AIR DEFENSE MAGAZINE

JANUARY-MARCH 1976

SOVIET AIR DEFENSE CONCEPTS

page 6

AIR DEFENSE MAGAZINE

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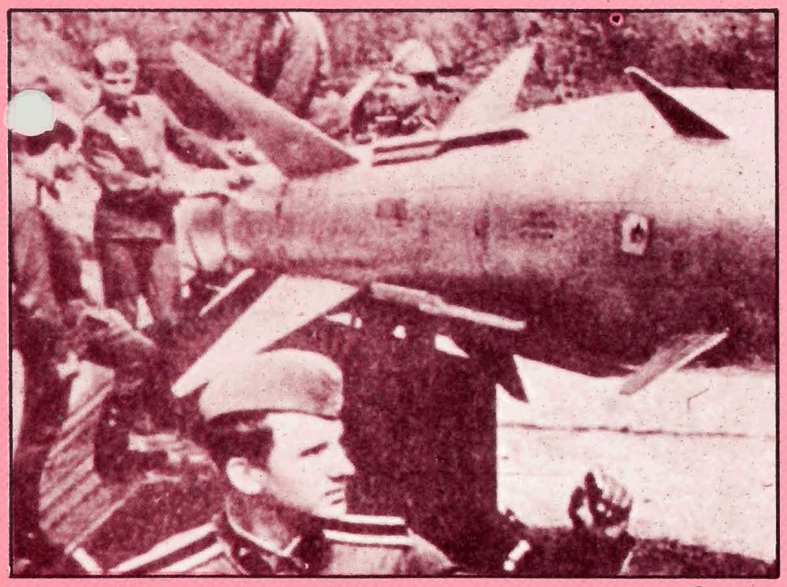
Our cover is a special effects treatment of photographs showing the action during an air defense practice alert as Soviet SA-4 (GANEF) missile crews rush through the exercise. The theme coincides with our lead article, "Soviet Air Defense Concepts," beginning on page 6.



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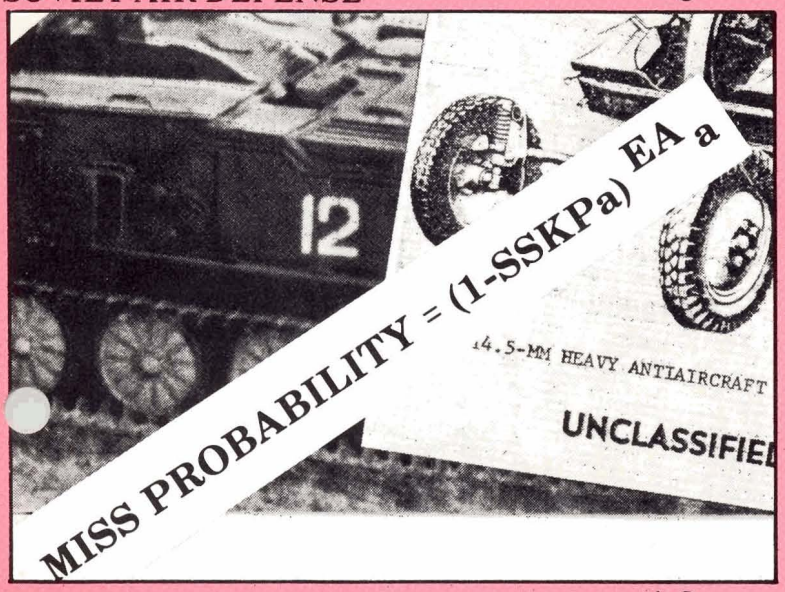

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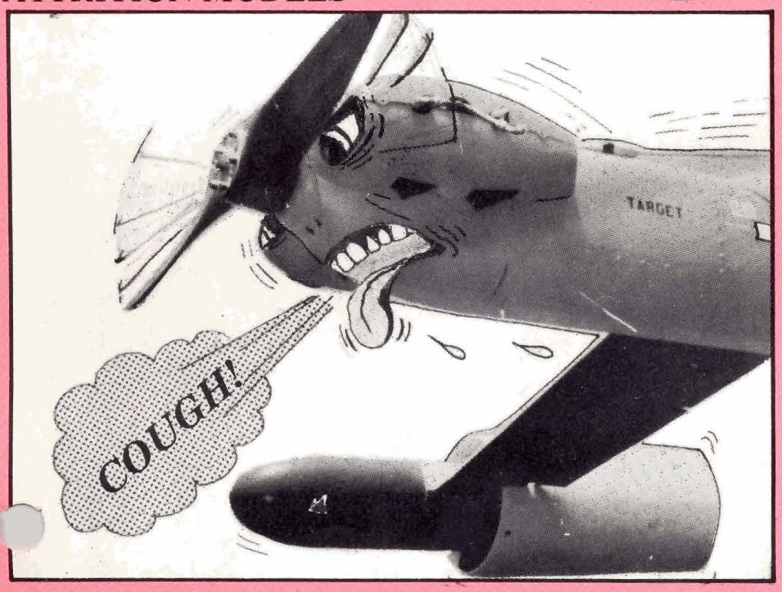

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ENGAGEMENT ZONE

letters to the editor

SOVIET AIR DEFENSE WEAPONS POSTER

Dear Sir:

This past week my office received the latest edition of Air Defense TRENDS. As an added bonus, a copy of the poster, "Soviet Air Defense Weapons," was inclosed. I have shown the poster to selected individuals here at the Naval Weapons center and all have indicated a desire to have a copy.

The mission of the Naval Weapons Center is to be the principal Navy Research, Development, Test, and Evaluation Center for Air Warfare Systems (except antisubmarine warfare systems) and missile weapon systems. One of the prime task assignments falls into the principal mission area of electronic warfare/defense suppression. The poster, "Soviet Air Defense Weapons," is most appealing to the personnel involved in that effort.

Request that an additional 25 posters be forwarded to my office for further distribution throughout the Naval Weapons Center.

Thank you for your assistance and keep up the good work!

RICHARD F. BOYD
LTC, GS
USADARCOM Liaison

Dear Sir:

Your October-December 1975 issue of TRENDS magazine contained a wall poster of Soviet Air Defense Weapons. This office would be interested in acquiring 20 of those posters to be used in our Opposing Force Program. The posters would be both displayed and used in lesson plans.

ROY J. ALLEN
CPT, GS
Project Officer
HQ, III Corps

Dear Sir:

In order to maintain the effectiveness of the Air Defense Training programs of the Second Marine Aircraft Wing, it is necessary to constantly improve the quality and quantity of training aids and techniques.

It is requested that 40 copies of the Air Defense Weapons Charts be forwarded this command (ATTN: G2, SC 302).

M.S. BURNS
1LT, USMC
Air Combat Intelligence Officer
2d Marine Aircraft Wing

Dear Sir:

Enclosed in the latest edition of Air Defense Trends (Oct-Dec 75) was a poster displaying Soviet Air Defense Weapons. Due to the increasing interest in the "Threat" within III Corps Artillery, this office requests 20 copies of the above poster. Request you send all posters to the following address:

Commander, III Corps Artillery
ATTN: AFVI-B
Ft Sill, OK 73501

WILLIAM J. TAYLOR
2LT, MI
Assistant S2

These letters are representative of the overwhelming response we've had to our Soviet Air Defense Weapons chart (October-December '75 issue). If your unit/office needs additional copies of the chart, write to:

The Editor
AIR DEFENSE Magazine
USAADS Box 5600
Ft Bliss TX 79916

Coordination is in progress between USAADS and TRADOC to have the poster produced and distributed Army-wide as a graphic training aid (GTA).

-Ed.

RECOGNIZE REDEYE ROLE

Dear Sir:

I am writing in reference to your Editor's comments in the Oct-Dec issue of Air Defense Trends. I strongly agree with your comment on the lack of articles and letters from the enlisted personnel of ADA.

I have a couple of thoughts that I would like to impress on the minds of all of your readers. The first pertains to the small air defense units in armored and infantry units, commonly called Redeye. I am a member of a Redeye section in the 1st Bn, 66th Armor, 2d Armored Div, Fort Hood, Texas. My major concern in this matter is the seeming lack of knowledge and awareness of the importance of the small air defense unit in an armored unit such as mine. Upon my arrival to 1st Bn, 66th Armor, and assignment to the Redeye section, I was thoroughly delighted to find that I was in a section of such importance to the rest of the battalion, or what I thought was important. But I soon found out, as I'm sure other similar air defense units did, that my primary mission was DETAILS!! Why? Because my commander,as did so many others in similar situations, displayed a minimum of knowledge of ADA. Needless to say, my section members and I were disappointed in ADA after the first month of our new assignment. To prove our enthusiasm to our commanders, all of the section members made outstanding scores at the Redeye school in Fort Bliss, which has nothing less than fantastic instructors. As a matter of fact, another member of my unit and I made the highest scores in our class, but to no avail.

Since then, we have changed company and battalion commanders and recognition of ADA in my armored unit has somewhat improved. But the fact remains that commanders in armor, infantry, and cavalry units still have not fully recognized ADA as a potential life preserver in a major war. Ever since I've seen the films of the destruction capabilities of fighter and close support aircraft, the thought has been impressed in my mind that the air threat must be suppressed in order that our armor and infantry units can accomplish their mission. In essence, we are quite dependent on each other. The solution? Recognition of the importance of small air defense units in armor and infantry units. The results: Better training,

more practical field exercises, and thus more effective kill rates in a combat situation.

SP4 ROBERT G. VINING II
CSC 1st Bn, 66th Armor
2d Armored Division
Fort Hood, Texas 76541

Indications are that the plight of the Redeye sections is improving as commanders become more aware of their important function. Your letter should help move things in the right direction.

-Ed.

ADA REQUIREMENTS

Dear Sir:

Since the October 1973 Arab-Israeli War, many articles have appeared in support of air defense artillery. Most of the authors described the ADA systems deployed with the US Army and noted that the Hercules and Hawk systems are old, somewhat immobile, and employ the technology of the 1950's and 1960's. The Chaparral and Vulcan systems have been described as fair-weather, off-the-shelf systems with many limitations. These articles also pointed to new systems under development—SAM-D, Roland, a new gun system. Take heart, brother, salvation is just around the corner. Or is it?

Congressional criticism of defense spending has been vociferous in recent years. Major military weapon systems costs have soared and cost overruns are the norm rather than the exception. Former Secretary of Defense McNamara and his successors tried to institute a more efficient method for procuring equipment to meet military requirements but failed to curtail the upward spiral of defense costs.

How has ADA Branch done in procuring a new weapon systems to meet the everincreasing threat? I recall a system called Mauler; another named Safeguard, Sentinal, Nike X, Zeus. What happened? Why are we now looking at foreign weapon systems to meet our ADA requirements? I thought the US was the absolute leader in advanced technology. Is our industry incapable of producing good ADA systems, do they just cost too much, or do we, the concept designers, ask too much?

First, let's look at some basics. The US is the world leader in technology. The reasons for this are varied but one fact is clear, the Department of Defense has been the forerunner in funding basic research and developmental costs since the start of World War II. Monies programed for R&D associated with weapon systems have maintained the US in a position of technological superiority. These efforts sometimes fell short of the elusive technological goal (MAULER), or became so expensive that these efforts were in vain in terms of deployed capability. But they helped us maintain the lead in technology.

Next, in developing and deploying the initial ADA missile systems, one of the major objectives was to shoot down all invaders. Since a hostile aircraft could be carrying a nuclear warhead, no one must pass. This was a nice thought, even though it was terribly expensive; and, as the USAF experience over Hanoi has proved, very optimistic. The question is, does this objective still live on in the minds of those who served so long and well in ARADCOM? Do we really need kill probabilities that approach 100 percent for division air defense? The US and the USSR have renounced the use of nuclear weapons. We have placed our population in jeopardy by agreeing not to deploy an antiballistic missile system. The inescapable conclusion is that the US will not use nuclear weapons at the strategic level except as a last resort. Therefore, does ADA need to plan or to deploy systems against a nuclear threat? Is the Congress willing to pay for an ADA system designed to counter a nuclear threat? They have already rejected Safeguard. Will they accept SAM-D?

Additonally, the Army is not the primary service responsible for air defense. The Air Force has made considerable advances in its air-to-air capabilities. How do these systems impact on Army requirements? Is there a need to double- or triple-kill hostile aircraft? Will Congress fund this type of over-kill?

Further, the DOD budget has continued to decrease in terms of buying power. Inflation and personnel costs associated with the volunteer Army have reduced the dollars available for the procurement of weapons. We must be very selective in our choice of new weapon systems simply because there are fewer dollars to purchase the required weapons. Although ADA is currently operating with outdated weapons and therefore should have a claim on procurement dollars, we can't feel like the Lone Ranger. Infantry, armor, field artillery, aviation, etc., all have valid claims for updating their fighting implements also.

In view of the above, what kind of air defense systems do we need for the 1980's? Someone thinks we need SAM-D. It's one of the Army's big five. But does SAM-D fit the changed strategic and tactical parameters of the mid-1970's? It was designed against a nuclear threat, a threat that Congress feels does not exist. Should the US tax payer be asked to pay an exorbitant price to deal with an unperceived threat? If Congress decides to buy SAM-D, then how much money will be available to procure a decent gun system for the division? Can ADA, with

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It is time to review our requirements for ADA and make some very difficult decisions. I would recommend against SAM-D because I think it is too costly. ADA and the Army cannot afford SAM-D because of the sacrifices that will be required in other areas. Our first priority must be an adequate defense for the fighting units which are the basis of the Army's combat power—the division. Our strategy for air defense systems of the 1980's must focus on the division and tactical mobility. It won't be easy and will require imagination and innovative approaches. Our efforts will be frustrated by severe cost constraints and the increasing threat posed by air-launched guided missiles and automated electronic warfare systems. A challenge? You'd better believe. But it's one we must solve in order to survive, not only as effective Army, but also as an accredited branch of that Army.

GORDON J. FAUBEL
MAJ, ADA
USMAAG to Iran

We understand that the SAM-D system is under constant scrutiny to avoid unnecessary "sophistication." The version under development has been extensively changed from the system originally planned, and its primary function will be to counter tactical aircraft which would threat our fighting units and rear areas. SAM-D is designed to replace Nike Hercules and Hawk and is expected to function effectively in the sophisticated ECM environment of the 1980's and beyond.

-Ed.

INTERC

HAWK IN DIRECT SUPP

Today we are confronted with overwhelming evidence that air defense of our field forces in combat is vital. No longer can US forces expect to enjoy the advantage of total air superiority experienced in past wars. In fact, the opposite may be true, and without protection from hostile air, ground forces will be denied the maneuver capability necessary to execute their battle plan; indeed, it is doubtful that they would survive on the modern battlefield. These facts were strongly reinforced by the latest Mideast war. The Arabs were confronted with an air force that was, by all accounts, clearly superior to their own. Yet, through the effective employment of air defense systems, they were able to virtually deny the Israelis their accustomed close air support, thus permitting adequate freedom of maneuver for their own ground forces.

This absolute necessity for air defense in support of maneuver forces has led to the current doctrine of a Hawk battalion in direct support of each division: in particular, each committed division. Hawk is the cornerstone of the current family of Army air defense weapons. Its capability to displace rapidly by battery/platoon echelon, while providing continuous protection for the ground force against low- and medium-altitude air attack, makes it an ideal complement to the divisional Chaparral/Vulcan battalion.

Organic Chaparral/Vulcan provides defense of the division commander's priority assets against low-altitude air attack. Hawk can generally provide complete coverage to the division area and, with its coverage weighted toward the FEBA, can provide air defense coverage well forward of the maneuver elements. Additionally, Hawk can weight its coverage toward any exposed boundaries and the division's priority assets.

When Hawk is included in the division's air defense scheme, the enemy's countermeasure and avoidance problem is greatly increased. The inherent limitations of Chaparral/Vulcan are offset by the Hawk system capabilities. Conversely, Chaparral/Vulcan complements the Hawk system by covering dead zones that may exist in the Hawk coverage of the divisional area. Also, Hawk gives the division an all-weather, day/night, increased altitude capability which it does not have with Chaparral/Vulcan alone. Besides the obvious benefits of extended altitude capability, Hawk's presence may also force the attacker to a low level, thereby increasing the effectiveness of divisional systems and rendering him vulnerable to small arms fire.

The function of the Hawk battalion in the direct support mission is appropriate because it

EPT POINT

Major General CJ Le Van

ORT OF THE DIVISION

places the battalion in the most responsive posture to handle the division's air defense requirements without sacrificing the principle of centralized direction by higher air defense authority. It allows the Hawk battalion commander to deploy his own units and assume as his primary sector of fire the zone of the supported division, subject only to any restrictions or specific guidance from the air defense group commander and higher air defense authority.

Inherent in the direct support mission concept is the orderly transition from a peacetime to wartime posture. The Hawk defense in Europe is an excellent example. Hawk units there are deployed in a belt forming a forward missile intercept zone. From these belt positions, Hawk is ideally suited to engage attackers well forward to cover deploying forces. At the first indication of hostilities, Hawk units will deploy from their present, known positions to predesignated alternate positions. Each battalion should be assigned a direct support mission for a specific division which will concurrently define that portion of the Hawk belt to be maintained by the battalion. The direct support mission will allow the battalion to respond most effectively to the division's needs and yet maintain the overall forward missile intercept zone.

Another significant advantage of Hawk's presence in the division is its role as the key element in the total integration of air defense support of the Army in the field. It provides the interface for the divisional air defense units into the overall air defense scheme. With the presence of a liaison team from the Chaparral/Vulcan battalion at the Hawk AADCP, changes in air defense rules and procedures received from higher air defense authority, in addition to early warning and hostile track information, are furnished the Chaparral/Vulcan fire units on a timely basis.

The direct support concept projects Hawk in its most valuable deployment. The advantages to be gained are very decisive. Above all, the direct support mission insures the flexibility for the Hawk battalion to quickly respond to the division's needs while, at the same time, enhancing the theater air defense commander's operational control by permitting definite and timely coordination between Hawk and the other divisional air defense units.

CJ LeVan

Every weapon system has fundamental strengths and weaknesses. When isolated, the individual weapon system's weaknesses are exposed, and it is then easily destroyed or countered. To prevent this, the system must not be isolated (i.e., one must deploy weapon systems in mixes so that the strength of system A covers the weaknesses of system B, and vice versa). This is the combined arms concept and it is true for all weapons — rifles, mortars, artillery, tanks, surface-to-air missile systems, aircraft, ships, etc. It is rather like shingling a roof — the shingles must overlap or the roof will leak and the rain will get through.

The more complex the weapon system becomes, the more emphatic become its strengths and weaknesses. An interceptor is helpless on the ground, a carrier is helpless against a submarine, a tank is helpless against a close-in Dragon/LAW shot, and a SAM system is helpless against mortars and automatic ground fire. Each of these complex systems is highly optimized to give formidable strength in one aspect, but its strength optimization generates correspondingly severe vulnerabilities per se.

One of the major weaknesses of any defense is the risk of being simply overrun. Concentration of attack requires concentration of defense (i.e., firepower) or the attacker can simply pay the low cost required to breach the defense and destroy it. Concentration is fundamental to theory of combat. A defense that is not concentrated is simply no defense at all. Defense concentration is achieved only by firepower (i.e., many shots must be fired quickly, either by a few shots each from many guns or by many shots each from a few guns).

Our fighting forces have long since learned the lesson of the combined arms concept *down to the lowest level unit which contains a composite mix of weapons.* In the infantry rifle company, we cannot rely on rifles alone but we must also have antitank weapons, grenade launchers, crew-served weapons, etc. So we add an entire weapons platoon right within the rifle company to augment the rifle platoons. But even in one rifle platoon, we must still have a composite weapons mix, so we even have a weapons squad in the platoon.

In our present air defense deployment concepts, we indeed give thought to the combined arms concept, but we have not used our AD weapons in actual combat and we have not yet appreciated the extent to which the weapons mix must be accomplished. We still individually deploy LORAD's, SHORAD's, and guns, and then we trust that they somehow manage to get integrated by our data/communications nets to some higher level such as the AD Group. In a sudden fierce air attack, it is highly probable that they will not be so integrated, particularly when the defenses are saturated and being overrun.

SOV
AIR DE
CONC

LIEUTENANT COLONEL

IET FENSE EPTS

THOMAS E. BEARDEN

The two basic ideas are these:

- So long as an attack consists almost entirely of a single threat type, a single response type of defense is adequate. In this case, a defense can be achieved by deployment of single systems which are overlapped to give mutually supporting coverage. One might call such a defense an "elemental" defense — only one "element" is used to comprise the defense deployment.
- When an attack consists of a "spectrum of threats," the elemental defense is inadequate and ineffective; i.e., since each element now has exposed vulnerabilities with respect to one or more elements comprising the attack, then every element is vulnerable to the attack. In such case, the vulnerable characteristic of one defense element cannot be rationalized as covering or shielding another defense element. This is true whether we are talking about an overall defense (defense of an organization), a single defense (critical asset), or even a single defense element (one individual weapon system). Since an effective spectrum attack by definition defeats each and every element of an elemental defense, then elemental deployment is unacceptable. *Spectrum attack demands spectrum defense at every site if the site is to have any reasonable chance of survival.* One might refer to the "spectrum site" deployment as compound or composite deployment, where it is understood that multiple and different weapon systems are codeployed at each individual site under a single site commander and command and control system.

