR
HIMAD COMMUNICATIONS

THE TD-1427(V)/U MULTIPLEXER PROVIDES THE AFFORDABLE ALTERNATIVE:

- **IMMEDIATE VOICE/DATA IMPROVEMENT**
- **LOW RISK, SMOOTH TRANSITION**
- **PROGRESSIVE UPGRADE WITH MSE/TRI-TAC INTEROPERABILITY**

CMC

CANADIAN MARCONI COMPANY

DEFENCE COMMUNICATIONS DIVISION 2442 Trenton Avenue, Montreal, Quebec, Canada H3P 1Y9
Telephone: (514) 341-7630 Telex: 05-827822 Fax: (514) 340-3100