AIR DEFENSE MAGAZINE

JULY-SEPTEMBER 1976

AIR DEFENSE MAGAZINE

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AIR DEFENSE Magazine is published quarterly by the US Army Air Defense School to keep air defense personnel informed of the latest tactical, doctrinal, and technical developments in air defense worldwide, and to maintain a stimulating and mutually productive dialog between the School and units in the field, with a view toward increased efficiency in all aspects of air defense.

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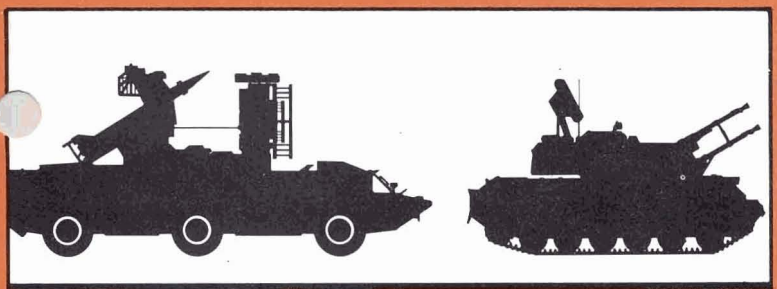
Articles and letters should be addressed to: The Editor, *AIR DEFENSE Magazine*, USAADS Box 5600, Fort Bliss, Texas 79916. Telephone numbers: AUTOVON 978-1801, Commercial 915-568-1801.

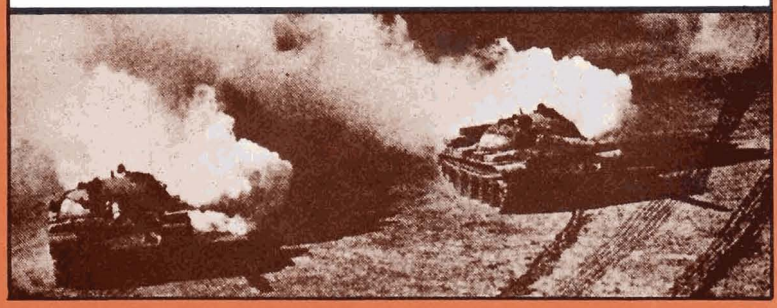
Use of funds for printing of this publication has been approved by Headquarters, Department of the Army, 23 December 1975, in accordance with AR 310-1.

Subscriptions to *AIR DEFENSE Magazine* may be obtained through the US Army Air Defense Artillery Museum Historical Association, USAADS Box 5240, Fort Bliss, Texas 79916. The rate is $4.00 per year.

Controlled Circulation postage paid at El Paso, TX.

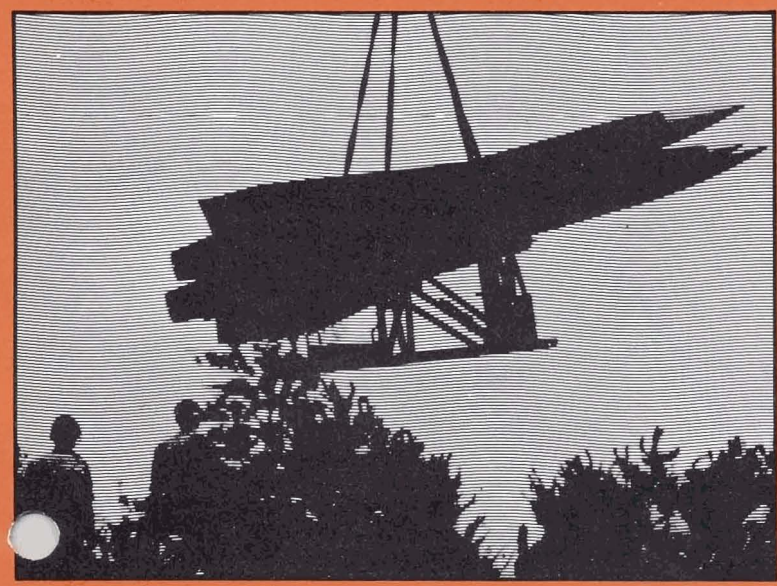
ABOUT THE COVER: The symbolic air defense umbrella on our wraparound cover depicts the mass, mix, and density of protection that the Soviets and their Warsaw Pact allies can provide for their maneuvering ground forces. The illustration spotlights our feature article, "The Ever-Expanding Umbrella," which begins on page 8.