This concept — that spectrum threat requires compound site deployment — has substantial impact on air defense. Each site is now a complex containing a composite mix of weapon systems. Site firepower, so necessary to survive against concentrated mass attack, is substantially increased. The compound site, being much larger than a single weapon system site, is much more difficult to camouflage and conceal. Since it can be located more easily by the attacker, frequent moves become necessary. Therefore, the equipment must be mobile or highly transportable, and march order and emplacement must be rapid and smooth. Crews must not require additional heavy equipment to move.

On the other hand, deployment of separated highly mobile, readily camouflaged systems — at least a few of them — provides a distinct advantage to the defender. Particularly against low- and medium-altitude defense suppressor aircraft, such systems provide additional surprise and break up the attack pattern once the attacker has located a main site complex.

Since most of the major sites may be expected to be located by the attacker, dummy sites (real sites with good dummy equipment) and site hardening become highly desirable, perhaps even necessary. The difference

between highly desired and required would be determined by the magnitude of the target acquisition and defense suppression elements of the threat.

The need for hardened sites but frequent moves would force the concept of using several prepared, hardened sites for each complex. Dummy equipment emplaced on one or more of these sites would constitute a primary and effective deception plan. Statistically, it would be advantageous to have as many sites unoccupied as are occupied by real or dummy equipment. To optimize defense survivability and effectiveness, frequent moves would be made to "shuffle the checkers" (i.e., to shift the pattern of *occupied real/occupied dummy/unoccupied* siting in a somewhat random manner).

Another aspect of this emerging concept is that *it allows a significant optimization in the use of relatively obsolete equipment and systems*. The problem is not linear; an "obsolete" system directly incorporated in a complex mix of codeployed systems is not nearly so obsolete or vulnerable as it is when deployed in a defense in an elemental fashion. When codeployed, some of its weaknesses are offset by the other elements. Codeployed, it still presents a problem to the attacker and requires that he devote a substantial portion of his attack spectrum to countering that particular defense element. For a specific "threat quantity," the threat portion devoted to countering "obsolescing" defense elements represents a substantial tradeoff and a decrease in the threat portion available for countering the more modern elements of each codeployed defense site. Since every defense site in a compound deployment has this mix, the attack cannot choose to optimize against one defense system but must try to cover all of them. This represents a fundamental change to the defense problem (i.e., that the attack always optimizes) since it directly degrades attack optimization. Technically, it reduces the concentration per defense element that the offense can mount, and this is highly significant. Further, this defense benefit is obtained by capitalizing on large "sunk costs" of previously-built

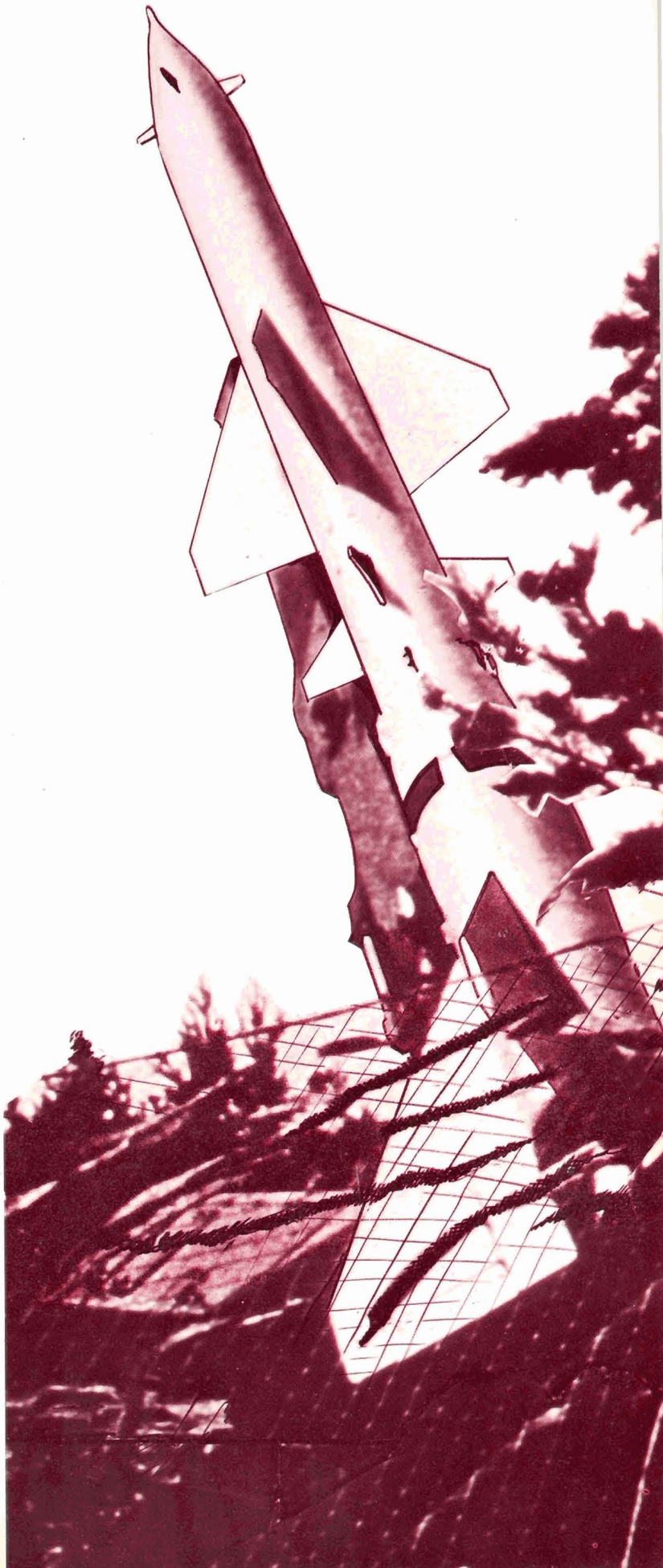
obsolescing weapon systems, and this is extremely cost-effective for an armed force that builds or has built large numbers of air defense systems. Indeed, such a scheme may be the only way an armed force can afford the density of air defense required by the increasingly massive and formidable air attack threat spectrum.

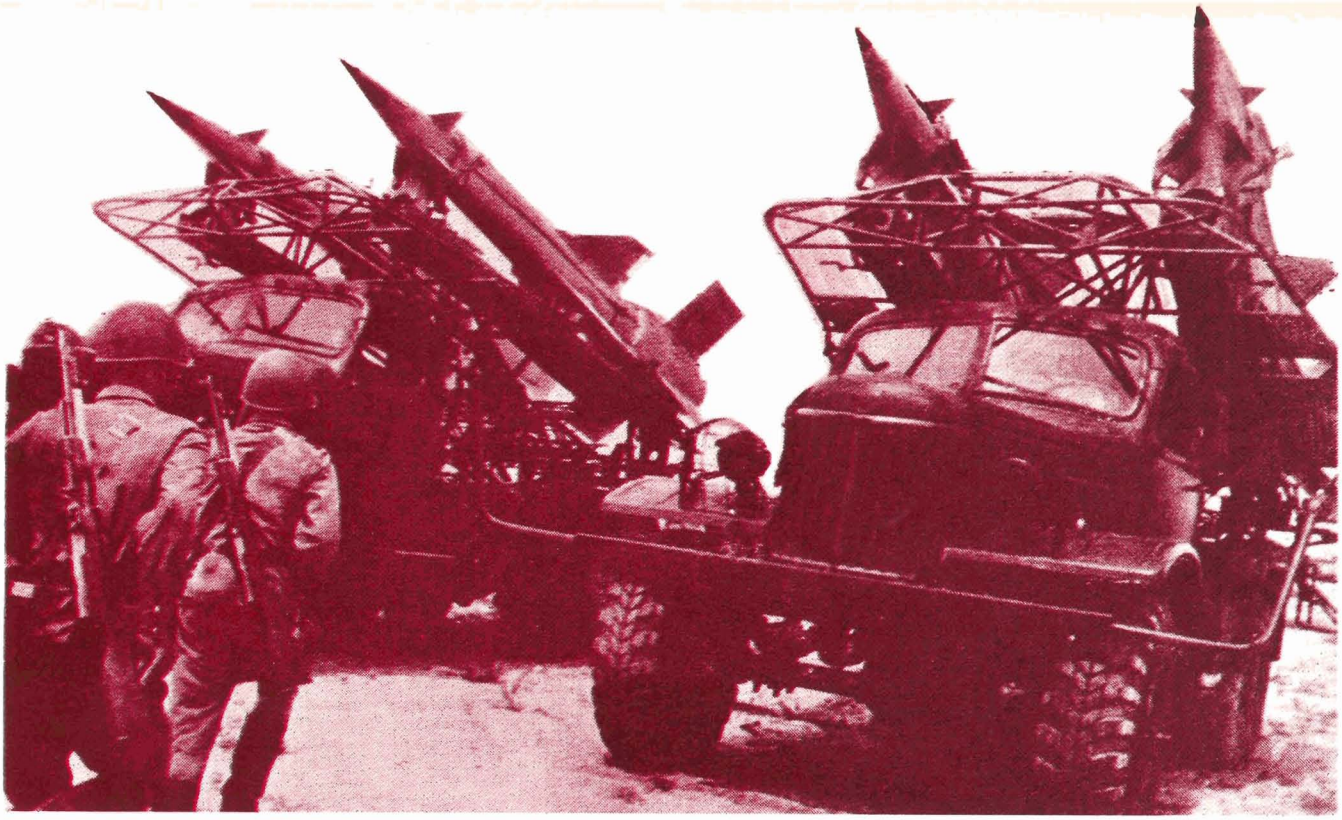
At this point, one cannot help but notice that this particular conceptual stream leads directly to the heart of the Soviet air defense concept behind the forward area. The Soviets have already progressed to the point of spectrum siting of codeployed weapon systems, often having as many as five major systems deployed at one site.

They have shown a further refinement in deliberately using individual system coverage redundancy at that same site. For example, two different versions of the SA-2, along with an SA-3, may be deployed on the same site. An SA-6 may be hidden adjacent to it, and one or more gun units may be placed on or immediately adjacent to it. The two SA-2's furnish frequency diversity and double coverage at high and medium altitudes. The SA-6 and SA-3 furnish the same advantages for low and medium altitudes. In addition, the hidden SA-6 provides an attack breaker or suppressor killer capability as a surprise for the attacker once he locates the main site. The gun systems cover the dead zones of the various SAM systems. Here again, multiple gun systems can provide dual coverage and frequency diversity. The external SA-6 may be frequently shifted and readily camouflaged at other convenient adjacent locations, thus making the job of direct attack against the site much more difficult for an attacking suppressor aircraft.

The use of a hardened site drastically reduces the probability of site kill by near ordnance misses and sharply reduces the amount of equipment damaged, even when one part of the site is hit. Redundant system coverage means little or no degradation of site capability when one of the redundant systems is knocked out, is down for maintenance, or has suffered equipment failure. Even when more than one weapon system is out of action on a site, the degradation may be little or none. For example, loss of either the SA-3 or the SA-6 and the loss of one SA-2 primarily reduce firepower only. The range and altitude coverages are maintained essentially intact.

The concept is highly adaptable to peacetime extended operation. With this scheme and extra empty sites, "shuffling the checkers" can be accomplished even before the war begins, and enemy knowledge of which sites are occupied can continually be degraded. This is particularly important to degrade the success probability of a surprise mass air attack. In this respect, the Soviet concept is quite superior to our own because each of our peacetime sites is occupied and a surprise





attack could be optimized against known occupied sites.

The concept optimizes the defense not only from the standpoint of overall probabilities but from subordinate conditional probability levels as well. For example, given that the attacker's ordnance lands successfully on site, what is the best concept for reducing its effectiveness? Site hardening and system redundancy. Given that a system is lost by enemy action, failure, or downtime, what is the best concept for maintaining defense effectiveness? System redundancy of identical coverages. Given that the vulnerability of one system is known and the enemy has exploited that weakness and developed a counter, what is the best means of deployment of that vulnerable system? Covering its vulnerability with another codeployed system that does not have that same identical weakness. The vulnerable system can be effectively used against other aspects of the threat spectrum, and it can survive its counter threat because its codeployed mate protects it. Given that the enemy reconnaissance is effective and he can be expected to locate most of our major sites before he launches his attack, what is the best method of nullifying or degrading this capability? Facing him with a site location that continually changes from unoccupied to dummy to occupied, and with many more sites than he can optimally attack. Also, providing camouflaged mobile systems at each site as a measure against suppressor attack. Considering the steadily increasing air threat spectrum, how can one attain the density of air defense required to face heavy, surprise, saturation air attack (e.g., one using remotely piloted vehicles (RPV's) or a large number of obsolete aircraft to saturate and missile-exhaust the defense) unless it is bristlingly dense? By continuing to build systems at a steady pace, and using the scheme of codeployment to maximize the usage of otherwise obsolescing systems. Over a period of years, the necessary defense density can be attained. These are just examples of the sort of conditional probability maximizing that appears to have gone into the Soviet concepts of air defense behind the forward area.

These concepts reveal that the Soviets have deliberately optimized their main concept of air defense from a coldly mathematical viewpoint.

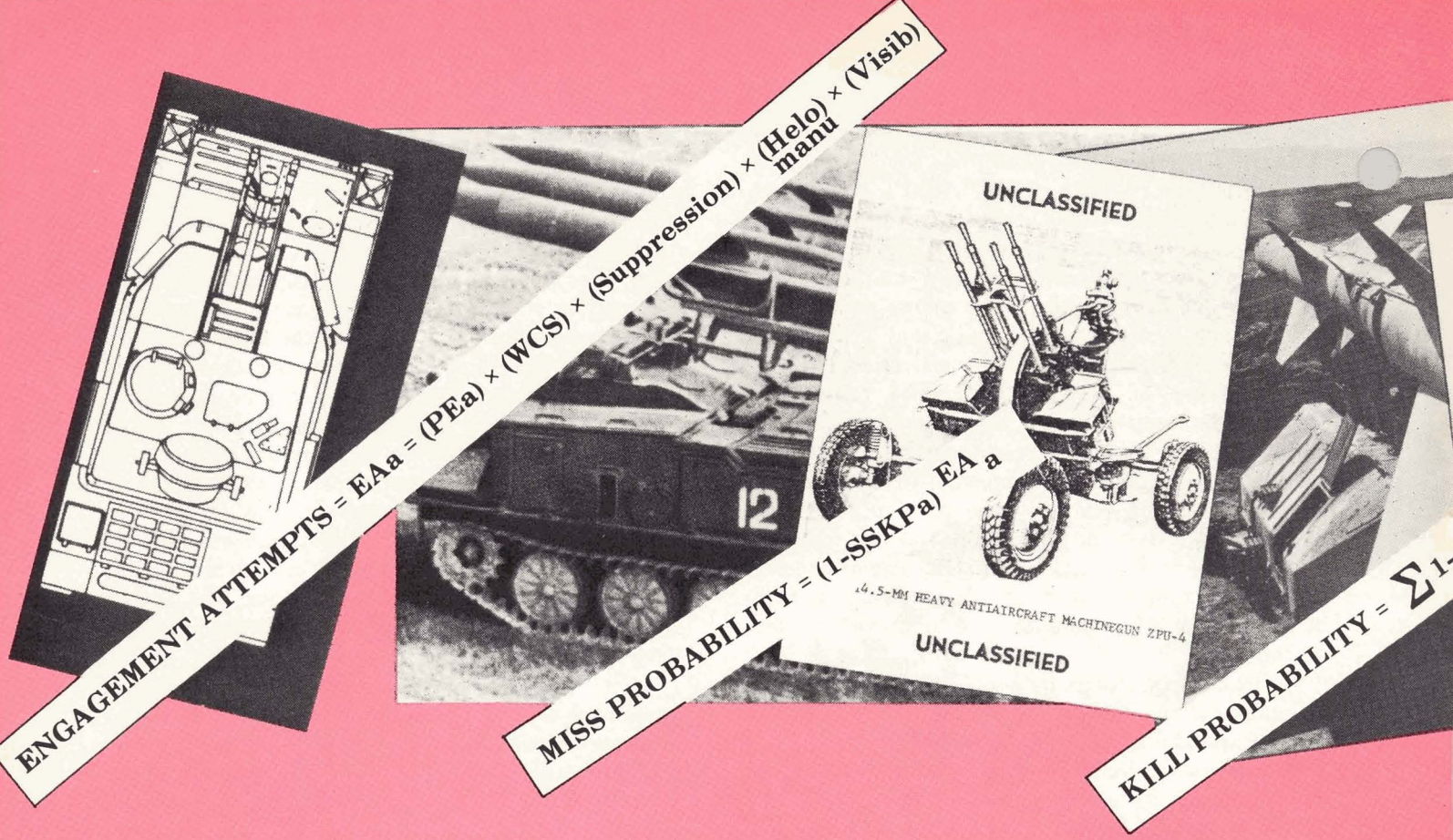
- They have considered not only overall probabilities but subordinate conditional probabilities as well; that is, they have optimized mathematically at all levels. The overall impact of this approach seriously challenges our conventional OR/SA approach to defense and offense wargames and consequently our derived force levels and damage-limiting assumptions.
- The survivability of each codeployed site is optimized, both against continuity of the knowledge of whether it is "hot" and against direct attack, all the way down to and including attack success (ordnance delivery) against the site.
- The ability of the defense to continue to function effectively in the presence of damage (i.e., its ability to absorb punishment and continue to function effectively) is drastically increased.
- The attack is forced to spread its suppression resources, which reduces the Q or sharpness of its attack against any one system. This reduces the attack concentration against each system which is highly beneficial to the defense.
- Not only is the Q of the overall attack reduced, but

also the Q of each individual threat component is reduced as well; for example, the individual effectiveness of ARM's, ECM, ASM's, and other aircraft ordnance is individually degraded.

- The effectiveness of an obsolescing defense weapon system is automatically enhanced by redundant, composite siting. This allows an effective return to be gained from previous "sunk cost" large capital investments in older systems. It allows the continued use of experienced missile crews, thus lessening the training burden. Developmental costs are also minimized because a proven system can be upgraded and modified. Developmental time is reduced by modifying proven systems, and totally new, advanced systems need be developed at less frequent intervals. Since these more complex systems require much longer development time, the effectiveness of air defenses is slowly upgraded and improved in the meantime.
- The concept materially simplifies the business of training and equipping third-country forces. Any friendly armed force can simply be "plugged in" at any generation in the chain of weapons and, once trained and equipped, its upgrading and modernization by adding the newer versions are simplified. Logistics are greatly simplified due to the use of many common parts in various versions of the same generic family. Larger production numbers of these parts result in reduced costs.
- The concept offers a practical means of achieving substantial firepower defenses by codeployment of multiple systems on the same site.
- The disadvantage of the concept is that large numbers of personnel are required to operate and maintain the equipment. This is an advantage, however, to the maintenance of site security against ground attack or guerrilla attack.
- The concept admirably fits, and is totally compatible with, the Soviet concept of air defense mobility previously outlined. For the forward combat area, a complete family of highly mobile, cross-country AD weapon systems has been developed by the Soviets.
- The concept is in accord with the bitter lessons learned by the Soviets when the Germans hit the Soviet army during Operation Barbarrossa in 1941 with an air attack that was spectacularly successful. In 1967 the thin air defenses of their Arab protegees were directly penetrated, and the Arabs were cut to bits by the unbelievably successful Israeli air attack. The Soviets value defense density and persisting effectiveness in the face of damage suffered.

It is the opinion of this writer that this concept, optimized at multiple levels, seriously challenges our own estimates of the effectiveness of both our air arm and our air defenses. It calls for a reexamination of our own approach to wargaming and to our conventional OR/SA approach. Since a successful mass air attack against NATO by the Warsaw Pact could precondition the outcome of the war in the first 2 hours, we can ill afford to ignore the concepts and analysis exhibited by our major potential adversary, who has experienced the disastrous results of mass air attack and who has forged his air defense thinking by testing the concepts in actual combat.

Lieutenant Colonel Bearden, who recently retired from the Army, has contributed five excellent articles on various aspects of air defense during the past year. He has also written numerous papers on the science of parapsychology. His assignment before retiring was Chief, Evaluation Branch, Military Studies Division, SAM-D Project Office, Redstone Arsenal, Alabama.



AOA ATTRITION MODELS~1

MAJOR ROBERT

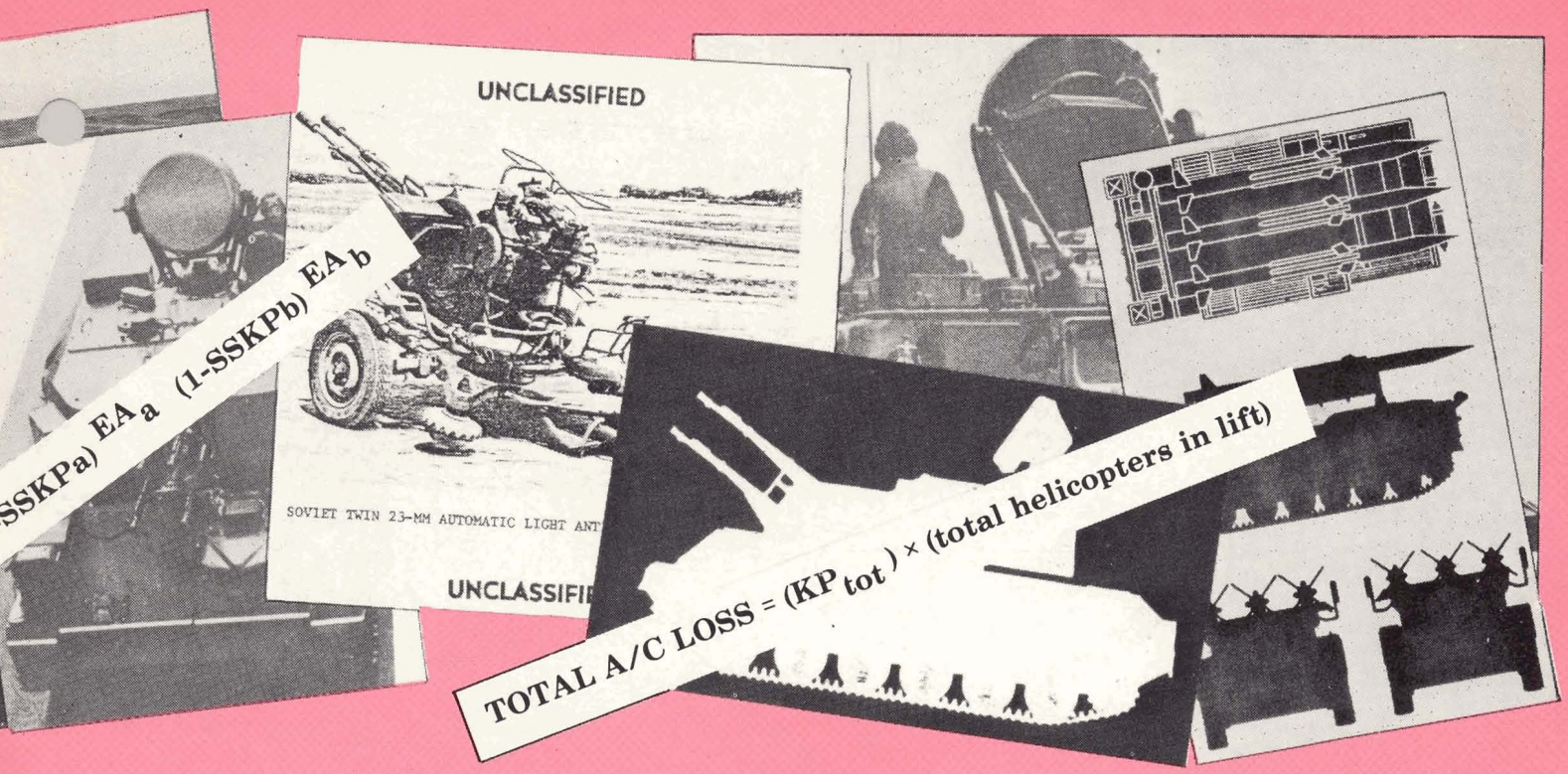
This article is submitted as a means of informing air defense personnel of the latest tactical and technical developments in air defense techniques at XVIII Airborne Corps. Views expressed are those of the author and do not necessarily reflect the opinion of the XVIII Airborne Corps or other Department of the Army activities.

Can you conduct a realistic air defense CPX? How do you measure the effectiveness of an air defense system against helicopters and tactical aircraft? This second question has been one of the most intriguing problems facing air defense for over 30 years. Based on studies at Fort Leavenworth and Eglin Air Force Base, and testing at Fort Bragg, we now may be able to objectively analyze the efficiency of air defense systems.

As early as 1943, the US Army began to predict aircraft losses to German AAA guns through a method called flak analysis. Flak analysis was a method for determining the safest way for friendly bombers to strike a target area so as to keep their loss rate at an absolute minimum. By the end of World War II, the use of flak analysis to predict losses was widespread not only in Europe but in the Pacific Theater as well.

Flak analysis continued as a military science after the war as long as the Army had large numbers of AAA guns in the inventory. However, during the period of rising emphasis on missiles, and the concomitant deemphasis on AAA guns in the late 1950's and the 1960's, interest in flak analysis declined. AAA guns were considered obsolete until the late 1960's when we realized from our experience in Vietnam that AAA guns still had a place on the battlefield. In South Vietnam, we lost over 400 fixed-wing aircraft and 2,100 helicopters (most of these due to AAA and small arms fire) and, in a few instances, surface-to-air missiles (SAM).[1]

During the Mideast War, when the Arabs employed more than 10,000 SAM's and antiaircraft guns, Israeli Skyhawks and Phantoms lost control of the skies over the Sinai and the Golan Heights for the first time since 1967.[2] Arab air defense systems, not aircraft, controlled the skies until the sites were destroyed by Israeli armored units. Eighty percent — 82 aircraft — of Israeli fixed-wing losses were to Arab SAM's or AAA guns.[3] These experiences in Vietnam and the Middle East brought a resurgence of interest in minimizing aircraft losses but the methodology is now called defense analysis.



NTEGRAL PART OF THE CPX

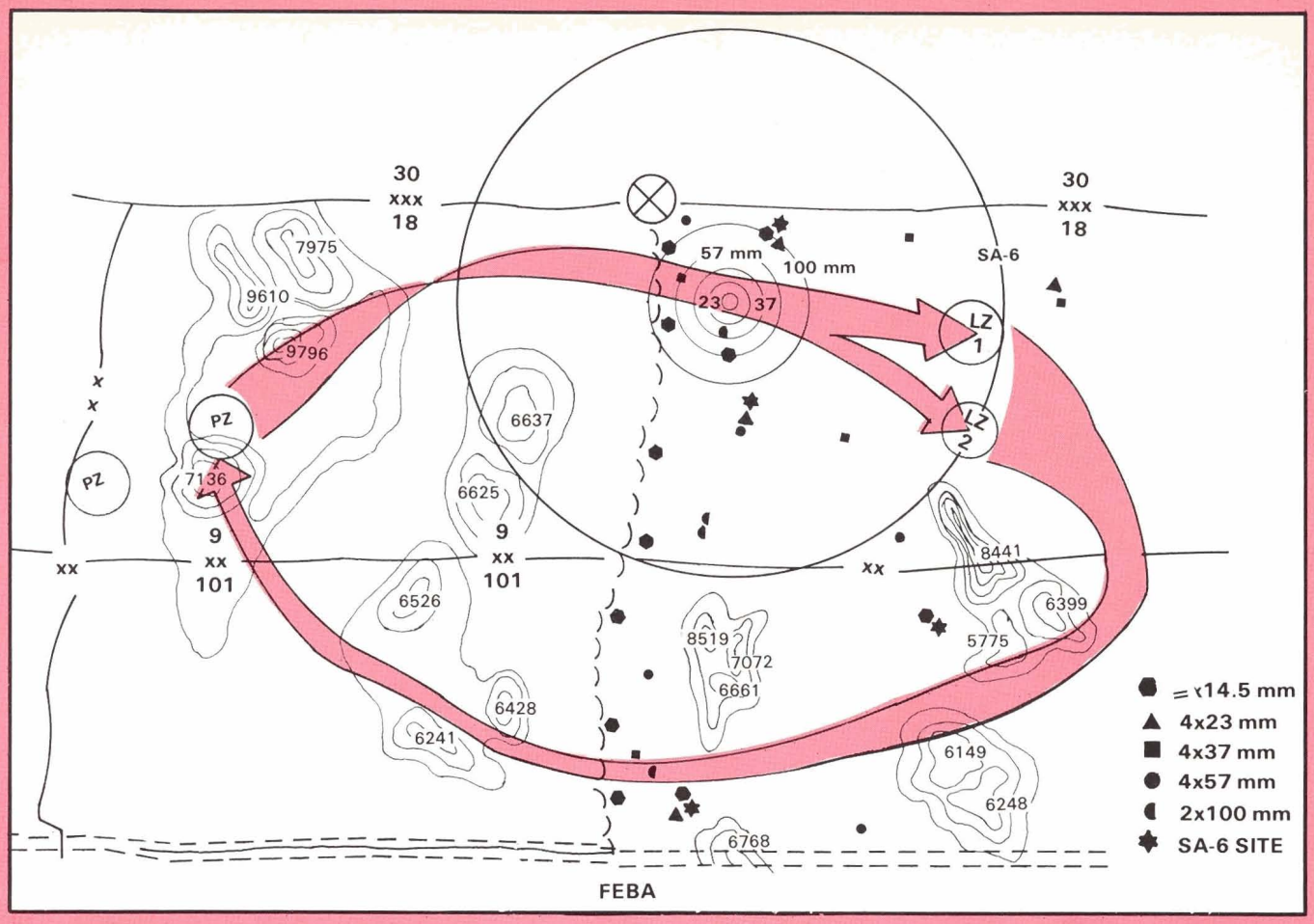
J. SUHOSKY

We now have a modern, sophisticated form of defense analysis based on mathematical models. The basic concept involves an aircraft and/or ADA attrition model. One of the most recent attrition models is that developed by the Combined Arms Combat Development Activity (CACDA) in July 1975.[4] The model is called the Scenario Oriented Recurring Evaluation System (SCORES) "Jiffy" Model and was used by XVIII Airborne Corps as a basis for determining helicopter losses during the Corps CPX, Caber Warrior III, conducted 22 July-21 September 1975. Data and computations used were unclassified.

One of the air defense objectives of the exercise was to determine practical and timely methods of assessing attrition of enemy air defense and friendly aircraft. A major constraint on any method was that player feedback must be as near real time as possible. Although air-to-air attrition was considered during the exercise, it is not included in the data presented in this analysis.

In Caber Warrior III the Aggressor air defense force structure included 14.5-mm, 23-mm, 37-mm, 57-mm, and 100-mm AAA and most SAM systems found in Warsaw Pact countries. During the controller school conducted prior to the four division equivalent (3 division — 3 separate brigades) exercise, each divisional ADA and aviation controller, along with the senior controller from each brigade, was given a table or precomputed helicopter losses per sortie for each of the Aggressor air defense systems. The attrition tables included the impact of such variables as terrain masking, visibility, weapon control status, helicopter AAA evasion maneuvers, and the effects of armed helicopter suppression on the probability of an ADA system completing a successful engagement, i.e., aircraft kill. Variables were originally taken from the CACDA study and computer programmed over the range of expected possibilities of system detection to determine the number of successful engagement attempts per helicopter sortie. An exercise unclassified Single Shot Kill Probability (SSKP) was then subtracted from one (1) to arrive at a miss probability. All miss probabilities were multiplied and subtracted from one (1) to determine the attrition rate per helicopter sortie. Mathematically this can be expressed:

$$\text{Possible Exposures} = PE = \frac{\text{No. AD Fire Units Type A}}{\text{No. Helicopters Per Lift}} \bullet$$



(Terrain Mask)

Engagement Attempts = EA_a = (PE_a) • (WCS) • (Suppression) (Helo Manu) • (Visib)

Miss Probability = $(1\text{-}SSKP_a)^{EA_a}$

Kill Probability = $\sum 1 - (1 - SSKP_a)^{EA_a} (1 - SSKP_b)^{EA_b} \ldots (1 - SSKP_n)^{EA_n}$

Total A/C Loss = (KP_{tot}) • (total helicopters in lift)

Where:

a = weapon system a, b = weapon system b, n = weapon system n.

WCS = weapon control status.

Suppression = armed helicopters or TAC air.

Helo Manu = evasive maneuvers by helicopters.

For simplicity of use during the CPX, the various tables were computed using only the possible engagements, suppression factors, and SSKP's as variables, while the following factors were held constant: visibility, helicopter maneuver, terrain mask, and weapon control status. This simplification made near real time loss assessment possible by the aviation and ADA controllers.

As an aid in determining the number of potential exposures per system, each of the aviation and ADA controllers was given two overprinted acetate range fans (1:50,000/1:250,000) depicting the effective range of each of the weapon systems within the force structure. For quick reference the effective engagement altitude of each system was also printed on the fans. The controllers maintained situation maps depicting the current disposition of the enemy ADA by using different colored map pins for each system. Once the controller received an overlay of a proposed airmobile route from the player group, he would trace the route with the appropriate scale range fan and determine the number of possible exposures to any number of specific ADA systems. When the number of possible exposures per system was determined, the controller entered the attrition table and read the kill probability per sortie for each system. In actuality, the number of possible exposures was somewhat less than the number of maximum exposures, i.e., *potential* exposures, because potential exposures had already been reduced to possible exposure by the use of variables considering avenues of approach and masking. The attrition tables refined the number of *possible* exposures to *probable* exposures and included engagement and kill probability factors.

Aggressor divisional ADA systems deployed and maneuvered in conjunction with their organic maneuver or parent unit as determined by CPX play. ADA systems were destroyed or captured based on tactical air strikes and ground action in accordance with real world capabilities. The overall CPX

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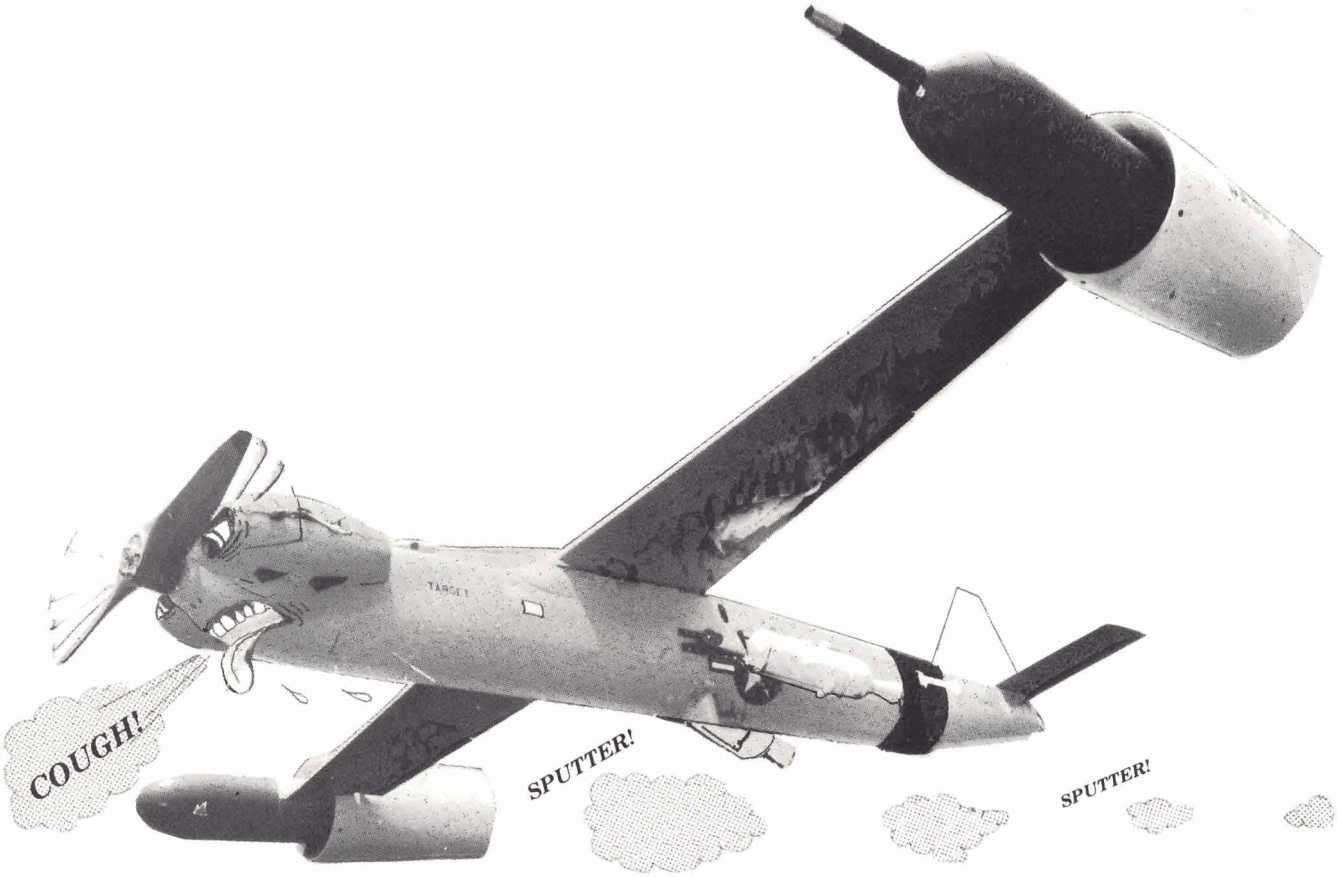


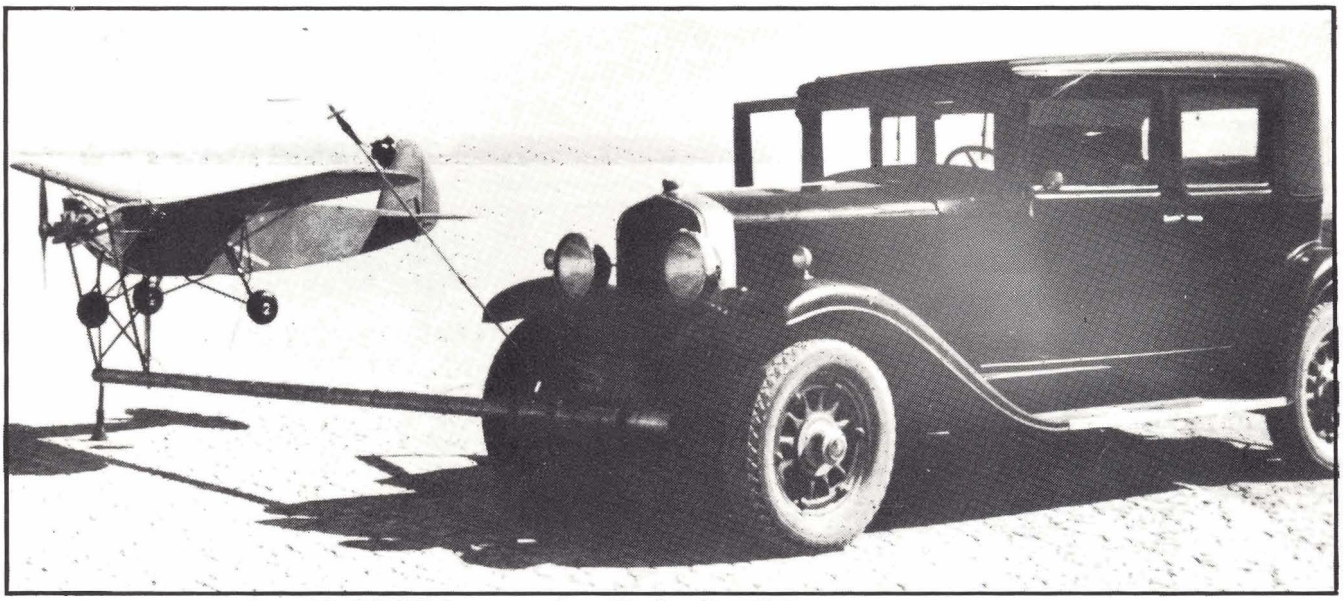
The Little Birds Who Refuse To Die

SERGEANT FIRST CLASS HAROLD W. ANDERSON

You've heard of TWA. How about RCAT Rangers? Ever heard anyone casually mention Ali Baba and his 400 Thieves? What we're talking about are some Army pilots and crewmen whose feet never leave the ground, and this is a story about the machines they have flown and still fly.

The MQM-33 target drone and the men who fly it have been called at various times Teeny Weeny Airlines, RCAT Rangers, and Ali Baba and his 400 Thieves. RCAT stands for radio controlled aerial target, and the Ali Baba bit gives one a hint about the reputation of the RCAT men, their attitude being: if we need it to fly our planes and ain't got it we'll get it.

How did these little 12-foot long airplanes get into the Army inventory, and how long have they been in use? Well, many retired NCO's can recall their first antiaircraft gunnery training when they fired at RCAT's. The idea of radio-controlled aerial targets was a gradual awareness of needs and capabilities during WW II. When it was found that bombers, fighters, and glider bombs could be remotely controlled, the antiaircraft gunnery people became interested. You see, Triple A people were always having to contend with irate Air Force folks who constantly complained that the gunners on the AA guns, who were supposed to be firing at banners towed behind manned fighters or bombers, were continually punching holes in the aircraft tail surfaces. This resulted in overworked sheet metal men and pilots who would rather be drawn and quartered than fly gunnery tow missions.



Model RP-1 mounted on Packard V-12 "open air wind tunnel."

In 1933, an ex-movie actor formed a company and named it Radio Plane. The company was located at Van Nuys, California, in three old Government surplus tarpaper huts. The idea was to design a remotely controlled airplane that could be flown as an actual target. It also had to be dependable and cheap. Speed was no problem because an airplane 6 to 10 feet long at close range would simulate a fighter moving at high speed at a greater range. The first aerial target developed by Radio Plane Company, known as the Model RP-1, had a cruising speed of approximately 50 miles per hour and was powered by a 2½-horsepower, 2-cycle, 2-cylinder engine. It was constructed of balsa and plywood and had a 9-foot wing span. The operator controlled the target with a device similar to a telephone dial. Although control reaction was not completely satisfactory, the RP-1 had all of the fundamentals of a modern control system.