EVER-EXPANDING UMBRELLA 8

HAWK AND THE CLAM SHELL 18



AIRMOBILITY 28

ARTICLES

DIVISIONAL AIR DEFENSE — HOW MUCH IS ENOUGH 34

PRINCIPLES AND PRACTICES OF LEADERSHIP 41

MANAGEMENT BY OBJECTIVES 48

SUKHOI SU-7B 26

HISTORY OF AIR DEFENSE 38

DEPARTMENTS

Intercept Point 2

Engagement Zone — Letters to the Editor 4

View from the Field 23

What Do You Do Now, Lieutenant? 32

Scanning 45

Enlisted Career News 51

Combined Arms Corner 54

Developments 56

Bars to Stars 58

INTERCEPT P

MAJOR GENERAL ROBERT J. LUNN

Have you ever asked yourself, "What is the Army doing to help me improve my professionalism and plan my career?" In this edition of "Intercept Point," I want to help you answer that question.

The Army's personnel management policies change frequently, with the most recent being the Enlisted Personnel Management System (EPMS). The objectives of EPMS are to:

- Provide a map to guide soldiers from grade E-1 to E-9.
- Provide continuing professional training throughout the soldier's career.
- Improve the promotion system.
- Broaden every soldier's skills, make assignments more flexible, and provide a greater challenge.

Under EPMS, changes have evolved in the Enlisted Evaluation System. One change is the substitution of the Skill Qualification Test (SQT) for the current MOS test. The SQT is so named because it will determine your ability to accomplish key tasks required to do your job.

EPMS is being implemented in five phases. Each phase contains a group of enlisted MOS. The 16-series MOS (ADA Operator MOS) are included in the first group. Soldiers holding these MOS will be given their first SQT during the period April-September 1977. The remaining four groups will be implemented at 6-month intervals. There are no ADA MOS in Groups II, III, or IV. All air defense maintenance MOS are contained in Group V (the final phase). The first SQT for these MOS are tentatively scheduled for January 1979.

On the surface, SQTs may initially appear to be similar to MOS tests; however, they are considerably different. The MOS tests usually required memorization of data that were not essential to performance of your duties. The SQTs are performance-oriented, which means the questions pertain to your daily job. SQTs are being developed from tasks selected from soldier's manuals, which are another new element introduced by EPMS. A solder's manual is being written for each MOS and will contain those critical tasks at each skill level that you must be capable of performing well.

The Skill Qualification Test may consist of three parts: a written portion, a hands-on portion, and a performance certification evaluation by your commander. Each part of the SQT is subdivided into what we call "tasks" or "scoreable units." The written portion will consist of from 30 to 50 tasks—each of which may have from 1 to 10 questions. The hands-on portion will consist of 1 to 16 "tasks," each with 1 to 20 steps. In the performance certification portion, your commander will grade you in areas such as physical fitness or arms qualification by giving you either a "go" or "no go" rating. In the supervisory grades (E-6 through E-9), there may be some SQTs without a hands-on or performance certification portion.

Two-thirds to three-fourths of the SQT will deal with the tasks of your present skill level. The other one-third or one-fourth will test your abilities in tasks from the next higher skill level. The written portion of the test will cover all of your MOS areas while the hands-on portion will evaluate only those aspects of your day-to-day duties. For example, if you're a 16P (Chaparral and Redeye), your written portion will ask questions about both missile systems; however, your hands-on portion will test you only on the system that you work with daily.

Now, let's look at how the SQTs will be scored and

what those scores mean to you. After your test is graded, you will receive one of the following:

• A "higher passing score"—this is the "cream of the crop" category. A score in this level is your key to obtaining a higher skill level and to promotion — but more on this in a minute.