Other experimental target planes were developed and flown, each model showing marked improvement over its predecessor. Since no wind tunnel was available for controlled testing of engineering models under simulated flight conditions, Radio Plane Company designed an "open air wind tunnel." The first and last of its kind, this "wind tunnel" consisted of a stripped-down Packard V-12 chassis with a tubular steel framework extending in front of the hood. Mounting the test plane on this framework, the engineers drove the car across a hot California dry lake at 120 miles per hour — far above the actual flying speed of this early target.

The first production targets (Model RP-5) rolled off the assembly line in 1941 and the Air Corps accepted them as Model OQ-2. These planes had a speed of 85 miles per hour. Power was supplied by a Righter 6½-horsepower, 2-cycle engine and the targets were driven by counter-rotating propellers to eliminate torque. Next came the Navy model TDD-1 or OQ-2A with a top speed of 88 mph. Modifications followed in rapid succession. The counter-rotating propellers were abandoned, new engines with a higher horsepower rating were installed, and fuel capacity was increased. These were called the OQ-3 and later the OQ-14. These targets were used by the thousands successfully by all three services. Then came the RP-15 in 1944. The RP-15 was capable of crusing at 195 mph, using a 2-cycle, 4-cylinder engine designed by McCulloch Company.

By the time war clouds gathered over Korea, it was recognized that air defense weapon advances had rendered the little OQ-3's, OQ-14's, and RP-15's obsolete. A new target was needed. Using the same engine as the RP-15, the RP-19, incorporating a metal fuselage and metal wing, was flown at a speed of 225 mph. In 1951 the RP-19 went into production and was called OQ-19A.

As time passed, various models of this bird were produced to fulfill various ADA requirements. Suddenly, the Air Force and the Navy took a peek and liked what they saw. All three services took a giant step and bought thousands of OQ-19A's. Radio Plane started a cadre training course for RCAT crewmen for all three services. The Army used its factory-trained personnel to form a RCAT School at Fort Bliss, Texas. The school turned out troops by the hundreds, and RCAT detachments were formed. In a short time, RCAT detachments were stationed from Yakima, Washington, to Fort Stewart, Georgia, and from Todendorf, Germany, to Misawa, Japan.

When ADA embraced guided missiles in the early 1950's, the RCAT control system was changed, and thus

the OQ-19B and OQ-19D came into being. The airframes and power plants were essentially the same as the OQ-19A, but the control systems were new.

The OQ-19B was equipped with an autopilot system so it could be controlled from a radar van. The Baker, as it was called, could be flown at 22,000 feet and 60 to 70 miles out in range. This was perfect for Nike Ajax, and, when flown closer in range, it was perfect for the 120-mm antiaircraft gun. The OQ-19D (Dog) was fully acrobatic and was used for insight missions only. The Dog target had no autopilot system and was hard for a controller to learn to fly. It was used for Quad 50 and 40-mm gunner training. The old Dog target was and is today the most popular bird among RCAT men.

In the mid-1950's, Radio Plane Company was absorbed by Northrop and a new and sprawling factory was built in Ventura, California, to produce RCAT's.

As time marched on, the RCAT itself caused an idea to formulate that would blossom into a multimillion dollar project. It seemed that the RCAT was such a hardy little bird that it would tolerate massive "shade tree" modifications, such as under the wing payloads, navigation lights for night missions, on-board beacons for radar, and a multitude of other experiments. The Northrop engineers said, "Why not modify the RCAT to carry a camera and photo flares?" They did just that, and the product was called the USD-1 Surveillance Drone.

In 1959, production of the RCAT was halted because the Army had over a thousand stacked in depot that had not been issued. RCAT detachments were phased out because missiles had replaced the big antiaircraft guns. Since the missiles were being fired at Red Canyon Range, New Mexico, on an ASP basis, the RCAT Battery was formed. The RCAT Battery flew the planes at Red Canyon at the rate of 200 per week.

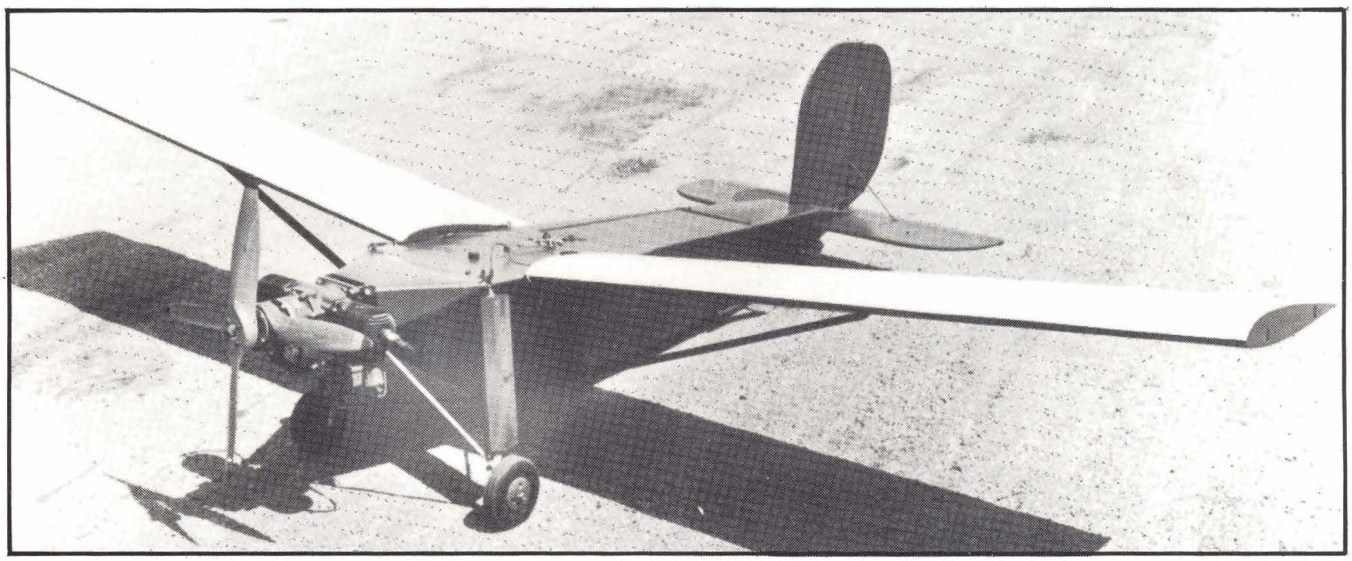
Meanwhile, the USD-1 was tried and proven and put into production. The USD-1 Surveillance Drone was placed under control of the Signal Corps, with the idea of deploying the USD-1 to field units such as division artillery headquarters, target acquisition battalions, and aviation aero scout platoons.

A training facility was needed, so a school was started in 1959 at Fort Huachuca, Arizona. The school began graduating drone personnel and deploying them in section strength worldwide. Since the USD-1 was essentially a classy RCAT, ex-RCAT detachment personnel were easily trained on the Drone. The MOS for RCAT and Drone was the same.

In 1961, the Army consolidated the RCAT and Drone schools by moving the RCAT school from Fort Bliss and integrating it into the Drone school. Then a controller learned to fly both aircraft in a 10-week course. The control system mechanic's course varied in duration according to the aircraft (15 weeks for RCAT, 26 weeks for USD-1), and their MOS had a skill identifier to indicate the control system for which they were trained.

Then, in the early 1960's, the RCAT Battery was placed under Range Command and moved in its entirety to Oro Grande Range Camp, New Mexico. Missile firings had ceased at Red Canyon, and McGregor Range had become the missile firing center. Oro Grande Range Camp was ideal for the RCAT Battery because it was centrally located for easy access to North McGregor Range launch sites and Dona Ana launch sites.

In 1966 the Drones were phased out of the Army inventory and most of the men went to the four winds; some went to the RCAT Battery which became the "last bastion" for RCAT men. It looked as if the little bird would finally follow the carrier pigeon into extinc-



Model OQ-3.

tion. Suddenly a reprieve came with the advent of Redeye, Chaparral, and Vulcan. All the RCAT's were outfitted with a new engine with more horsepower and new streamlined cowlings and fairings were applied. The 0Q-19 designation was then changed to MQM-33. More men were trained and sent to the RCAT Battery. The Battery now performed a multiple role. One platoon flew at Dona Ana Range for the quad 50's and twin 40's. One platoon flew at White Sands Missile Range for Redeye research and development. One platoon flew at North McGregor for Redeye/Chaparral and as back-up for Firebee on missile firings. The Battery had its own specially designed drone recovery trucks and motor pool. It also had an RCAT maintenance and assembly platoon that worked 24 hours a day on 8-hour shifts during peak periods. And, finally, the RCAT Battery had a radar section of six M-33 radars. It seemed as if the old days were back.

The RCAT School, being considerably smaller since the demise of the USD-1, was moved back to Fort Bliss in the fall of 1967. At the same time, the RCAT Battery was moved to better facilities at McGregor Range Camp. During this period, RCAT's were flown at the rate of about 100 a week. Everything looked rosey. Then RCAT suffered a low blow.

Parts for airplanes, handling and launching equipment, and vehicles were running out and no parts were being manufactured. In 1969 the RCAT Battery ceased to exist as a battery. It became a section of 80 men in HQ and RS Battery, Range Command. To top it off, RCAT's were being requested at different Army installations. The School closed down in 1968, so no detachments could be trained even if the equipment was available. Crews were sent on TDY to fly for Redeye and Vulcan at different posts. From 1969 through 1971, hardly a month went by that the RCAT Section did not have one or two crews on TDY to Fort Sill, Fort Campbell, Fort Carson, Fort Lewis, or Fort Hood. As time passed, parts supplies became more critical. The drone retriever trucks were gradually retired to the bone yard, one by one. The mission frequency decreased slowly but surely. TDA strength dwindled accordingly. Old timers retired and young troops donned civies or retrained.

Then enter stage right: the ballistic aerial target system (BATS). The BATS was something akin to a flu shot; RCAT would be better off in the long run, but it still hurt.

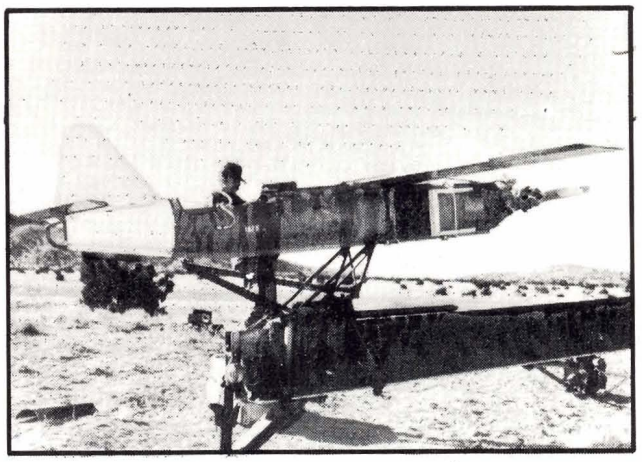
The BATS took over for all Redeye and Chaparral firings. This cut RCAT's mission load by two thirds. No more TDY. Was the little red and white bird still needed? Could it be economically replaced by a jet drone? The answers to those questions were and are to this day yes and no, respectively. The RCAT was needed for Vulcan, Duster, small arms, and scientific test beds. There were drawbacks to the BATS — more expensive and not maneuverable. The BATS became a full-time responsibility for RCAT personnel. No MOS for BATS. Not even an additional skill identifier. This hurt because RCAT authorized strength had dwindled to 27 EM. Army-wide authorized strength for target aircraft NCO's was six E-7's and eleven E-6's. Army-wide authorization for control system mechanics was 7 EM. This left approximately 15 slots Army wide for target aircraft crewmen in the grades E-5 and below. All the RCAT slots were at McGregor Range or White Sands Missile Range. Just the same, RCAT had to exist. After all, with no school, who would train

USD-1B Surveillance Drone.

replacements for Army National Guard (ARNG) RCAT detachments? RCAT Section would; through an OJT program. The NCO's of RCAT would train replacements for their own section on an as-needed basis. RCAT Section also supported ARNG units during summer camp (primarily New Mexico). It was found that no jet drone could support the various target requirements as economically as RCAT and BATS working together.

Meanwhile, the parts attrition for RCAT marched on; slower because of BATS, but nevertheless dwindling. As parts were exhausted, ingenuity became the name of the game. Sheet metal, rivets, safety wire, bubble gum, and sweat often made the difference between a mission met or a mission missed. No parts, lack of needed tools, and lack of raw materials caused the "Ali Baba and his 400 Thieves" reputation. RCAT men became expert traders and scroungers. Nobody stole anything, but if a coveted piece of pipe or sheet of metal was left unattended, the "area of responsibility" was immediately changed on that item.

As months passed, it was found that the BATS was really a blessing in disguise. Instead of launching 200 RCAT's per week, it is now down to 200 to 250 RCAT's a year (that's still a lot of activity). This arrangement left RCAT the time to be used for special test projects. RCAT's have taken air samples, delivered MK-34 torpedoes, and carried telemetry. These are but a few of the things RCAT has done other than its normal mission. RCAT's have performed other projects that are really interesting and useful but are still classified. RCAT has flown for the Air Force, which discontinued its RCAT's years ago and is now regretting it.



MQM-33B on catapult.

To this day, "the beat goes on." RCAT's tow banners behind them to keep from losing RCAT's from AW fire. The parts attrition continues, and troops still rip off parachutes, propellers, and engines from RCAT's if they can get to a down-range RCAT before we do. But still, the little birds fly their missions. When the jet drones can't make their mission because of rain, snow, or even lack of airspace, the RCAT takes the ball and goes. Can a jet drone give one firing presentation per minute? No! Can a jet fly down a narrow canyon right on the deck? No! The RCAT can do these things — another reason why it's still around.

Late in 1975, RCAT men were switched to Army Aviation MOS and are now known as aircraft crewmen. The job won't change; just the MOS. Wonder what Aviation circles think about it? Well, all we can say is, "Look out big birds, here come the RCAT Rangers and their 'Little Birds Who Refuse to Die.' "

Sergeant Anderson has been in service 14 years and has spent most of that time working with drone aircraft. He has also served 3 years in a Nike Hercules unit. His present assignment is Shop Chief and Chief Controller, RCAT Section, HQ and HQ Battery, Range Command, Fort Bliss, Texas.

AIR DEFENSE IN THE

2D INFANTRY DIVISION

The 2d Battalion (C/V) (SP), 61st Air Defense Artillery reports on its experience and benefits derived while participating fully in the FIT-TO-FIGHT (PRO-LIFE) Program of the 2d Infantry Division.

As the first rays of sunlight begin to illuminate the surrounding mountains, the battalion prepares for its 4-mile run. Having completed a vigorous daily dozen, the officers and men move onto the road and begin their double time among the other line battalions. Another morning in the life of an infantry battalion? Not this time, my friend. This is an air defense battalion — divisional air defense in the PRO-LIFE Division.

Rigorous physical training is an important segment of the 2d Infantry Division's PRO-LIFE Program, a master plan designed to improve the quality of every soldier in the division by providing a well-planned and challenging environment for his total development. A significant byproduct of this comprehensive program is that it gives our unit, the 2d Battalion (C/V) (SP), 61st Air Defense Artillery, a spectacular opportunity to become a well-known and integral part of the Division by making PRO-LIFE work for us.

This article explains the dual advantages of the PRO-LIFE Program for the ADA battalion — how it improves the battalion and facilitates its assimilation into the division which it serves as a full-fledged member of the combined arms team.

PRO-LIFE

PRO-LIFE is more than a program — it is an attitude, an approach to life, the philosophy of an entire division. It permeates virtually every facet of the 2d Division soldiers' environment. It embraces three major components: realistic, challenging training; exciting, invigorating physical exercise; and useful, stimulating education.

LIVE-FIRE

Every line battalion in the Division strives to achieve the utmost in realistic training. Therefore, live-fire exercises are conducted frequently, and in these exciting "shootouts," all weapons in use are loaded with live ammunition — from the M16 to Cobra Gunships. In the midst of the resulting din of massed firepower, the unmistakable staccato roar of Vulcan has become a well-known sound to 2d Division soldiers. Firing in the ground support mode, the air defenders gain experience and confidence as well as notoriety among their support counterparts. Watching Vulcan pulverize ground targets also builds the confidence of the crews and supported elements in the deadly destructive Vulcan-power that can be used against aerial or ground targets. Chaparral crews are kept busy with live tracking and numerous missions in support of maneuver elements. Vulcan, Chaparral, and Redeye then team up twice yearly for live firing at the Eighth Army SEA Range. The recent installation of a moving target simulator in Korea complements this training by providing excellent Redeye practice facilities as well as aircraft recognition training for air defense crews.

In addition to live-fire scenarios, several other types of challenging training are stressed. One is reverse cycle training in which units switch from day to night operations for a period of 2 weeks each quarter. This training provides both insight into the problems of night operations and practical experience in overcoming them. The goal is simple — to deprive any future enemy of an advantage during darkness.

SPARTAN

Special proficiency at rugged training and nation-building (SPARTAN) training is also highly emphasized. It blends the most stressful physical and tactical training, often in combined operations with Republic of Korea (ROK) counterparts, and exposes the air defense soldier to a wide range of exciting activities. The program includes pathfinder operations, mountaineering, survival operations, small boat operations, military skiing, expedient river-crossing techniques, orienteering, airmobility training, and ranger operations. Ranger training at the ROK ranger courses is particularly popular with the men, and it pushes dedication and stamina to the limit.

But combined training is not just an off-shoot of SPARTAN training. It is required annual training for all combat and combat support units, conducted over a 2-week period. It is programmed for battalion level, but is frequently held on company level. The training to be conducted is field and tactically oriented and is mutually agreed upon with the ROK commander concerned. In practice, it entails sharing equipment and ideas to enhance mission accomplishment opportunities, and it results in increased knowledge and the zeal to defend against a common enemy. Usually, the training concludes with sports and social events that enhance the rapport established in the field.

FIT-TO-FIGHT

There is nothing surprising about a division that emphasizes sports and physical fitness. There are few duty stations in the Army, however, where each man (including general officers) is expected to run 4 miles each morning. Furthermore, no unit in the Army matches the 2d Division in innovation or physical challenge through sports. In addition to the expected array of sports such as tennis, bowling, flag football, and the like, the PRO-LIFE Division boasts an adopted martial art, Tae Kwon Do (TKD), a Korean version of Karate, as well as a set of modified sports that heavily accentuate the rugged hard knocks of physical competition — combat football, combat basketball, combat hockey, and combat cross-country.

Tae Kwon Do, like other martial arts, is not easy to learn. It stretches the body in unusual places, requires intense concentration, and demands discipline of mind and body. However, the self-discipline and confidence that mastering it brings are essential ingredients in the formula for success in the modern, professional Army. Also, the Tae Kwon Do program is ideal for fostering the esprit and sense of personal accomplishment that convince men they can be winners in life — and thus PRO-LIFE.

All personnel are required to study the rudiments of Tae Kwon Do during their first 12 weeks in the division. This training takes place as part of the morning PT Program, and it supplants the "daily dozen" every other day. The object of this phase of training is the achievement of the orange belt — symbol of initiation as a TKD novice. Having discarded their beginner's white belts in favor of this newly won award, soldiers then choose whether to continue study or remain at the orange belt level. If continued study is elected, three means are available — attendance at advanced classes conducted during PT, membership and participation in a variety of TKD clubs at the battalion level, or selection for and participation with battalion TKD teams.

Tae Kwon Do tournaments are held regularly, and they are hard-fought and well-attended. Interbattalion competition is fierce, and the Korean judges (all black belt holders) insure that only the best-disciplined and best-trained contestants win. The 2d Bn, 61st ADA, has an outstanding competitive record, having swept the first division team championship ever held and narrowly failing (by a single point) to retain its title in the second. But win or lose, these tournaments bring the officers and men of every unit in the division together, and they make the winners of 2/61 ADA difficult to forget.

Combat football is perhaps the most rugged sport ever played by the American soldier. With 40 men on each side, 2 balls simultaneously in play, and no padding of any kind, this no-holds-barred combination rugby/soccer/football game separates the men from the boys in a hurry. It was first played by ROK Army soldiers and later instituted in the Division.

Tournaments in this sport are held regularly also, and 2/61 has been DISCOM Champion, Division Troops Champion, and runner-up to the Division Champions. The Division still talks about the game in late 1974, when 2/61 lost the division championship after the *seventh* overtime period. When the dust had cleared, 2/61 still held its head high, and every man in the battalion was proud to be a member.

Combat basketball, combat hockey, and combat cross-country are similar adaptions of well-known sports. Contact makes each game strenuous, and the competition is keen. Our battalion was the test unit for combat hockey, and we take particular pride in its development.

Perhaps the most important result of the Fit to Fight program is what we call "harmony through sports;" in other words, harmony in human relations. Professional sports showed the way, with people like Gayle Sayers and Brian Piccolo demonstrating that participating in athletics together helps people of different races and creeds come to respect and admire each other. That lesson was learned by the "Second to None," and the active sports program has noticeably improved its human relations.

EDUCATION

The on-duty education program has high priority in the Division. Each soldier is guaranteed 18 hours a month of on-duty time during which he may pursue academic or MOS-related subjects of interest. Special emphasis is placed on men who have not graduated from high school or received the GED equivalent, as well as anyone who falls below the DA minimum educational requirements for his grade.

The on-duty program is serviced by several civilian-staffed education centers, but it is highly decentralized to allow tailoring by the individual units. Military instructors who have advanced degrees are used extensively as teachers. High school courses are taught by civilian instructors under the auspices of the St. Louis High School extension in Hawaii and the University of Hawaii. College courses, taught by both civilian and military instructors, are offered through Los Angeles City College, the University of Hawaii, and the University of Maryland.

The 2d of the 61st allows a minimum of 18 hours a month of on-duty education, which includes an average of three to five college credit courses conducted at battalion level, a variety of MOS correspondence courses conducted in supervised study periods, and

special college preparatory mathematics classes conducted by St. Louis High School. In addition, there are a number of personnel who attend high school or prehigh school classes each afternoon for a 10-week semester, centrally taught by St. Louis High School.

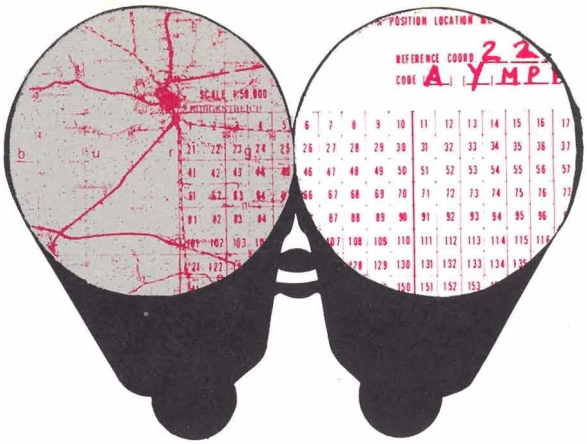
The on-duty education program is an opportunity for each soldier to better himself through academic efforts. Moreover, it has an immediate dividend for the Army — increased ability to perform on the job. This is especially true for the Air Defense Artillery with its complex weapon systems. The ability to read and comprehend technical manuals is absolutely essential, both to the maintenance effort and to the performance of the tactical mission of the air defense battalion.

DIVISIONAL AIR DEFENSE

The past few years have seen significant progress in the implementation of divisional air defense. The concept of low-altitude air defense which moves, shoots, and communicates with the supported maneuver elements was not instantly adopted by all commanders, and great effort has been expended to orient local field commanders in the use of divisional ADA assets. The efforts are finally paying off. In the words of LTC James B. Statler, Commander of 2/61st ADA, "We are no longer required to sell air defense to this Division... the commanders see our worth and ask for our support every time they move."

While much of the credit for this attitude must be attributed to the soundness of doctrine and the excellent selling job of air defense artillerymen, a large and important share must be credited to the success of the PRO-LIFE program. The conscientious application of the principles of this program has made the 2/61st ADA an outstanding combat unit. We believe it is unquestionably the most physically fit ADA battalion in the US Army. It has undergone the most rugged training, and it pursues a rigorous schedule of live-tracking and live-fire exercises. It also operates a wide-ranging education program for each member of the battalion to insure the development of the whole man.

In all these activities, the officers and men of 2/61st ADA have worked in concert with 20 other battalions of this division. Through frequent contact, keen competition, and shared pride in PRO-LIFE, air defense has gained team work and understanding from the men of the 2d Division. Should the Division be called to battle, they know that 2/61st ADA will be able to fulfill its motto — *CLEAR THE SKY.*



VIEW from the FIELD

CHAPARRAL/VULCAN POSITION LOCATION REPORTING SYSTEM

MAJOR RAYMOND WAUFORD

Innovations of the 2d Bn, 5th ADA continue to be reported to AIR DEFENSE Magazine, therefore, for the second successive "View from the Field," the 2/5 again takes the spotlight. This is an account of the battalion's latest efforts to gain greater efficiency in reporting the locations of its C/V squads.

Knowledge of Chaparral and Vulcan squad position locations is necessary for effective Chaparral/Vulcan battalion command and control and division-level airspace coordination when supporting armored division operations. Air defense requirements can quickly change as the maneuver commander senses changes in the tactical situation and capitalizes on the mobility of armor to influence an action.

The requirements for Chaparral and Vulcan invariably exceed the battalion's limited assets. Platoon and battery deployments for a given operation are based on a specific concept and course of action with only the highest priorities receiving Chaparral/Vulcan protection. Significant changes to the planned course of action often greatly change the expected effectiveness of planned passive air defense measures for division elements. As a result, an urgent need can quickly develop requiring redeployment of Chaparral/Vulcan air defense firepower to gain local sir superiority, i.e., freedom to mass and maneuver.

Knowledge of immediate Chaparral and Vulcan squad position locations and operational status form the basis for sound decisions on Chaparral/Vulcan redeployment to support changing operations. Likewise, airspace coordination at division and maneuver brigade level is greatly enhanced if current position locations are known, permitting graphic portrayal of the current air defense posture.

The need for timely position location information on as many as 48 separate squads at Chaparral/Vulcan battalion level and division level is unique to the Chaparral/Vulcan battalion. This requirement cannot be realistically satisfied using the dryad numerical-authentication system found in the standard communications-electronics operational instruction (CEOI).

Survivability on the battlefield dictates that radio transmissions be of very short duration. Messages containing multiple position locations using the dryad system are lengthy. Such transmissions not only give away the Chaparral or Vulcan platoon's location but the supported asset's location as well. The Chaparral/Vulcan battalion is faced with a situation where the existing method of communications security results in risk to its tactical security. What is needed is an alternative to the present dryad numerical-authentication system that provides both communications and tactical security and satisfies the information needs of the Chaparral/Vulcan battalion for command and control.

The problem of position location reporting has been examined by the 2d Battalion, 5th Air Defense Artillery, during field exercises over the past year. A system has been identified that provides adequate position location information in a format that permits reporting using short radio transmissions. A version of the system is being forwarded to the Nation Security Agency for review with respect to communication security.

The method uses a Chaparral/Vulcan position location matrix similar to the one shown in Figure 1. The matrix is printed on clear acetate and consists of a numbered grid system of 500-meter grid squares constructed at a map scale of 1:50,000. The center

2ND BN 5TH ADA 2 AD

CHAPARRAL/VULCAN POSITION LOCATION MATRIX

REFERENCE COORD. ____ ____ ____ ____ ____ ____

CODE (____) (____) ____ ____ ____ ____ ____ ____

SCALE 1:50,000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400

Figure 1

horizontal and vertical lines are drawn larger than the other grid lines and their intersection serves as the matrix reference point for positioning of the matrix on a map. Matrix grids are sequentially numbered in Figure 1 for ease of illustration. Multiple matrixes with randomly assigned numbers would be employed in the field. The position location matrix is used as follows:

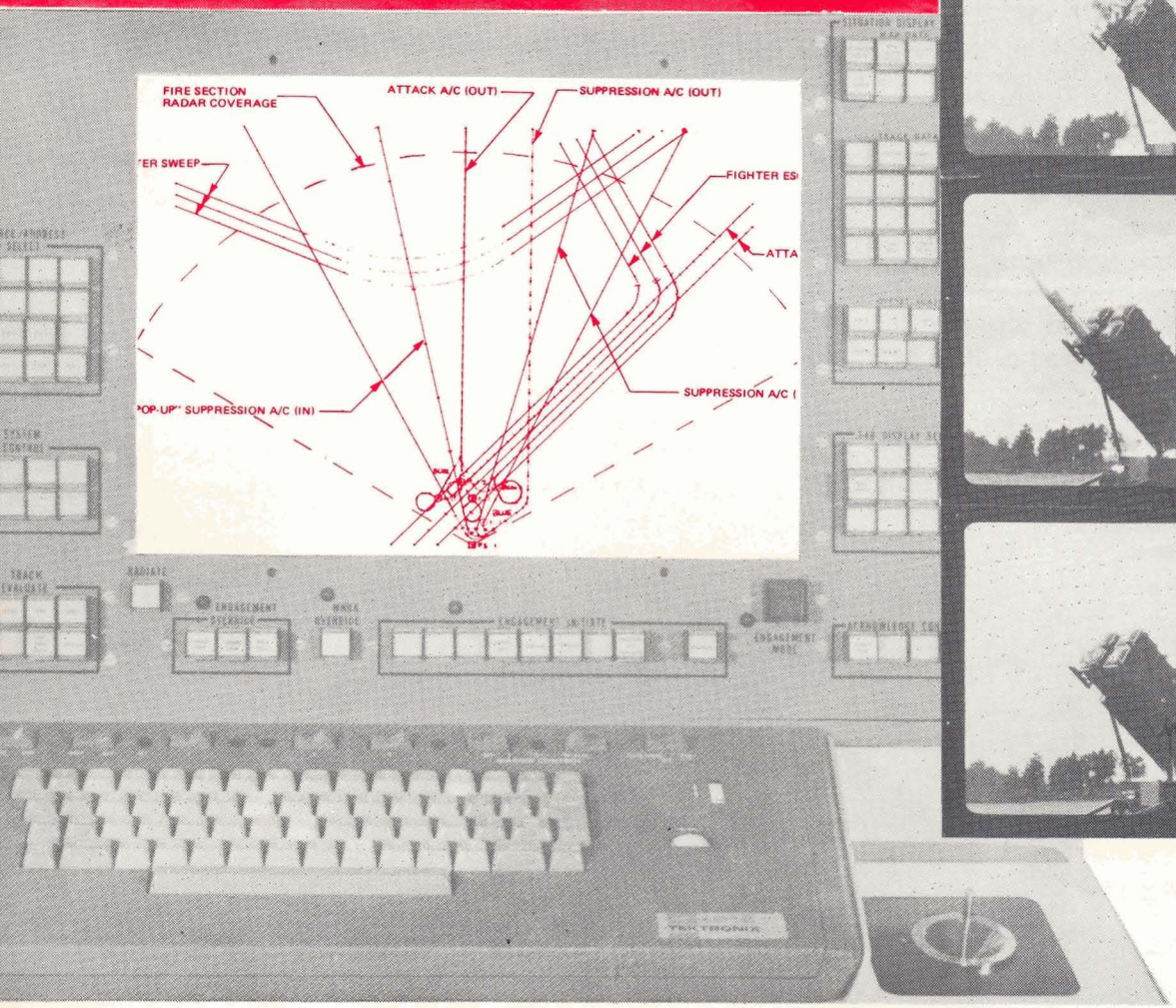
- First, Chaparral/Vulcan squad position locations are indicated on a map.
- The position location matrix is superimposed over the map so that the squad positions are covered by the transparent matrix. The horizontal and vertical reference lines are positioned to coincide with any convenient map grid lines.
- The reference coordinate is read under the intersection of the horizontal and vertical reference lines and recorded in the space provided at the top of the matrix.
- A CEOI is used to encode the matrix reference coordinate, using the dryad system.
- The grid square numbers corresponding to the squad locations are recorded.
- The position location message then consists of the encoded reference coordinate and a series of grid square reference numbers corresponding to the squad locations of a platoon or battery.

Experience has shown that position locations within a 500-meter square is sufficient for command and control purposes and allows for squad maneuver to alternate positions following each aircraft engagement. The position location matrix, using randomly numbered grids, can best be employed as a CEOI item with multiple matrix sheets for specific dates and times. The matrix is being forwarded to the National Security Agency for review to verify the degree of security it will provide as well as to identify any special instructions for its use. Local support requirements must also be identified to provide an organic capability to produce the matrix for issue as a CEOI item.

The position location matrix is a very flexible tool for use by battalion and battery headquarters. Combined with brevity lists and the dryad, warning orders and operations orders for Chaparral and Vulcan batteries and platoons can be sent by short radio transmissions to quickly respond to changes in the employment of armor task forces.

Sample copies of the position location matrix are available on request from the 2d Battalion, 5th Air Defense Artillery, ATTN: S-3, 2d Armored Division, Fort Hood, Texas 76546.

Major Raymond Wauford wrote this article while serving as S-3, 2d Bn, 5th ADA. He has recently been reassigned to DCOS for Development, Research, and Acquisition in Washington. A graduate of Vanderbilt University, he also holds a Masters Degree from the University of Texas at El Paso. His article, "Vulcan Versus the Helicopter — Mounted Antitank Guided Missile", appears in our Oct-Dec 1975 issue.


FIRE SECTION
RADAR COVERAGE
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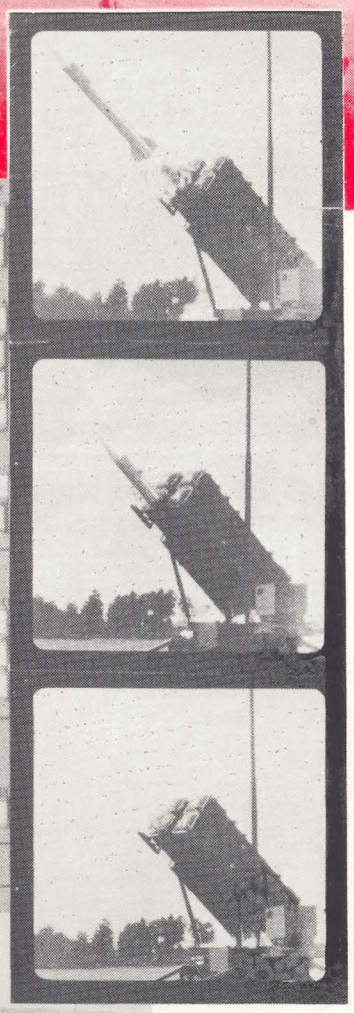


SAM-

CAPTAIN JAMES L. HUBBARD

Development of the most complex air defense missile system ever conceived has created the demand for a new and sophisticated means of evaluation. The SAM-D weapon system exploits recent technological progress in computers and integrated circuits to provide unprecedented air defense firepower and, as a result, SAM-D is envisioned to replace both Hawk and Nike Hercules on the battlefield of the future. Its wide range of capability and great potential firepower present a unique problem to the developer — how does one evaluate the system during (and following) development to insure that it exploits its full potential?

With every air defense weapon system to date the answer has been fairly simple. Merely fly one or two targets against the system and attempt to engage them. The "yardstick" is even simpler. If the target is "hit" consistently, the system checks out; if not, the system fails. Given SAM-D's increase in firepower the solution is no longer simple. The cost involved in stringently testing the system with live targets and missiles is prohibitive, particularly with the many iterations required during the development phase. Fortunately, however, a cost effective solution for SAM-D is implied by the system itself. To test a highly complex computer-driven system, a computer must be used. In particular, a highly sophisticated hardware/software simulation facility must be developed that will provide accurate, credible answers to questions concerning capability. The simulation itself must undergo stringent evaluation to insure faithful representation of the real world in general and the weapon system in particular.

In 1973 the SAM-D project encountered this problem head-on during early involvement in development of SAM-D firing doctrine. The SAM-D system, unlike its less automated predecessors, incorporates most of the firing doctrine into system software. Many of the decisions that were traditionally made by tactical control officers or console operators will now be made by the weapon control computer. The automation of this formerly manual process became increasingly complex as the need for a reliable system-peculiar simulation was identified. Existing Army models were considered and discarded due to their generality in approach to the air defense problem, the complexity of required inputs, and the unwieldy mass of output data. A contract was let to Systems Control Incorporated in Palo Alto, California, to create a SAM-D firing section model, the interactive tactical engagement model (ITEM-I). The model was then used in the formulation of firing doctrine for SAM-D. Later, the need to examine battalion-level SAM-D command and control was identified, and ITEM-II was developed to fill this need.

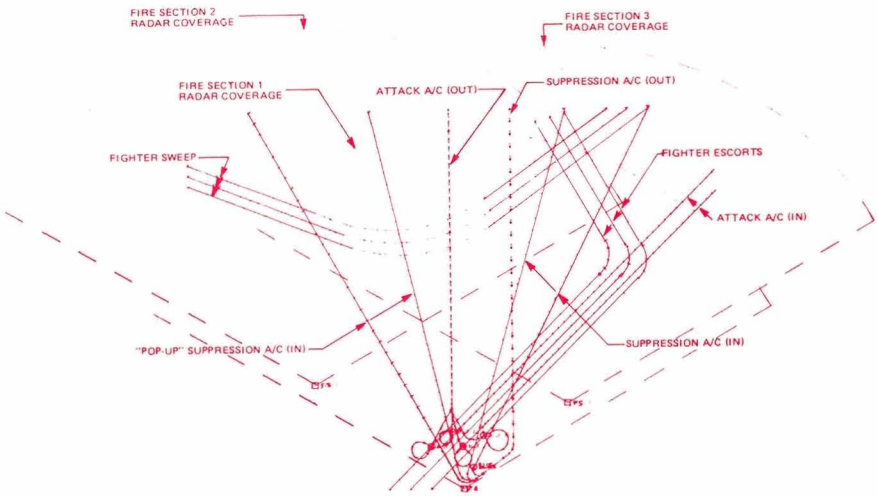
The ITEM model is a Monte Carlo, event-driven SAM-D battalion simulation. The model's name is perhaps a misnomer — it is not an interactive but rather a "batch-process" model. The performance of the system hardware is built into the model. Fire section and defended asset deployments are defined by the user as input data. Threat scenarios are input by defining points on attack paths. Attack groups are then specified by time, path numbers, and target. The program later uses this information to provide program real-time flight profiles of the attackers. A probability of detection and line-of-sight evaluation determines when and by which fire section a threat is detected. The program has the additional capability of using preprocessed digitized terrain data in the detection process.

Once the threats are detected and identified, a complex threat evaluation and weapon assignment algorithm determine when and by whom each threat is engaged. All engagements are necessarily automatic. The differential missile-guidance equations are solved using a fourth order Runge-Kutta method with a typical step size of 5 seconds. Variations are made to allow for discontinuities in the guidance equations (e.g., rocket motor burn out, threat maneuver, etc.)

The success of each intercept is determined probabilistically. Detailed statistical data are kept for each Monte Carlo cycle (each run through the scenario) and the data are combined and provided in the form of means and standard deviations upon completion of each run of the program.

Even with the high degree of complexity offered by the ITEM II model, it was found to be inadequate in one very critical area — it does not allow manual intervention. It provides concise, highly reliable data

D TACTICAL OPERATIONS SIMULATOR



regarding SAM-D in an automatic environment, but its very nature precludes assessment of the effects of having a "man-in-the-loop." Since this will be a rather fundamental characteristic of the actual system, the solution to the SAM-D testing problem was found to be incomplete.

To adequately test system reaction/performance with optimal manual override, a need was identified for a truly interactive model of the SAM-D system. ITEM II provided the starting point in developing this capability.

Recently, Science Applications Incorporated was placed under contract to formulate and develop a full-scale mock-up of the SAM-D firing console which would be capable of interacting with the ITEM-II model providing a real-time display of the environment and the man/machine engagement of the threat. The result was the SAM-D tactical operations simulator (TOS).

The heart of the TOS is a Tektronic 4014 graphics console which has been modified to closely resemble the SAM-D firing console. The 4014 is connected to a CDC 6600 Computer via an IBM System 7 front-end processor. The modified ITEM-II and associated graphics interface routines are resident with an executive on the CDC 6600. The System 7 provides a communication interface.

The TOS has most of the operator interface capabilities that the actual system will have, the only exceptions being those with limited simulation value (e.g., radar radiate control). The TOS can simulate either a single fire section (selected from the input scenario during initialization) or act as the battalion control element supervising the fires of a number of fire sections. In the battalion mode, the fire sections are necessarily in the automatic engage mode with control exercised via engagement inhibits.

The TOS provides a facility for the evaluation of doctrinal firing techniques, provides a capability to examine the effects of a "man-in-the-loop," and provides real-time information during the critical system development phase. The challenge of evaluating the Army's newest computer-driven system has been met with the help of a computer.

Editor's Note: The author plans to gather data on utilization and accomplishments of the SAM-D tactical operations simulator and submit a future article for publication based on this research.

Captain Hubbard, a Vietnam veteran, holds a degree in mathematics from the University of Texas at El Paso. He is also an honor graduate of the ADA Officers Advanced Course and distinguished graduate of the Guided Missile Staff Officers Course. Having previously served with Hawk units in Germany and the US, he is now assigned as a guided missile staff officer with the SAM-D Project Office at Redstone Arsenal.

CONTINUED FROM PAGE 14

scheme of maneuver and rates of advance were determined by combat ratios in the SCORES study. System operational readiness (OR) rates were not used in this model because of other assumptions made in the CPX. However, OR rates are included in the CACDA study and can be easily included in the equation. Operational availability rates of enemy ADA systems were considered when calculating attrition of USAF aircraft.

Attrition of USAF aircraft and enemy ADA to Air Force tactical sorties was based on the USAF Tactical Air Warfare Center SCORES war game model[5] and modified by available unclassified background data from the 1973 Mideast War. From these sources and data, we computed and "fragged" the number of sorties necessary to attrit the exercise enemy ADA threat down to a level where resultant losses to an airborne force by enemy ADA would not be excessive.

Air Force attrition to enemy ADA systems was computed jointly by USAF and ADA control cells at Corps level. Fifty percent of US high-performance aircraft losses occurred during the concentrated ADA suppression campaign conducted from D — 7 to D day.