• A "passing score" — this is the "satisfactory" category. A score in this level means two things—1) you verify your present skill level and 2) you are not required to take the test again for 2 years. You do not, however, qualify for award of the next higher skill level. Thus, to stay in contention for promotion, you may volunteer to retake the SQT the following year to try for that "higher passing score."

• A "failing" score — this is the "unsatisfactory" category. If you fail your SQT, you must take it again the following year. Two failures in a row constitute grounds for administrative MOS reclassification or qualitative management action.

How do skill levels and SQTs relate to promotions? You must be awarded the next higher skill level before being eligible for promotion to the next higher grade. To qualify for this higher skill level, you must have done two things: 1) obtained a "higher passing score" on the SQT and 2) completed the appropriate NCO course or performed well in an authorized slot (OJT) for the next higher grade. For example, an E-5 must attain a "higher passing score" on his SQT 3, be awarded skill level 3, *and* either perform satisfactory OJT in an E-6 slot or complete the Basic NCO Course to be eligible for promotion to E-6.

Now that you are aware of the "nuts and bolts" of the SQT program, you are probably wondering how the SQT system will operate. First, all soldiers will be issued soldier's manuals. Second, 60 days prior to the quarter in which your SQT is scheduled, you will receive an SQT notice that will outline those tasks from the soldier's manual selected for testing in the SQT. In addition, the notice will outline the components to be tested.

In the past, MOS test administration was the responsibility of the Adjutant General. Now, a different system is being established and implemented at TRADOC installations throughout CONUS. Implementation Armywide will occur in the near future. Test control officer (TCO) responsibilities will gradually be transferred from the AG to the G3/DPT. The new system has several advantages:

• SQT is a readiness indicator that will identify your individual weaknesses and how they affect you and your unit's performance. When these weaknesses are identified, the G3/DPT can schedule appropriate training.

• The hands-on portion of the SQT will require scheduling of training sites, equipment, and personnel in advance to allow sufficient time for coordination and allow you maximum preparation time.

• The system expertise is already in the G3/DPT organization.

Your challenge is to maintain a high state of proficiency in your job and to use the EPMS "road map" as a guide towards a successful career in the Air Defense Artillery.

Robert J. Lunn

ENGAGEMENT ZONE

letters to the editor

PATRIOT A MUST

Dear Sir:

I read with considerable interest MAJ Faubel's letter in the January-March 1976 issue of AIR DEFENSE. The questions he raised in the third paragraph were interesting. I was disappointed that he did not develop the answers to them. His apparent concern that an adequate air defense must be provided for the field forces is one that many of us share —it's unfortunate that many of the generalities he used to support his argument are incorrect and/or inconsistent.

As an example, MAJ Faubel states that the PATRIOT (formerly SAM-D) system was designed against a nuclear threat. This statement is untrue —PATRIOT was conceived and developed as a field force air defense system to defeat conventional air threats. At one time, there was a requirement to preserve an option to defeat a nuclear threat, but this requirement no longer exists.

The implication in MAJ Faubel's letter that Mauler was a developmental failure also requires comment. At the time of program cancellation, that system was enjoying remarkable technical success in its test program. Its demise occurred because the air defense users changed their minds and would not support the requirement for an all-weather forward area air defense system against which Mauler was then being developed. This requirement has since been resurrected and is the one which supports the current U.S. Roland program. How times (and people) have changed.

The statement that DOD has been the forerunner in funding *basic* research is probably also untrue. DOD devotes the majority of its funds to applied research and advanced and engineering development. *Basic* research has been, is, and should always be, the province of private industry and academia.

I would also note that:

• ADA Branch does not procure weapon systems. Specific ADA personnel in appropriate TRADOC assignments represent the "user" and state a requirement for new systems or modifications to existing systems. The procurement of the systems to meet these requirements is the responsibility of appropriate elements of the U.S. Army Materiel Development and Readiness Command.

• Congress did not vote against the deployment of the Safeguard system until *after* the approval of the SALT I Treaty.

• The ballistic missile defense system that we agreed not to deploy (Safeguard) was not intended to protect our population but rather to preserve our ICBM force for retaliatory purposes.