Empirical data on losses of C-130 transport aircraft in a mid-intensity ADA threat is almost nonexistent. However, using data in the CACDA model and applying it to C-130's, the losses were relatively light during airborne operations. C-130 losses were almost all caused by SA-7's organic to aggressor units along the flight route and proximate to the drop zones. All C-130 flights were made after a successful ADA suppression campaign was conducted. AAA guns and other SAM systems were ineffective during the parachute assault primarily because the USAF concentrated its ADA suppression on the attrition of other crew-served ADA sites within the division area. This campaign severely reduced the ADA threat. C-130 losses were highly influenced by altitude, flight routes, and the location of enemy maneuver units along the flight routes. SA-7 gunner strength and basic loads were played on the same levels as the parent maneuver unit. Once again, unit controllers assessed aircraft losses on a random basis in a particular lift. SSKP's were based on empirical data and on the CACDA study. To give the divisional controllers maximum flexibility, at various times during the exercise, enemy ADA units within division/brigade areas of operations were "chopped" to the division/brigade controller for maneuver as the tactical situation dictated. Unit controllers randomly attrited helicopters of a given lift to be as objective as possible in determining which supplies/personnel were lost before reaching the objective area. The impact of these losses can be judged by the fact that commanders cancelled, delayed, or modified several airmobile operations because of potential and/or actual aircraft losses.

In summary, the models listed in the CACDA study and the USAF TACAIR warfare wargaming models provide some very helpful attrition and suppression rates for planning any CPX. With the use of computerized programs, these models can be modified to accommodate as many variables and as much empirical data as is necessary to build a viable ADA environment in a CPX.

FOOTNOTES:

[1]LTC Rudy J. Wagner, "Small Arms in Air Defense," *Air Defense Trends*, (Sep 1974).

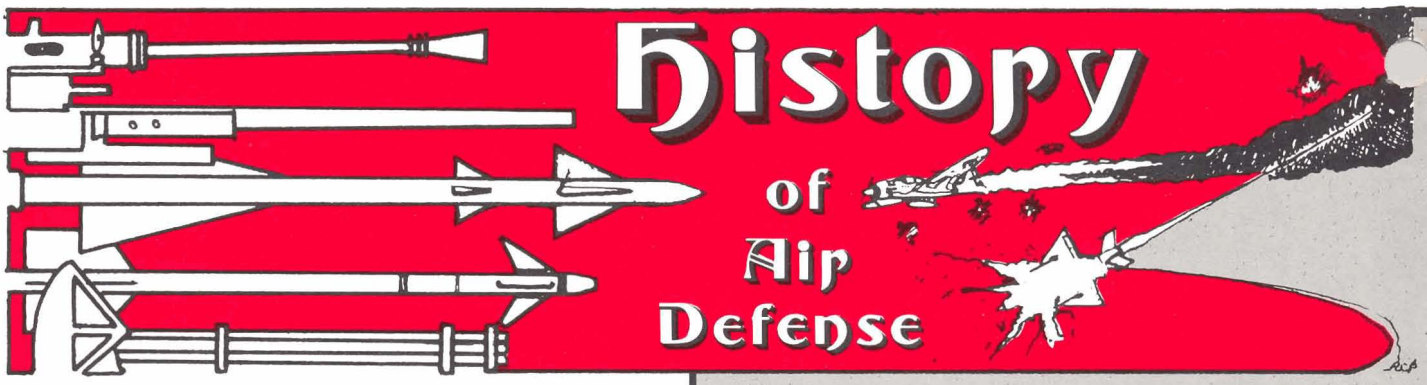
[2]LTC William O. Staudenmaier, "Learning From the Middle East War," *Air Defense Trends* (April-June 1975), 8.

[3]Ibid P. 11.

[4]*US Army Combined Arms Center, "SCORES 'Jiffy' War Gaming Methodology,"* Combined Combat Development Activity, Fort Leavenworth, Kansas, July 1975.

[5]Tactical Air Command, USAF Tactical Air Warfare Center, Methodology for SCORES War Games (Eglin AF Base, FL, June 1975)

Major Suhosky has completed several Branch courses and graduated from the Command and General Staff College. He holds a masters degree in business administration from the University of Pennsylvania. He has commanded ADA units in the US and Special Forces units in Vietnam. His present assignment is as ADA operations officer in G-3, XVIII Airborne Corps, Fort Bragg, North Carolina.



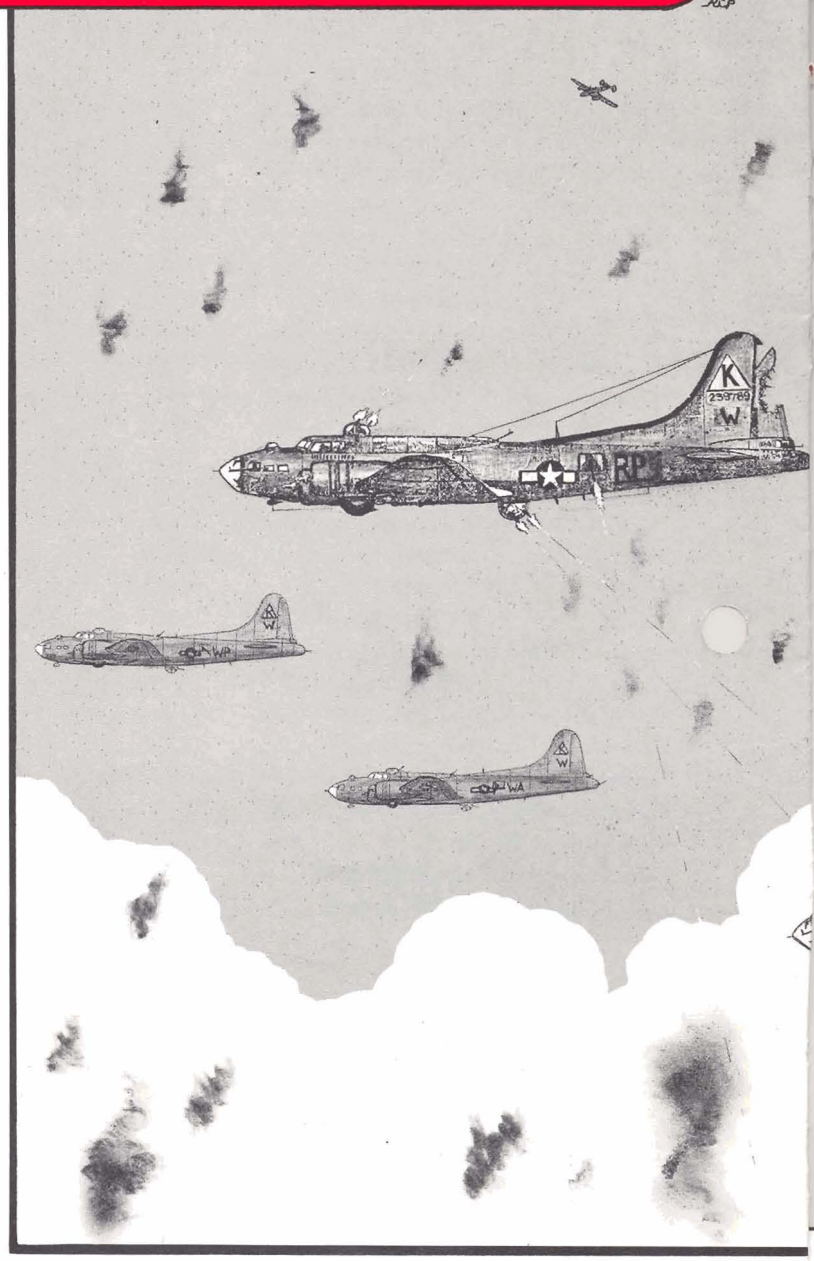
Schweinfurt-Regensburg Raids

The city of Schweinfurt was the heart of the antifriction bearing industry of Germany. Over one-half of all workers in the industry and one-half of the total production were concentrated in the southwest part of the city. As part of the overall strategic plan for the bombing of German production facilities, Schweinfurt was high on the list. Destruction of the bearing factories would cripple seriously those other industries which produced aircraft, tanks, and other machines of war. Plans had been formulated for extending the range of fighters so that escort could be provided for bombers. However, it was decided to launch the raids against Schweinfurt even before long-range fighter escort could be provided. The first 2 of 40 raids are discussed here; both essentially were air-to-air battles.

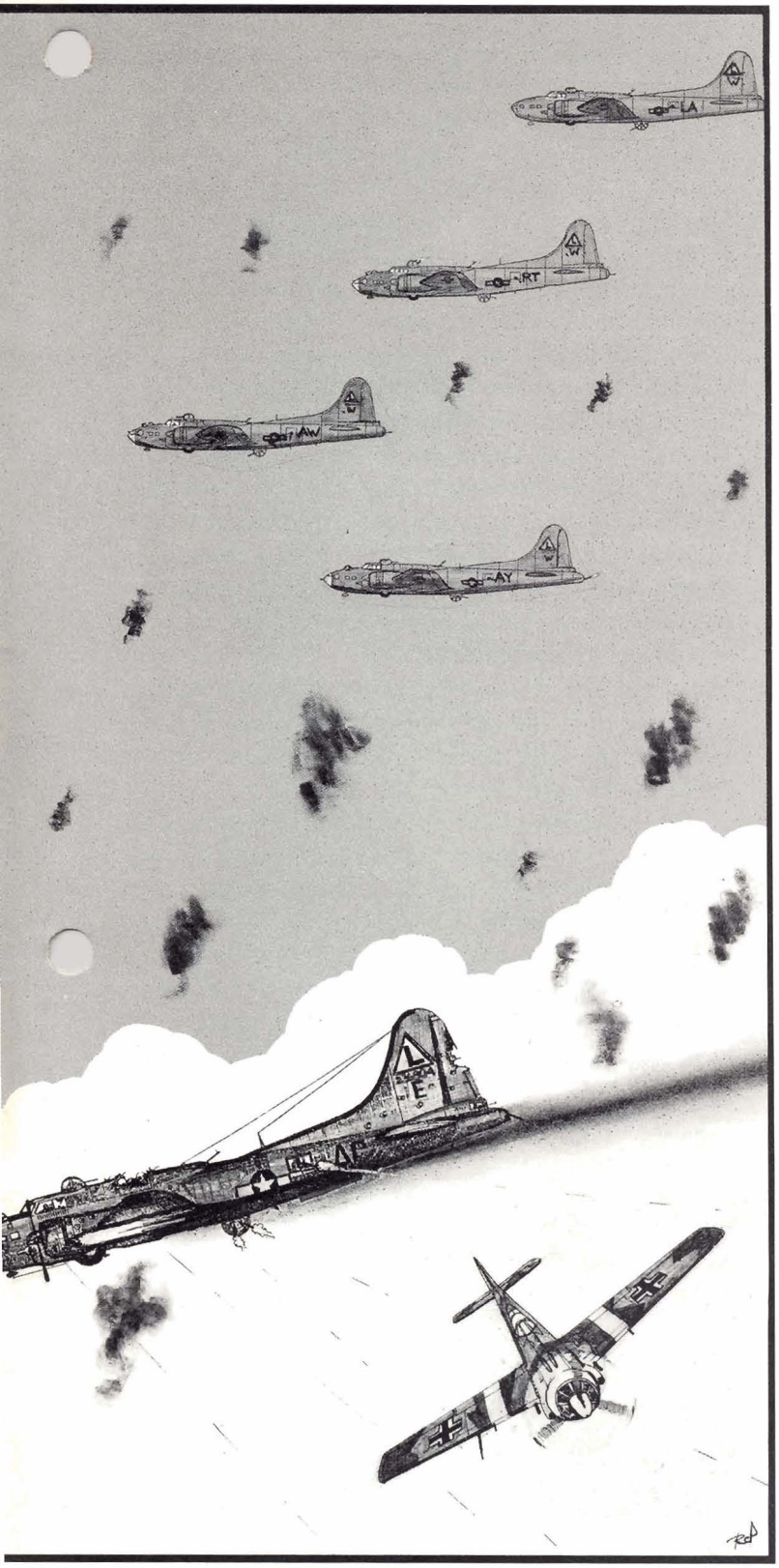
On 17 August 1943, a force of just over 300 B-17's, the largest force so far in the war, was to strike two targets: the ball-bearing plants at Schweinfurt, and the Messerschmitt factory at Regensburg, which produced about one-half of Germany's single-engine fighters. The Regensburg force was to strike first and then proceed to fields in North Africa. It was hoped that this force would have drawn most of the German fighters, allowing the Schweinfurt force an easier time of it. Fighter escort would be provided to the endurance limit of friendly aircraft.

The Regensburg force of 126 bombers was attacked by German fighters as soon as the fighter escort had turned back, with the air battle decreasing in intensity as the target area was approached. The attack cost 36 bombers, although the B-17's claimed to have shot down 78 German fighters in the battle.

The Schweinfurt force of 189 bombers also was attacked by the Germans after its fighter escort turned back. Because this force had been delayed by weather in



B-17E's, of the 381st Bombardment group, under attack as



hey pass the IP and begin their final approach to Schweinfurt.

its takeoff, the Germans were able to refuel and devote considerable attention to it. Both American forces were opposed by some 400 to 500 fighters of all kinds, attacking aggressively with cannon, rockets, and parachute bombs. Many attacks were from the front quarter, where the B-17 defensive armament was weakest and the high closure rate placed the Germans under defensive fires for a shorter period of time. Wave after wave of fighters passed through the formations from all directions in what was described as the worst air battle yet encountered by the Americans. Of some 315 effective bomber sorties for the two targets hit, the losses totaled 59 (19 percent). One of the groups lost 11 of its 25 bombers.

The second great raid occurred on 14 October 1943. Two task forces, totaling 383 bombers, were to hit Schweinfurt about 1400. Although the weather over the Continent was clear, that over England was bad. The heavy cloud cover caused 60 bombers to fail to link up with the forces; operational aborts accounted for many others not reaching the target area. In all, only 257 bombers actually headed for Schweinfurt, and 28 of these were to be shot down on the way. Plans called for fighter escort to a point near the Rhine River on the way to the target, with fighters again providing escort from the same point on the withdrawal route. The weather prevented some of the fighters from making rendezvous on penetration and grounded most of the fighters later in the day so that withdrawal escort was incomplete.

The Germans started attacking even before the escort had to return to bases. Attacks continued until the survivors reached the Channel on their withdrawal. Most of the heavier attacks were initiated by three to five single-engine fighters from head-on to draw the bulk of the defensive fires of the tight bomber formations. These fighters were followed closely by twin-engine fighters carrying rockets and cannon; the rockets would be fired first, followed by sustained fire from 20-mm and 30-mm cannon. The rockets produced bursts comparable to 88-mm antiaircraft ammunition, and one hit by a rocket was enough to destroy an airplane. Simultaneously, attacks would be made from the sides and rear of the bomber stream by single- and twin-engine fighters firing rockets, cannon, and machineguns.

As the target area was approached, the Germans began to concentrate on one formation of a task force; a tactic which, for some reason, was not standard procedure with the Germans. If it had been adopted as a

normal tactic against the leading box, the results would have been increased friendly losses. Some four-engine bombers were used by the Germans to launch rocket and cannon fire from out of range of the machineguns of the B-17's. One bomber trailed the formations, radioing their positions and altitudes to controllers on the ground who then could direct fighters into proper position.

In some cases, the Germans attempted to bomb the task forces. Some fighters flew about 1,000 feet above the bombers and dropped small bombs on the formations. Others flew above and ahead of the formations and dropped aerial parachute mines, fuzed to explode at the bombers' altitude. None of these efforts produced casualties. Similar types of attacks were reported at various times throughout the war, in Europe as well as in the Pacific areas.

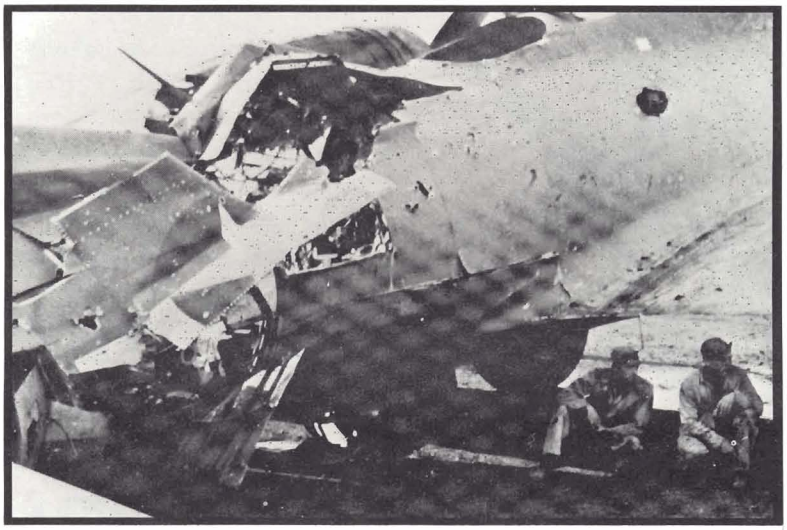
The bombers were flying at altitudes from 21,000 to 24,000 feet to minimize flak damage; in addition, the route to the target and return was planned so as to avoid known antiaircraft concentrations. Flak on the way to the target was reported as meager and inaccurate; however, in the target area it was reported as intense and accurate, although only two bombers were lost as a direct result of flak damage.

The October raid was expensive. Official reports generally agree that 60 or 61 bombers were lost on the raid, an attrition rate of 20 percent. However, this does not tell the full story. Over the Continent, 59 were shot down; 1 bomber was ditched in the Channel; 3 were abandoned over the Continent and 2 over England, and 2 crashed on landing — all due to battle damage; 17 which returned safely were so damaged as to be completely unflyable; 142 other bombers received varying degrees of damage. Only 50 bombers returned without damage. In terms of personnel, 599 were killed or missing and 40 were wounded. The total bomber loss as a direct result of the action was 82, some 32 percent of the 257 crossing the Continent, which was some 21 percent of the total force of 383 originally launched. One of the task forces lost almost 50 percent of its attacking force; the 305th Bombardment Group returned with only 2 of its original 15 bombers. The Germans had reached the peak of their effectiveness.

The attrition of both the August and October raids was prohibitive — losses of aircraft and personnel such as these could not be sustained. Deep penetrations of Germany without fighter escort were suspended for 4 months until fighter escort range could be extended.

Some important lessons were learned in connection with the first two Schweinfurt raids. Bombers, even though heavily armed and flying close formation to provide the best mutual defense against fighters, were vulnerable to concentrated, well-directed, and well-planned attack. Had the Germans chosen to mass their attacks on first one and then another of the individual boxes of the large formation, much higher friendly losses would have occurred.

History repeated itself on 11 January 1944. Aircraft industry targets were scheduled for attack by 663 bombers, escorted by fighters to and from the target area, only 90 miles from Berlin. Bad weather affected bombers and fighters, so that only 238 bombers reached the targets. A P-51 group, which was to provide escort in the target area, was late, and other fighters had problems making rendezvous. German fighters, using improved tactics, accounted for most of the 60 bombers (25 percent) lost on the mission.



(USAF Photo)

The bombers which returned from Schweinfurt were mangled by German cannon shells, rockets, and flak.

ENLISTED CAREER NEWS

SUSPENSION OF SECONDARY MOS TESTING

Secondary MOS testing for soldiers in grades E-1 through E-8 has been suspended until Skill Qualification Tests (SQT's) become available for their MOS under the Enlisted Personnel Management System(EPMS). The suspension, effective with the February 1976 MOS test period, is the result of studies completed by MILPERCEN and the Office of the Deputy Chief of Staff for Personnel. The studies revealed that an unduly increased workload would occur at testing facilities adjusting to a combination of Primary and Secondary MOS testing, the new EER/SEER, and SQT conversion under EPMS. As of the end of November 1975, statistics showed that of the E-6 through E-8 population required to maintain SMOS, only 4 percent were employed in their SMOS. Another survey of 400 E-6 files showed that less than 12 percent had been employed in their SMOS at some point in their careers.

Detailed policies governing SMOS evaluation under EPMS will be contained in a forthcoming revision of AR 600-200. More information on the suspension of SMOS testing may be found by referring to DAPC-EPP-E message 122300Z Jan 76, Subject: Suspension of SMOS Testing.

ENLISTMENT MOS BONUS

The enlistment bonus program will undergo major changes during the first half of 1976. Bonuses in four MOS will be eliminated on February 1. Enlistment bonuses will be suspended for another five MOS beginning June 1, and the amount of bonus will be reduced for four other MOS.

These and other changes were announced by DA as a result of reduction in funds available for the enlistment bonus program. Bonus payments to prior service soldiers ended November 1, 1975.

Effective February 1, bonus payments will end in the following MOS: 15E — Pershing missile crewman; 16D — Hawk missile crewman; 27E — wire-guided missile system repairman; and 27H — Shillelagh missile system repairman.

On June 1, bonus payments will be suspended for 05C — radio teletype operator; 12E — atomic demolition munitions specialist; 15D — Lance missile crewman; 16E — Hawk fire control crewman; 16P — Chaparral crewman. Also on June 1 the amount of bonus payments will be reduced to $1,500 for 11B — light weapons infantryman; 11C — infantry indirect fire crewman; 11D — armor reconnaissance specialist; and 11E — armor crewman. Enlistees in those four MOS now receive bonuses of $2,500.

Other changes to the program include the ending of the acceptance of GED-certification for high school education. Beginning June 1, all enlistees must possess a high school diploma and be in mental category I-III at time of enlistment.

On June 1, 1976, six MOS will still offer $1,500 enlistment bonuses. They are 11B — light weapons infantry; 11C — infantry indirect fire crewman; 11D — armor reconnaissance specialist; 11D — armor crewman; 13B — field artillery crewman; and 13E — field artillery cannon operation-fire direction assistant.

PRO PAY RULES CLARIFIED

Drill sergeants, recruiters, and career counselors must be performing these respective duties to qualify for special duty assignment (SDA) proficiency pay. There seems to be some confusion in the award of the pay, particularly, when a soldier is reassigned to another post. These guidelines from MILPERCEN should insure a consistent policy:

Soldiers receiving SDA pro pay who are reassigned to another post in an authorized SDA position will continue to receive SDA pay without interruption while in transit. If a soldier is reassigned from an authorized SDA position to a non-SDA position, his SDA pro pay will stop when he is removed from his position in his losing unit. If he is reassigned to another SDA position, but upon his arrival the position is already filled, the gaining commander will decide who will fill the position and terminate the SDA pro pay for the one not selected. The effective date for the termination of the pay for the soldier not selected is the date of arrival of the incoming soldier.

During the implementation of one station training, SDA pay may be awarded or continued if a drill sergeant (DS) is reassigned to a post before the activation of a training activity or while awaiting the transfer of authorized DS spaces — if the soldier starts performing DS-related duties upon his arrival. MILPERCEN officials point out, however, that the number of drill sergeants receiving SDA pro pay may not exceed the total number of DS spaces a post will be authorized.

TIGHT REIN ON PCS MOVES CONTINUES

A shortage of PCS funds means that soldiers may be spending longer tours at their CONUS assignments. DA is saying that completion of a 24- or 36-month CONUS tour by itself is no longer justification for a PCS move. Only essential moves to maintain operational readiness and to meet the Army's oversea commitments will be made.

In oversea areas, involuntary tour extensions will remain in effect until further notice. School assignments will get a close look and every effort will be made to assign soldiers to schools closest to their present duty stations.

The Army is not allowed to budget for inflationary hikes that decrease the real value of PCS funds; the alternative is to curb PCS moves. Further restrictive measures may be necessary if PCS costs continue to rise.

OFFICIAL PHOTOGRAPHS

Every fifth year, on the month of their birth, enlisted members grade E-6 through E-9 must submit two photos for their records. Photos should be sent to: Commander, US Army Enlisted Records Center, Attn: PCRC-F, Ft. Benjamin Harrison, Indiana, 46249.

The photographs are used by DA selection boards and career management activities. Missing photos or photos of soldiers in unpressed, misfitted uniforms with missing or improperly displayed ribbons and long hair tend to give the impression of unprofessional and careless soldiers.

It is the responsibility of each soldier to insure that his official photographs are current and represent him in the best possible manner.

PROJECT AHEAD

Project AHEAD (Army Help for Education and Development), a new program in cooperative education, has been announced by DA.

Under Project AHEAD, an enlistee with a high school diploma can enroll in any of the 500 colleges participating in the program and earn credits toward a degree (during on- and off-duty hours) at the same time he fulfills his military enlistment. College credits can be earned from a variety of sources such as service experience (i.e., BCT and AIT), College Level Examination Program, correspondence courses, and courses from other colleges. The Army provides financial aid up to 75 percent of tuition costs. During a normal 3-year enlistment, a soldier can earn from 30-60 college credits toward a degree.

Project AHEAD is especially beneficial to career soldiers who, because of different assignments, have had a difficult time accumulating enough credits to earn degrees.

The project is operated by the participating colleges and universities. The Army acts only as an agent for implementing the program. For details, contact your educational advisor.

EPMS POINT OF CONTACT

In this issue we are beginning a new section of Enlisted Career News. We introduce SGM Francis R. Pavao who is serving as the Enlisted Personnel Management System (EPMS) point of contact at the US Army Air Defense School for Air Defense Artillery (ADA) enlisted men. His services will include receiving and passing along information from the US Army Military Personnel Center (MILPERCEN), Department of the Army, and the US Army Training and Doctrine Command, answering questions you may ask him, and obtaining interpretations whenever necessary.

Since the EPMS covers all enlisted personnel in the Army, by designating a point of contact at this level, the ADA soldier should receive fast, up-to-date information as to how changes effect him and his career.

A Word About SGM Pavao

Since 1948, he has served off and on in ADA units ranging from battery to Army level involving the 120-mm gun, Duster, Chaparral/Vulcan, Ajax, and Hawk systems, and has attended two courses at the US Army Air Defense School. His oversea assignments include Hawaii, Japan, Korea, and Vietnam. He has completed 24 years of active service in the Army.

Here SGM Pavao Discusses EPMS As It Affects ADA Personnel.

Effective 1 October 1975, Air Defense Artillery enlisted personnel (career management field 16) were integrated into the Enlisted Personnel Management System (EPMS). This action brought about many changes within the career field. These changes include skill levels that equate to grades, the combining of some MOS at different skill levels, publishing of soldier's manuals, and skill qualification tests (SQT's).

The US Army Air Defense School has the responsibility to develop, write, and validate both the soldier's manuals and the SQT's.

Soldier's manuals are being written for each MOS. At present, the first soldier's manual (16J) is being printed and should be distributed to the field in the near future. Others are in various stages of development. Some have been sent to selected field units for validation.

The manuals will contain those tasks that are felt to be critical for an individual to perform his job in a proficient manner. They will also contain tasks that are common to all Air Defense Artillery MOS. For the common tasks, the writers have tried to list everything an individual soldier needs to know to perform the tasks, especially for skill levels 1 and 2. For higher skill levels and for MOS-related tasks, it is felt a person will be able to acquire the reference material needed for proficiency in those tasks. Therefore, the writers did not go into lengthy details on the skills and knowledges required.

The skill qualification tests replace the MOS tests and will be taken from the appropriate soldier's manuals. The SQT will consist of three parts — hands-on, written, and commander's certification. The hands-on portion will be on equipment with which the individual is currently working. The written portion will cover all aspects of an MOS at the appropriate skill level. For example, the 16J written test may cover both the electronic search central and the forward area alerting radar; the 16P test may cover the Chaparral system and the Redeye. The commander's certification will be used for such tasks as weapons qualification, physical training, etc.

It has to be remembered that the soldier will take the SQT for the next higher skill level; e.g., skill level 1 will take SQT 2, skill level 2 will take SQT 3, etc. In this manner the individual can qualify for the award of the next higher skill level. Being qualified at the next higher skill level is one of the prerequisites for promotion.

It is anticipated that the soldier's manual will be distributed at least 60 days prior to administering the SQT. The first SQT to be administered in the 16CMF will be for MOS 16J during the Oct-Dec 76 time-frame. This test will be used as world-wide validation of the SQT. It will not be used for any DA personnel management programs, nor will the results be made a part of a soldier's official DA records. It will be administered in the field solely as part of the validation process for the SQT and to exercise administrative procedures. SQT's "for the record" will begin during 1977.

It is necessary for each soldier to master all tasks for his current skill level and then those of the next higher skill level in preparation for his SQT.

If you have any questions or suggestions, send them to:

SGM Francis R. Pavao
c/o Editor, AIR DEFENSE Magazine
USAADS, Box 5600
Fort Bliss, Texas 79916.

BARS to STARS

OPD UPDATE

INSTALLATION MANAGEMENT JOBS

The complexity of Army installation management demands expertise in engineering, logistics, financial administration, personnel management, and leadership. It also requires officers who are experienced in coping with special problems involved in managing installations. To this end, MILPERCEN has taken action to identify and develop qualified installation managers.

MILPERCEN will identify officers who have previous installation management experience or who have completed installation management related training such as the Army Installation Management Course at Fort Lee, VA, or the Facilities Engineer Management Course at Fort Belvoir, VA.

Officers demonstrating potential for successfully serving in installation management positions of increasing responsibility will be awarded an installation management additional skill identifier (ASI) "6Y." MILPERCEN's Officer Personnel Directorate will monitor these officers to insure their future professional development and utilization.

In March 1976, major commands will be asked to code appropriate positions with ASI 6Y. Requisitions for projected installation management vacancies are to be forwarded to MILPERCEN early enough to insure that officers with required schooling are provided. OPD career divisions will program officers chosen for these assignments to attend installation management courses enroute to their duty stations.

Since the variety of skills required of functional managers at installation level already correlates with many existing OPMS specialties, use of the new ASI 6Y as a management tool was carefully studied. The ASI was preferable to establishing a separate OPMS installation management specialty.

Officers awarded the installation manager ASI are reminded this personnel management action is not intended to lock them into installation-level assignments for the rest of their careers. Instead, they can expect periodic assignments as either functional installation managers or installation commanders in conjunction with typical duty assignment progression with their designated OPMS specialties.

Positions that typically will be coded with ASI 6Y at the installation/garrison level worldwide include: commander/deputy commander, chief of staff; IG; comptroller/assistant comptroller, budget officer; positions within the directorates of personnel and community activities; security; plans and training; industrial operations; facilities engineering; and communications-electronics.

SENIOR WARRANT OFFICER CORRESPONDENCE COURSE

Active duty and Reserve component warrant officers are eligible to enroll in the warrant officer senior correspondence course — E32. The course is designed to prepare warrant officers for the most demanding technical staff positions. CW4's, CW3's, and CW2's with at least 6 years' warrant officer service are eligible. The 6-year requirement may be waived by the Commandant of the US Army Aviation School, on a case-by-case basis when requested on the application for enrollment.

The course consists of 42 subcourses totaling 408 credit hours. Students may work at their own speed but a minimum of 120 credit hours must be completed each year. Studying at the minimum permissible credit level, it will take about 3 years to complete.

Interested warrant officers may apply by submitting a DA Form 145 (Army Correspondence Course Enrollment Application) as outlined in paragraph 4 of DA Pamphlet 351-20. The form should specify the course title, "Warrant Officer Senior Correspondence Course, E32," and be addressed to the Commandant, US Army Aviation School, ATTN: Department of the Army Training Support, P.O. Box 7, Fort Rucker, Alabama 36362.

Senior Air Defense Artillery Commanders

MG Robert W. Fye
32d US Army Air Defense Command

BG Daniel H. Wardrop
31st Air Defense Artillery Brigade

BG John B. Oblinger, Jr.
38th Air Defense Artillery Brigade

COL R. M. Singletary
The School Brigade

COL David A. Hufnagel
The Air Defense Artillery Training Brigade

COL Avon R. Omps
11th ADA Group

COL J. Hollis V. McCrea, Jr.
108th ADA Group

COL Richard J. A. Guertin
10th ADA Group

COL Cary B. Hutchinson, Jr.
69th ADA Group

COL Walter J. Mehl
94th ADA Group

COL Charles G. Scott
559th ADA Warhead Support Group

LTC John B. Stone
570th USA Artillery Group

LTC Fredrick W. Kulik
552d USA Artillery Group

LTC Marvin A. Bihn
5th USA Artillery Group

LTC Robert Tozier
2d Battalion, 67th ADA (C/V)

LTC Ed Solomosy
2d Battalion, 60th ADA (C/V)

LTC Raleigh Meyer
6th Battalion, 56th ADA (C/V)

LTC Donald R. Park
3d Battalion, 59th ADA (Hawk)

LTC Bruce Hamilton
2d Battalion, 62d ADA (Hawk)

LTC Ivo J. Cavoli
2d Battalion, 2d ADA (Hawk)

LTC William A. Bradley
1st Battalion, 1st ADA (Hawk)

LTC Charles Szendry
3d Battalion, 7th ADA (Hawk)

LTC Nathaniel R. Roache
2d Battalion, 57th ADA (Hawk)

LTC Francis M. Williams
6th Battalion, 52d ADA (Hawk)

LTC James J. Kernan
3d Battalion, 60th ADA (Hawk)

LTC Carl C. Neely
2d Battalion, 56th ADA (Herc)

LTC James W. Evertt
3d Battalion, 71st ADA (Herc)

LTC James E. Rambo
2d Battalion, 1st ADA (Herc)

LTC Travis N. Dyer
5th Battalion, 6th ADA (Herc)

LTC Charles W. Binney
2d Battalion, 59th ADA (C/V)

LTC Wallace C. Arnold
3d Battalion, 61st ADA (C/V)

LTC John Connolly
3d Battalion, 67th ADA (C/V)

LTC Robert Mathis
1st Battalion, 59th ADA (C/V)

LTC Patrick Cunningham
1st Battalion, 2d ADA (Hawk)

LTC John Peckham
1st Battalion, 44th ADA (Hawk)

LTC Harlan R. Pierce
2d Battalion, 44th ADA (Herc)

LTC Robert D. LaTour
2d Battalion, 71st ADA (Hawk)

LTC Joseph Stone
2d Battalion, 61st ADA (C/V)

LTC Charles Johnson
1st Battalion, 68th ADA (C/V)

LTC William Winzurk
2d Battalion, 5th ADA (C/V)

LTC Elton Shauf
4th Battalion, 61st ADA (C/V)

LTC Henry M. Reed II
3d Battalion, 4th ADA (C/V)

LTC Roger L. McLeod
1st Battalion, 3d ADA(C/V)

LTC Joseph Thurston
1st Battalion, 67th ADA (C/V)

LTC William I. Barrett
1st Battalion, 43d ADA (Herc)

LTC Richard F. McCrary
1st Battalion, 62d ADA (C/V)

LTC Welton Hamilton
3d Battalion, 68th ADA (Hawk)

LTC John Sampson
1st Battalion, 65th ADA (Hawk)

LTC Francis R. Stevens
2d Battalion, 52d ADA (Herc)

LTC Hunter G. Haselton
1st Battalion, 7th ADA

LTC John W. Moore
1st Battalion, 55th ADA

LTC Samuel L. Hayton
2d Battalion, 55th ADA

LTC Ronald L. Peden
4th Battalion, 1st ADA (C/V)

LTC Carl F. Gustafson
3d ADA Training Battalion (MSL)

LTC Donald A. Campbell
4th ADA Training Battalion (FAW)

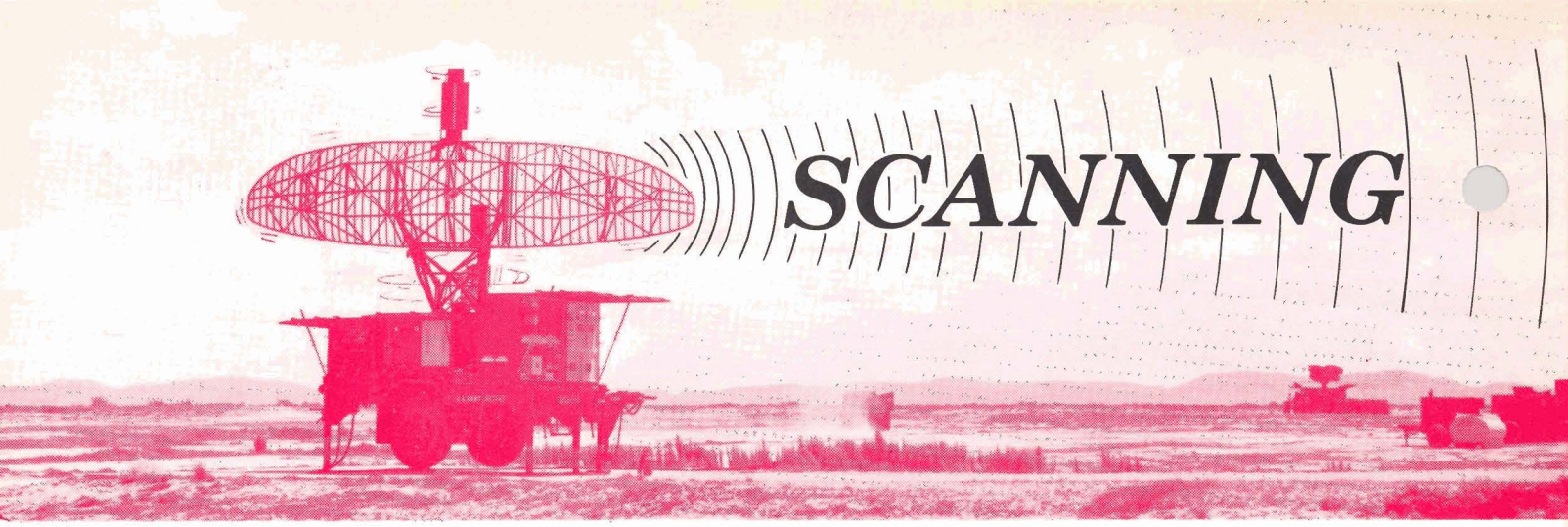
LTC John Loeffler
Staff and Faculty Battalion

LTC Harrell G. Hall, Jr.
Student Battalion

LTC Fred W. Balkovetz
Allied Student Battalion

LTC Ronald O. McLaurin
5th Battalion, 57th ADA (Hawk)

LTC Phillip B. Chesher
4th Battalion, 62d ADA



AIRBORNE REDEYE

SSG Tommy Hatcher of A Btry, 3d Bn (Abn), Vulcan/Redeye, 4th ADA, shows how the Redeye weapon container would be carried prior to jump, and demonstrates how the Redeye weapon, having been removed from the container, would be immediately employed during an airborne assault.

Recently, the 3d Bn (Abn), Vulcan-Redeye, 4th ADA, 82d Airborne Division, participated in Caballero Cactus IV Operation (Air Assault) in the vicinity of Desperation Drop Zone in New Mexico. In Cactus IV the battalion tested a new concept in airborne equipment delivery. Two jumpers carried Redeye weapon containers (tied to them by 30-foot lowering lines) and were ready to provide air defense protection for the drop zone almost immediately upon landing. The container was designed and developed by SSG Daniel Rivera of A Btry who has long experience with airborne troops.

The first air defender to jump with the container was LT James Gillcrist, also of A Btry, when he exited a C-130 Hercules during a recent night airborne assault. Up to the present time, the container has been packed with a field handling trainer which has nearly the same dimensions as a live round.

A further step that has been proposed is to develop a universal container that would accommodate Redeye, Stinger, and Dragon weapon systems.

FORT BLISS BEGINS BCT

Basic Combat Training (BCT) returned to Fort Bliss in January under the new One Station Training Program which provides for a trainee to receive BCT and Advanced Individual Training (AIT) at the same post, resulting in savings of both time and money.

The Air Defense Artillery BCT Brigade is comprised of two battalions of five batteries each (one of which is a special training battery), plus a reception station.

Other facilities include attractively refurbished dayrooms, complete with a variety of enjoyable game activities, color television, reading facilities, and the dining facility. A special chapel has also been created.

With an arrival rate of about 200 recruits per week, the BCT facility will have a total of more than 2,200 in population at full capacity, including the permanent party and cadre personnel.

All trainees taking their BCT here will have chosen Air Defense Artillery at the time they joined up in the recruiting station.

A 7-week training schedule will be followed once the trainees enter actual training. The first 2 weeks of BCT will be conducted on Fort Bliss, then the trainee moves to McGregor/Meyer Range for the next 4 weeks. He will return to Fort Bliss for weekends and the final week of training and graduation.

After graduation from BCT, the trainee will attend specialized training with The School Brigade or AIT with The Air Defense Artillery Training Brigade. Once AIT is behind him, the trainee will be available for worldwide assignment as a part of the air defense artillery team.