• The U.S. and the USSR have *not* renounced the use of nuclear weapons. Our training and doctrine still include their use when required. The USSR regularly conducts nuclear exercises and has given no indication of not using nuclear weapons if the use of those weapons were to their advantage. We did sign a nuclear nonproliferation treaty which says in essence that we agree that those countries not having a nuclear delivery capability should not develop one, but this is a far different thing from renouncing the *use* of nuclear weapons.

• Deployment studies repeatedly show that high skill probabilities are an essential element in determining relative cost effectiveness, other system parameters being generally equal.

• The cost of PATRIOT is *not* exorbitant. The life-cycle funding profile for this system is obviously different than for Hawk, largely because Hawk is already in the field; but in the long run, PATRIOT will provide a much greater air defense capability at *lower* total cost. The real question is, "can we afford *not* to buy and deploy this system?"

• That the preeminent role of the Air Force is controlling air defense is acknowledged. It must also be remembered, however, that the first few days (and maybe hours) of the next war will be decisive. The enemy's air defenses will obviously be intact at the beginning of this period and the ability of our Air Force to operate with impunity near the FEBA during this critical time period has yet to be conclusively demonstrated. Given the extremely limited number of first-line aircraft in the USAF relative to the Red Air inventory, it is unlikely that they will be committed to a high-risk operation at the outset. The role of the PATRIOT system during this phase will be to provide the umbrella under which our

forward air defense systems can fight and survive. Without PATRIOT, it is possible that Red Air can overfly our forward systems protected from our Air Force by their long-range SAM systems and strike our vital areas a crippling blow. The presence of PATRIOT is justified if the system does no more than force the attacker to operate at altitudes where our short-range and manportable systems are most effective.

• The increasing threat posed by air-launched guided missiles and automated electronic warfare systems mentioned in the last paragraph of MAJ Faubel's letter is exactly the threat against which PATRIOT is designed and against which none of our current systems or those to be available in the reasonably near-term perform nearly so well.

I agree completely that periodic reviews of air defense requirements are in order. It is the responsibility of the air defense user to determine the capability required, state a requirement for that capability, and defend the requirement as long as it is valid. Mechanisms already exist for prioritizing the various weaponry requirements submitted for consideration in allocating acquisition funds. PATRIOT has recently been subjected to the most intense scrutiny. This review procedure could effect and the inescapable conclusion reached by well-informed decision-makers was that PATRIOT is essential to the effective defense of the field forces. The resounding answer to the question I posed in my sixth comment was, "We simply cannot afford *not* to have PATRIOT."

W. M. LEWIS, JR.
LTC, ADA
Redstone Arsenal, AL

MORE PATRIOT SUPPORT

Dear Sir:

In the January-March 1976 issue of AIR DEFENSE, MAJ Gordon J. Faubel, USMAAG to Iran, made several observations concerning ADA requirements and the PATRIOT system (formerly SAM-D) which need to be put into perspective.

MAJ Faubel implies that PATRIOT exceeds the requirements for an air defense weapon system and states that, "ADA and the Army cannot afford SAM-D (PATRIOT) because of the sacrifices that will be required in other areas."

Although MAJ Fabel's opinions are well taken, analyses of DOD and Army air defense studies conducted since the early 1960's do not support those opinions. There were no fewer than six major air defense studies conducted between 1960 and 1964 which concluded that Nike Hercules and Hawk were unable to counter the threat and that the Army required a new technology air defense system to counter that threat. In 1965, system concept/trade-off studies were conducted which determined that a system like PATRIOT would meet the Army's requirement.

Since 1965, there has been at least one major air defense study conducted each year which has scrutinized the cost and operational effectiveness, performance characteristics, technical risk, and/or trade-offs associated with the PATRIOT system. The major conclusions of each of these studies have supported the PATRIOT effort. In fact, all studies conducted to date indicate that PATRIOT is the most cost effective solution to the HIMAD requirement for the 1980's and beyond time frame.

Throughout the PATRIOT program, there has been a vigorous and continuing effort to identify and evaluate alternative system designs that offered better operational effectiveness at lower costs. While this is a normal part of weapon systems management during development, the effort has been much more intense in PATRIOT's case because of PATRIOT's high visibility in terms of requirements and costs.

So, contrary to MAJ Faubel's belief, Army air defense requirements *are* being reviewed, not only by the Army, but by DOD and Congress. In spite of severe cost constraints and an ever increasing threat, imagination and innovative approaches *are* being applied and some very difficult decisions *have* been and *are* being made, resulting in the fact that the PATRIOT system continues to receive full support from DOD and the Army.

The sacrifice that MAJ Faubel is unwilling to make now may well be infinitesimal compared to the sacrifices we would make on a modern battlefield with an air defense comprised of deficient weapon systems in the out year time frame.

EDMUND L. VAN DERVORT
LTC, ADA
Chief, Applications Div
Military Applications Dir
PATRIOT Project Office

M42A1?

Dear Sir,

I would like to bring to your attention the article and photo of the Duster on page 27 of the AIR DEFENSE Magazine for April-June, 1976. The article ("Instant Replay") wrongly describes the weapon in the photo as an M42A1. It is in fact an M19 from WW II and the Korean conflict.

The M42A1 (which I commanded a section of in Vietnam) was mounted on an M41 reconnaissance tank chassis. The trailer, which was "miraculously" hooked to the M19/M42, was organic by TOE to that vehicle.

JOSE A. (Duster) GARCIA
SFC, Senior Instructor
A Btry, 4th Tng Bn, 1st ADATB
Fort Bliss, TX 79916

A NEW COMBINED ARMS TEAM SYMBOL

Dear Sir:

For years the triangle △ has symbolized the infantry, armor, artillery combined arms team. Each side represents one of the traditional combat arms. Inclusion of air defense as an essential member of the combined arms team necessitates replacing or redefining the symbol to retain accuracy. So what symbol should we use?

The addition of a fourth leg to construct a square □ is a logical extension. Other rectangular shapes can be excluded because the longer sides might imply greater importance, and the combined arms team requires that the combat elements be represented equally.

The diamond ◇ retains the balanced quartic features of the square. But even though "square" is no longer current slang for old-fashioned or unsophisticated, this meaning has been immortalized by Webster. Old-fashioned or unsophisticated is hardly an appropriate connotation for the new combined arms team. The more favorable connotations associated with the diamond and the fact that it has effectively the same geometric characteristics as the square encourages selection of this alternative.

Unfortunately, neither the diamond nor the square is as good a symbol as the triangle was. Each leg was connected to the other emphasizing the direct dependence of each branch on the other. A cross + could indicate the individual characteristics of each combat arm while retaining the visual reminder of common dependency.

The three-dimensional tetrahedron △ demonstrates the added complexity of the battlefield. Symbolism is shifted to the four vertices, but a two-dimensional representation of the tetrahedron is the triangle, thus the basic combat arms concept is reinforced. i.e., each of the combat arms would view the plane of support of the other three. Its own uniqueness and independence would be emphasized by the dimensional separation and the interdependence by the necessity of having all four to complete the figure.

The symbol selected to represent today's combined arms team is important. Though the speed of change may add a fifth member, delete a current member, or otherwise change the combined arms team concept, the time seems right for making the combined arms team symbol four-sided.

PHILLIP W. SISSON
CPT, ADA

TACS

Dear Sir:

I am currently filling the position of Ground Liaison Officer to the 507th Tactical Air Control Group, which of course is responsible for the tactical air control system (TACS) for the Ninth Air Force.

As you know, ADA and the TACS are closely associated. I recently had the opportunity of reviewing your magazine. It was quite obvious to me that the contents of your magazine were appropriate for perusal by Air Force personnel here in TACS. Because of this, I would like to request that I be placed on your mailing list.

MICHAEL J. CULLOTY
CPT, Infantry
Ground Liaison Officer

Consider it done! The 507th is now on our mailing list. – Ed.

INDEX TO AIR DEFENSE MAGAZINE

Beginning with the January-March 1976 issue, AIR DEFENSE Magazine will be indexed in the *Air University Library Index to Military Periodicals*. The *Index* may be obtained from the Air University Library, Maxwell Air Force Base, Alabama 36112. — Ed.