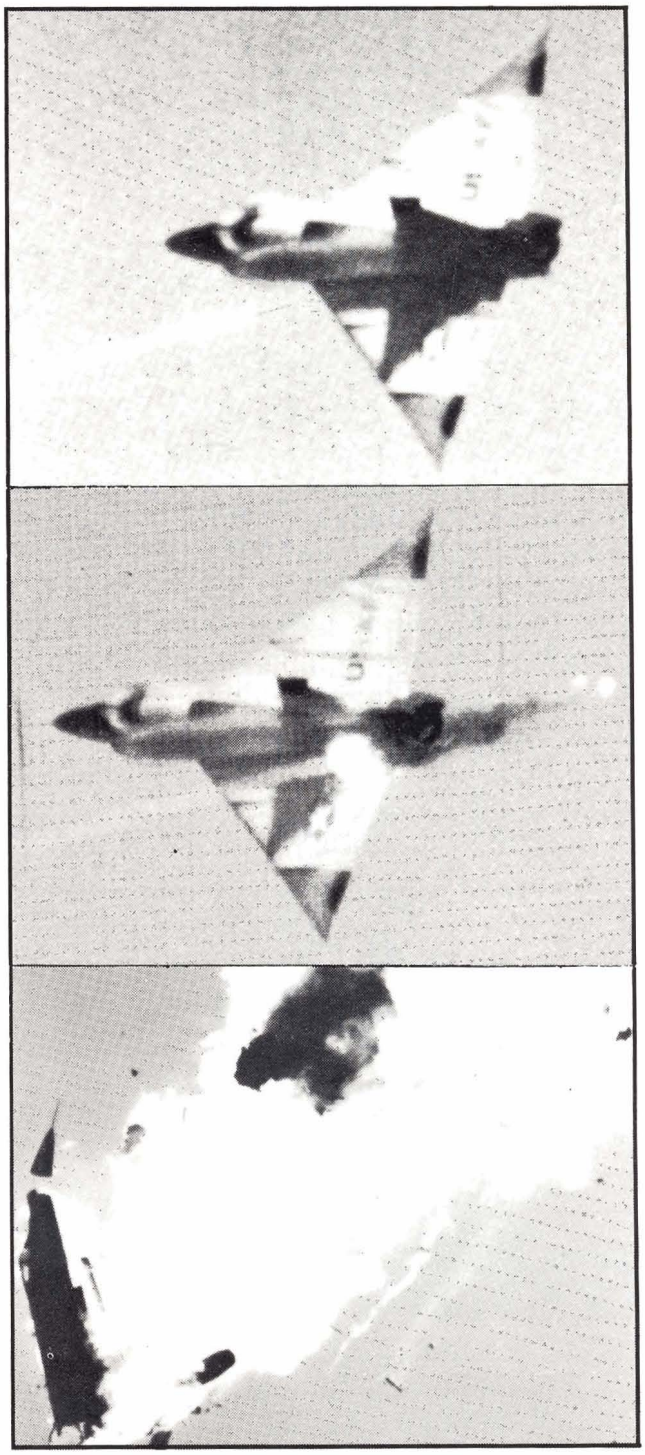
For trainees enlisted in MOS 16P, Chaparral Crewman, another new concept which is being introduced at Fort Bliss will be pursued: One Station Unit Training. This is a 14-week training program designed for 16P trainees. They will be assembled at the Reception Center and spend the next 14 weeks in a combined BCT-AIT program using the same cadre in the same unit for training uniformity. The 14 weeks of 16P training contain an integrated program of instruction. Seven weeks of the instruction will be given at Logan Heights, followed by 7 more weeks on main post.

Through the use of new, modern training programs and the help of everyone at Fort Bliss, the Army will be able to look forward to a better trained, higher qualified, and more spirited ADA soldier in the future.

STINGER SCORES AGAIN

Stinger, the Army's new MANPAD antiaircraft guided missile, knocked down a radio-controlled F-102 making a maximum speed, low-altitude run during a recent test.

Under development by the Army Missile Command, Stinger will give soldiers immediate defense against helicopters and low-level, high-speed aircraft attacks.



AD UNIT SUPPORTS USAF TESTING PROGRAM

Battery B, 5th Battalion, 57th Air Defense Artillery successfully supported the US Air Force Optics (Oscura Peak Tracker Investigation and Comparison Series) Program at White Sands Missile Range. Twelve basic Hawk missiles were launched in a remote area on the northern portion of the range. The firings included two night missile firings.

The Air Force requested that the Army modify the Hawk missile to fly a predetermined trajectory rather than the target intercept-type trajectory. Fort Bliss personnel detailed a modification plan for the missiles and then modified each missile according to the plan. With only one exception, each missile flew the exact predetermined trajectory as requested by the Air Force.

The objective of the launches was to use an Air Force van-mounted telescope system to collect imagery and tracking data during missile flight. The telescope system employs both passive and active trackers in the visible and infrared wavelength regions. The Hawk launches were necessary to aid in the evaluation of the capabilities and limitations of an extensive array of tracking and imaging systems used by the Air Force.

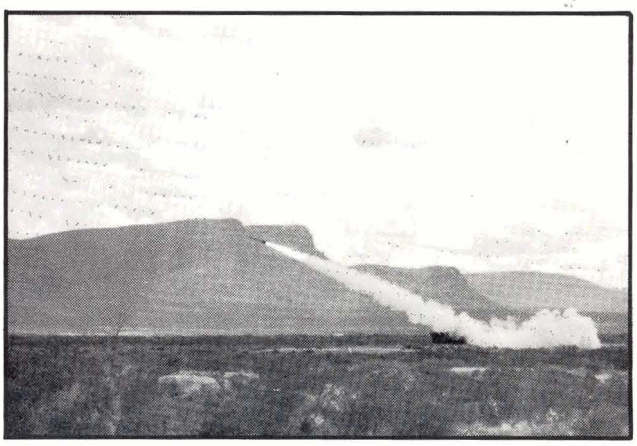
The Air Force had 7 range workdays scheduled to launch the 12 Hawk missiles. Both the Air Force and White Sands Missile Range encountered problems which caused short lead-time changes in the launch schedule and, at times, even threatened the entire schedule. The Hawk battery was extremely flexible to the changes.

The overall testing program was a complete success. The data collected from the Hawk launches is invaluable to the US Air Force in determining the capabilities and limitations of future tracking systems.

MINISMOKES AID AIR DEFENSE TRAINING

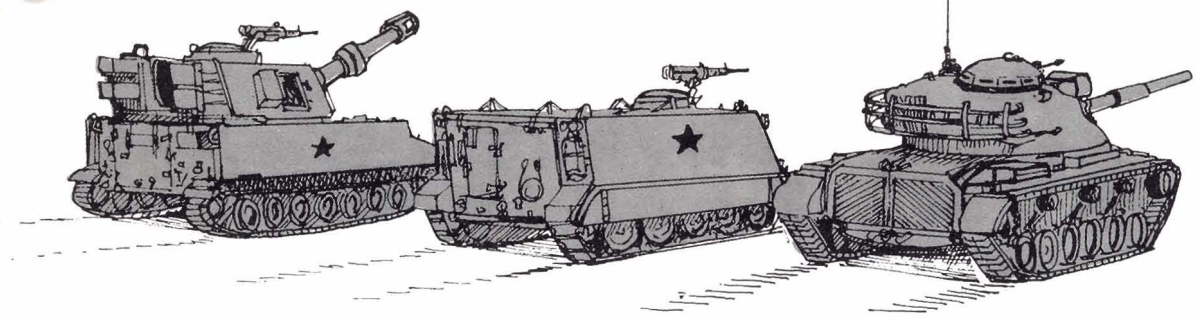
The 4th Battalion (C/V) (SP), 61st Air Defense Artillery with the 4th Infantry Division at Fort Carson has developed a very useful means of achieving realism in training by simulating air defense engagements of hostile aircraft. When a high-performance or rotary wing aircraft is identified as hostile, the Chaparral or Vulcan gunner ignites a minismoke. Both green and yellow have been used successfully. The minismoke is used to simulate one Chaparral missile or 180 rounds of 20-mm ammunition (three 60-round bursts). The minismoke immediately reveals to the forward air controller or aviator that his aircraft has been engaged. The minismoke gives a fair approximation of the Chaparral and Vulcan signatures. In addition, minismokes are issued in the same quantity as the unit's basic load and can be used as a realistic vehicle for simulating ammunition resupply. Gunners, of course, continue to track targets using normal procedures, but the minismoke — ignited at the time of firing — provides a useful means of controlling and quantifying simulated engagements.

DEPUTY SECRETARY OF DEFENSE AND SECRETARY OF THE ARMY VISIT BLISS



The Honorable William P. Clements, Jr., Deputy Secretary of Defense, and the Honorable Martin R. Hoffman, Secretary of the Army, visited Fort Bliss in February. They were briefed on roles and missions of the US Army Air Defense Center and Fort Bliss and viewed demonstrations of air defense weapon systems, including firings of Chaparral, Vulcan, Hawk, and Redeye. The 4th ADA Training Battalion of the ADA Training Brigade conducted the demonstration and trainee graduating students did the firing. At an ensuing press conference, Secretary Clements and Secretary Hoffman praised the professionalism of today's air defense soldiers and expressed confidence in them and their weapons.

Combined Arms Corner



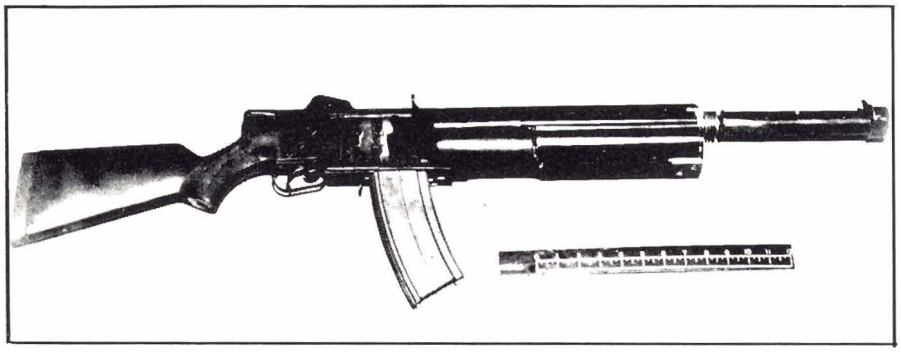
MULTISHOT AREA-FIRE GRENADE LAUNCHER

Design feasibility of a first generation prototype of a multishot area-fire grenade launcher has been demonstrated at HQ, US Army Armament Command. It is being developed as an integral part of a proposed future rifle system.

Design feasibility tests of the launcher, designed to fire a 30-mm grenade cartridge, have been successful. The launcher will give infantrymen a capability of accurate and rapid fire of grenades to ranges in excess of 500 meters. The launcher, mounted in the forestock of the rifle, is semiautomatic, with a 4-shot capacity. The launcher is fed from a tubular magazine attached alongside the barrel.

Work has started on development of a second generation prototype that will be tested extensively for reliability prior to Army evaluation of both the hardware and the multishot concepts.

The multishot capability became possible because of a reduction in the size and weight of the ammunition. The result is a 30-mm grenade.



LIGHTWEIGHT LASER DESIGNATOR

This lightweight laser designator (LWLD (AN/PAW-1)), weighing only 13 pounds, can be aimed like a rifle by infantrymen to pinpoint targets for laser-homing missiles and projectiles, or used to designate targets for airborne laser spot trackers. Starting in March the Army will begin a 6-month program at Fort Benning, Georgia, to field test the LWLD under actual operating conditions against a variety of laser seekers and laser spot trackers.

XM-1 PROTOTYPES

Chrysler Corporation XM-1 Prototype

General Motors XM-1 Prototype

Prototypes of the XM-1, the new main battle tank, were turned over to the Army in early February for testing. The XM-1 will provide a significant improvement to the Army's offensive ground combat power with improved mobility, ballistic protection, fire control, and shoot-on-the-run capabilities.

Two major contractors, Chrysler Corporation and General Motors, are competing for the contract. Although the two prototypes differ in details, they are basically of similar design. The Army will also evaluate a modified version of the German Leopard 2 tank for possible adoption.

Engineering development is expected to begin following successful completion of the prototype testing. The first tanks would roll off the assembly line in 1979. Full scale production would begin in 1980; about 3,300 tanks would be built.

The XM-1 is designed to replace the M-60 and offers many improvements over it. The XM-1 will use the same 105-mm main gun as the M-60 and M-60A1 tanks; however, a new 105-mm round will pack a new punch not found in the older tanks. The new round will provide improved accuracy and penetration and, as an added advantage, can be used in the current standard 105-mm gun.

A new shoot-on-the-run fire control system has been developed to provide accurate fire at both moving and stationary targets. Using the stabilized sight and weapon drive system, the gunner merely alines the cross hairs with the target — moving or stationary — and the system does the rest. The gunner can range on the target instantaneously with the laser rangefinder and just as quickly pull the trigger, launching an accurately aimed round.

Secondary firepower will be provided by a 40-mm high-velocity grenade launcher at the commander's station, a 7.62-mm coaxial machinegun, and a 7.62 pintle-mounted machinegun atop the loader's station.

Increased horsepower and new design concepts add up to increased speed for the XM-1. In preliminary tests, the XM-1 has traversed a cross-country course at speeds three times greater than the M-60A1. The 1,500-horsepower engine gives the XM-1 a top speed of 45 miles per hour.

Armor protection is as advanced as the firepower. Designers have given the XM-1 the increased ability to withstand the rigors of an enemy hit and continue to fight. In addition to special armor, the XM-1's fuel and ammunition are compartmentalized, providing greater protection from the secondary effects of a direct hit. The tank's lower silhouette further reduces vulnerability to a direct hit.

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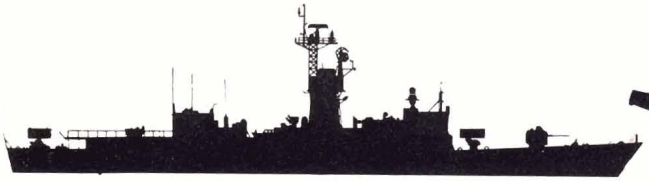
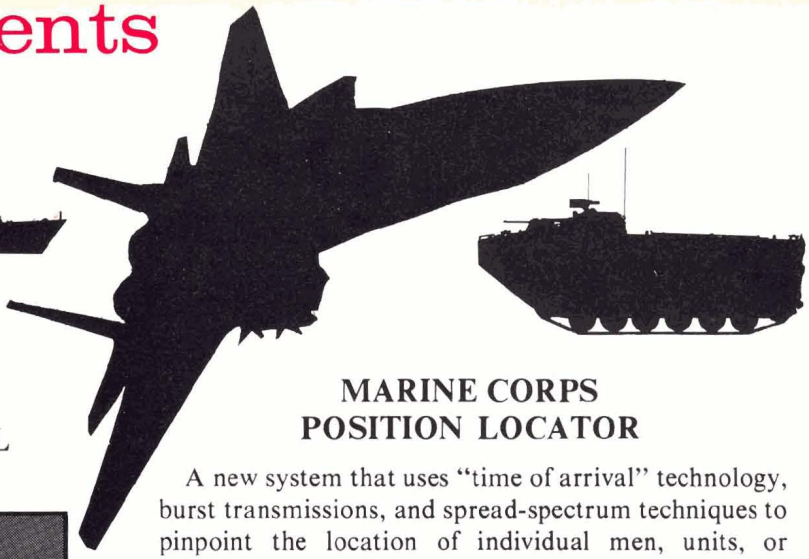
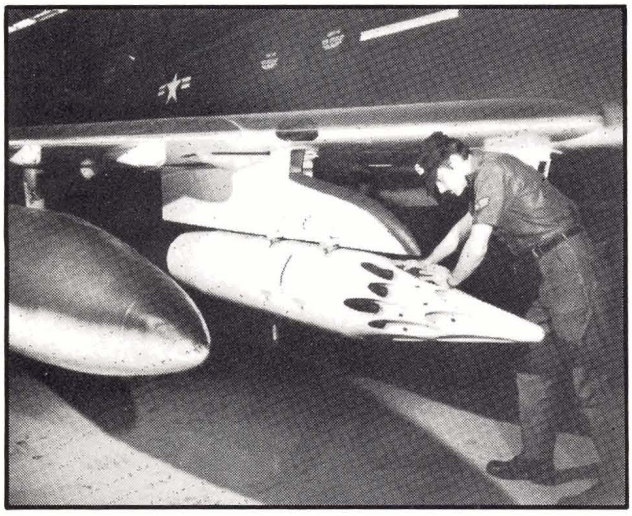




USAF TESTS EXPERIMENTAL ROCKET LAUNCHER



The first US-built experimental rocket launcher pod, designed to withstand the pounding of supersonic flight and successfully launch its ordnance, has been delivered to the Air Force.

At 229 pounds, the experimental launcher weighs less than European-designed supersonic-qualified launcher pods, yet will carry nearly 100 pounds additional payload. Extensive use of heat-and-pressure-cured epoxy fiberglass composites gives the launcher its lightness and strength. The three-section launcher houses 18 2.75-inch diameter, folding fin aircraft rockets (FFAR) with warhead weights up to 25 pounds each.

Each of the three launcher sections is removable for easy replacement and servicing. Epoxy-fiberglass bands strengthen the 82-inch nose-cone section which houses 18 extruded aluminum launch tubes bonded together with film adhesive. This aerodynamically-shaped section is covered to a constant diameter with rigid urethane foam and covered with epoxy-fiberglass skin 70-thousands of an inch thick. Mechanical detents, electrical firing contacts, and intervalometer are housed in the 16-inch middle, or base section. This section will absorb the most wear and is designed for easy replacement. An aerodynamic transition and trailing surface, also made of epoxy-fiberglass with a bayonet-type attach system, completes the launcher.

MARINE CORPS POSITION LOCATOR

A new system that uses "time of arrival" technology, burst transmissions, and spread-spectrum techniques to pinpoint the location of individual men, units, or vehicles scattered across a combat zone has been delivered to the US Marine Corps. The system — an engineering development model — is called PLRS, for Position Location Reporting System.

Each member of the force has a preassigned time slot during which his PLRS equipment automatically transmits a 100-watt burst of data in less than 1 millisecond. The computer-controlled master unit monitors the transmissions from each user unit and remotely orders certain other user units to monitor adjacent transmissions.

The PLRS provides map coordinates or range and bearing to a querying user so that a man in the field would need only a map and compass to pinpoint his location.

The PLRS master unit consists of a data link, computer, and display equipment. The unit, housed in a trailer, may be airlifted by helicopter to follow advancing troops. The master unit distributes the position, identity, and preformatted messages to tactical operations centers while continually monitoring and displaying user locations and movements in real time. The back-packed PLRS user unit weighs less than 15 pounds and can operate on a single battery for 24 hours at a time.

Patrols should never become lost on any future battlefield if this back-packed equipment goes along.

AIR DEFENSE Book Review

BODYGUARD OF LIES, by Anthony Cave Brown, Harper and Row; 821 pages; illustrated; $15.95.

National survival involves many intricately woven threads of strategy that form the bulwark necessary to fend off would-be assailants. Among these threads, and certainly one of the most important (particularly in wartime), is the functioning of the Secret Service. Here is a historical account of American and British intelligence efforts which combined to insure the success of Allied forces in the famous D-Day operation of 6 June 1944 when our troops stormed the beaches of Normandy.

The events that followed England's success early in the war in breaking Germany's secret radio communications code (code named ULTRA) provide the substance for the story.

The thrust of Allied secret service activities was to deceive the Germans, particularly as to when and where they could expect the impending main Allied landing on the continent. The intended effect of this guessing game was to force the Germans to spread their forces to cover several likely areas of attack. One actual probe or landing was carried out to bolster the deception. It was the Dieppe raid in August 1942. The Allies paid dearly for this strategem because the Germans were alert and waiting.

As the time of the actual invasion drew near, several directly related deception plans were executed. They included landing sites at the Pas de Calais, the Bay of Biscay, in the Balkins, and in southern France. Security "leaks" were fed to the Germans by secret agents to make an invasion of the Pas de Calais appear to be the main effort. This ruse was strengthened by the mention of General Patton as the commander. Also, dummy equipment, weapons, installations, and shipping were employed to add realism — even to the extent of false radio traffic. And here we see still another aspect of intelligence at work. Through ULTRA, the Allied secret services were able to intercept German messages and thus learn the effects of their attempt at deception.

The book reveals the callous and cold-blooded nature of intelligence gathering. Agents sometimes had to be sacrificed to avoid alerting the Germans to the fact that the Allies had the information necessary to decode their messages. And even though British leaders learned about the Coventry raid in advance, they had to refrain from tipping their hand by alerting the people, so important was the necessity of keeping the secret. Also, counter agents had to mix some truth with lies to the Germans to avoid coming under suspicion. As a result, the Germans were informed in advance of some Allied air attacks or other operations, as was probably the case at Dieppe.

Another way of getting false information to the Germans was through the French Resistance movement. An agent or Resistance leader would unknowingly be given false information and then was tricked into being captured. The German interrogators would "extract" the information he was carrying. In these cases, the victim had to believe the information he gave was true, otherwise, if he were to break under torture, he might nullify the scheme.

The big ruse was successful because Hitler became convinced that the main D-Day invasion was to be in the Pas de Calais. In spite of the fact that copies of field orders captured by Germans at Normandy revealed that huge forces were to land there, the Allied secret service was able to reach Hitler through counter agents in time to reconvince him that the Pas de Calais was the site of the main effort and keep him from shifting his reserves to Normandy. Otherwise, the D-Day invasion of Normandy would most likely have failed.

Because of the classified nature of all the information involved, and the steadfast reluctance of officials to cooperate, it is amazing that the author was able to even begin, much less complete, such a comprehensive work. *Bodyguard of Lies* is an exceptional study of Allied intelligence operations during World War II that vividly describes how the effort contributed to the final victory.

The Editor Comments

With the January-March issue we enter our eighth year of publication. Over the years we have continuously evaluated the magazine, seeking to insure that it is fully effective as the Air Defense Artillery professional journal. During these evaluations, the title (Air Defense Trends) came under scrutiny several times. It did not seem to "hit the mark" as a descriptive title. Emphasis was being placed on TRENDS, yet the magazine transcends merely reporting "trends" in air defense. The depth and breadth of coverage reach into all aspects of air defense, requiring an appropriately broad title. Therefore, with this inaugural issue of 1976, the emphasis is being placed more accurately and the title of your journal has been changed to *AIR DEFENSE Magazine.* Now, more than ever, *AIR DEFENSE* is your Branch periodical. With your contributions and comments, it will flourish. However, the number of articles being submitted for publication has decreased drastically during recent months. The quality of *AIR DEFENSE Magazine* will be equal to the input we receive from Air Defenders worldwide, as will its success in fulfilling its mission as the professional journal of Air Defense Artillery.

— R.C.P.