SOVIET AIR DEFENSE WEAPONS POSTER

Dear Sir:

Whilst visiting the 570th US Army Artillery Group with whom we operate, I much admired the Soviet Air Defense Weapons poster issued with your October-December 1975 issue of Air Defense Trends. This is an outstandingly good poster and the only one of its type I have seen.

If it would be at all possible, I was wondering whether there would be any chance of obtaining a few copies of this excellent poster. I am required to teach Soviet Weapons Identification to the Royal Scots and if you could spare 6 copies, this would be ideal as well as very generous. If this is greedy then even one would be much appreciated.

C.D.M. RITCHIE
Major, The Royal Scots
1st Battalion
The Royal Scots
(The Royal Regiment)
Oxford Barracks

Your six Soviet Air Defense Weapons posters are on the way to you. We're glad to hear that they will help in your Soviet Weapons Identification program. Best regards to the Royal Scots from the staff of AIR DEFENSE.

Dear Sir:

We request that you furnish two copies of the Soviet Air Defense Weapons poster which appeared in your October-December 1975 issue.

We would like to examine the poster for possible use in our intelligence training program.

It would also be appreciated if you would inform this office of the present status of reproduction of the poster by TRADOC as a graphic training aid (GTA).

HARRISON M. PHILLIPS
GS-11
Intelligence Ops Specialist
Foreign Intelligence & Plans
Division, ODCSI
USA Forces Command

Requests similar to Mr. Phillips' letter (above) continue to come in at a steady pace. Since the early months of this year, we have filled hundreds of requests for a total of over 2,500 extra copies of the poster. It has been very gratifying to hear from not only numerous Army units and agencies but from Air Force, Navy, Marine, and Allied nation offices as well.

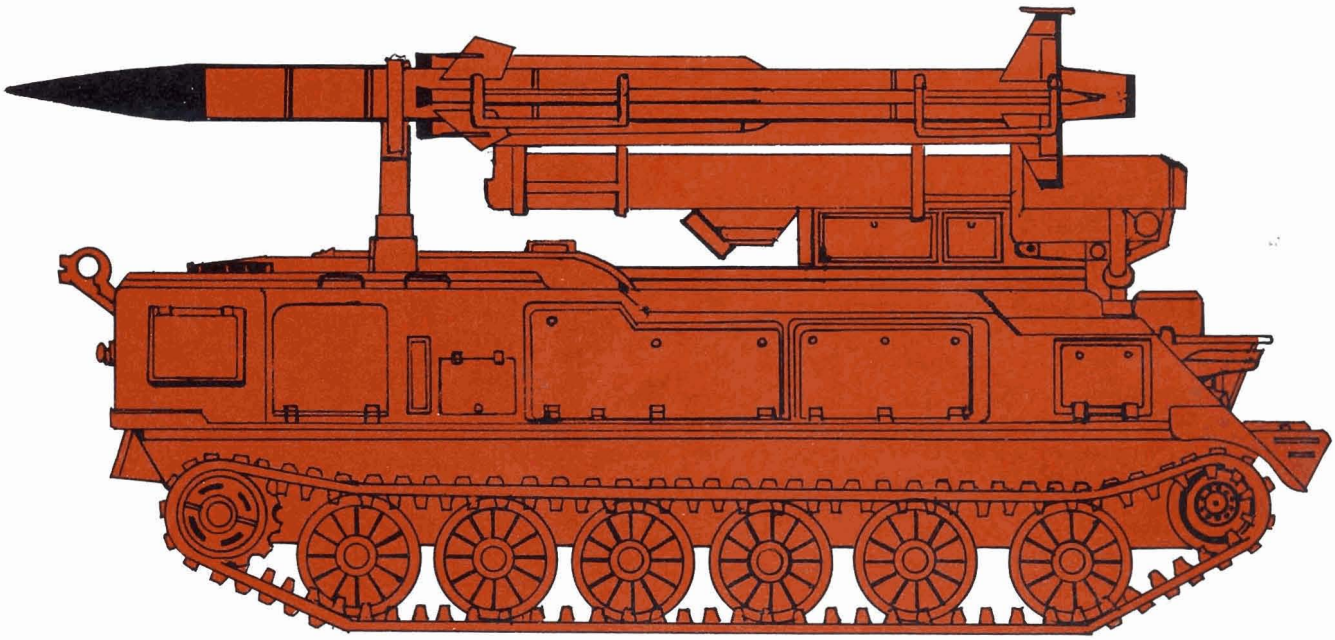
On 2 September 1976, DA and TRADOC approved the reproduction of the Soviet Air Defense Weapons poster as Graphic Training Aid (GTA) 44-2-4. TRADOC is now soliciting the Basis of Issue (BOI) for the poster from the field. After the BOI has been established, the poster will be forwarded to the Adjutant General for processing.

We will continue to fill requests for the poster until our supply is exhausted or until GTA 44-2-4 is being distributed by DA.

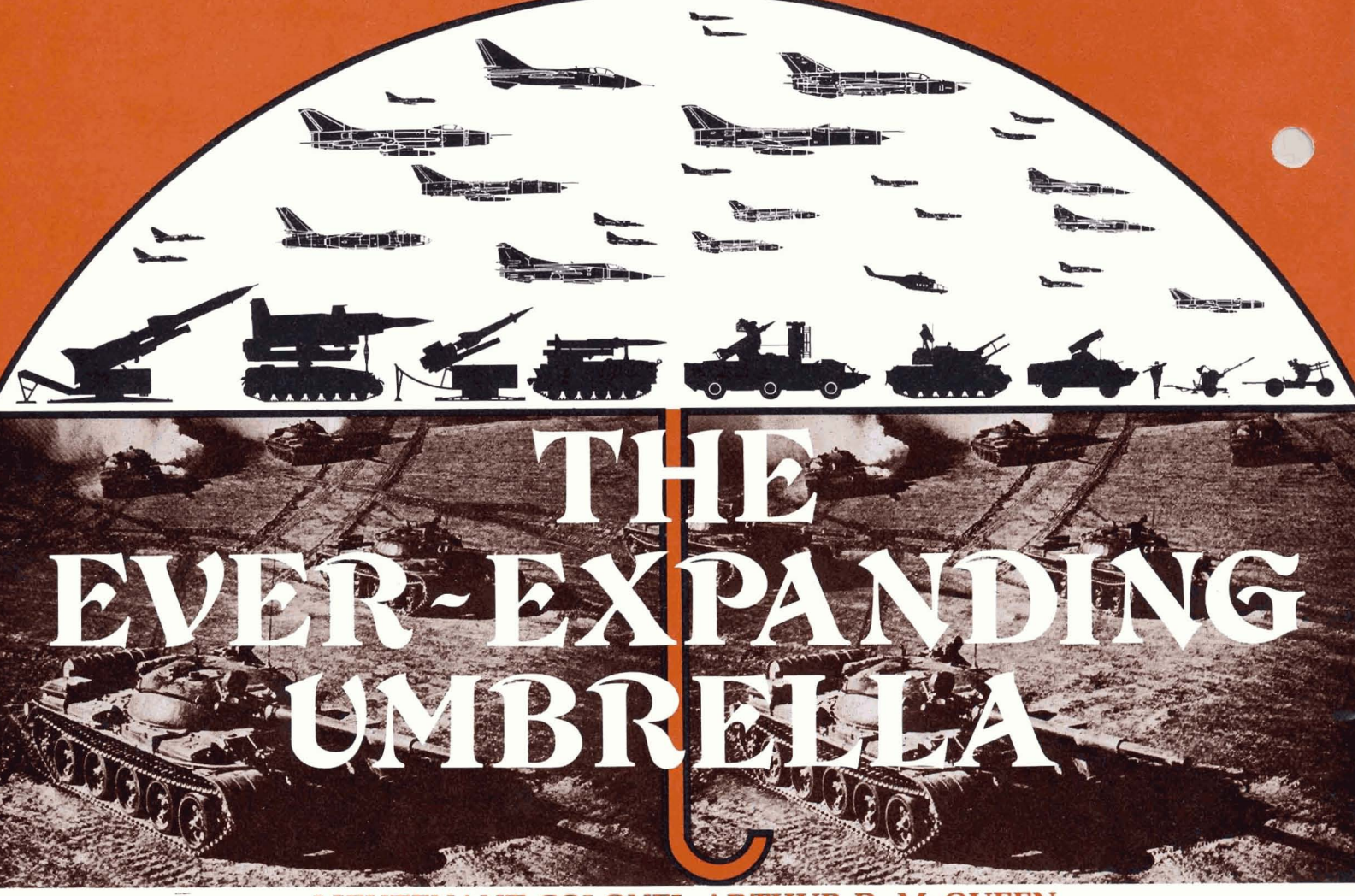
Several additions and corrections, based on newly-acquired information, will appear on GTA 44-2-4 when it is published by DA. The changes are provided here to enable you to update the posters which are currently in the field.

- *SA-9 MISSILE SYSTEM. The second sentence will read: "The GASKIN missile has a slant range of approximately 7 kilometers and has an altitude capability of about 15,000 feet."*
- *S-60. The following sentence will be added: "Normally, six S-60 guns with associated fire control equipment constitute a battery."*
- *SA-6 MISSILE SYSTEM. The illustration below is reproduced according to the poster scale (1" = 3.33')* and will be used on GTA 44-2-4. This SA-6 GAINFUL has been adjusted to show the correct positioning of the missile erector on the vehicle.*

**As an extra note, the scale 1" = 3.33' was selected for a reason. If 1" equals 3.33' —then 6" equals approximately 20'. Therefore, a dollar bill can be used as a handy 6" (20') reference scale for comparison purposes.* *– Ed.*



SA-6 MISSILE SYSTEM "GAINFUL"



THE EVER-EXPANDING UMBRELLA

LIEUTENANT COLONEL ARTHUR D. McQUEEN

"No modern army can expect to win in battle unless its maneuver forces operate under a cohesive, extensive, and mobile umbrella of modern air defense."

— FM 100-5 OPERATIONS.

This article points up some recent trends in tactical air support and tactical air defense for Soviet ground forces. Data and opinions presented are those of the author; are derived from the author's studies in the open literature; and in no way imply endorsement by the Department of the Army or the Department of Defense.

Of all the Twentieth Century's contributions to warfare, none has had the impact of the combat aircraft, except possibly nuclear energy. The airplane brought an entirely new dimension to warfare which had historically been restricted to sea and land.

Fully cognizant of the airplane's role in any future combat, no nation in the world in recent years has invested more effort and resources in the development and deployment of military aircraft than the Soviet Union. For example, while the United States was involved in the Vietnam conflict, the Soviets produced 37 prototype aircraft and four new operational types. One result is that the fastest, highest flying, operational, and deployed fighter-interceptor aircraft in the world today are flown by the Russians.

The Soviet tactical air defense capabilities can be envisioned as a protective umbrella covering Soviet ground forces from hostile air attacks (missiles or airplanes). Tactical air fighter-interceptor support can be viewed as a part of the umbrella covering the entire combat area, friendly and enemy, and many of these (such as the Su-19 and MiG-23) also incorporate an offensive air assault capability just as US Air Force fighters do. The remainder of tactical air support has several facets, including tactical air-assault craft in the form of helicopters, high-performance jet aircraft and some prop-driven aircraft, medium- and long-range bombers, and a logistics and troop air transport capability. Here, we will concern ourselves primarily with the Soviet tactical air assault support to ground forces capability and, secondarily, with air defense fighter-interceptor capability.

Some Discernible Characteristics

Several characteristics should be kept in mind when reviewing recent trends in close air support and air defense of Soviet ground forces. Among these are the integrated or combined nature of tactical air support-tactical air defense forces, the rapidly developing field of electronic warfare, the

retention of older or obsolete systems in the available inventory, the apparent "offensive" orientation of Soviet military doctrine, and the diversified nature of Soviet capabilities.

Unlike the US military, where tactical air support and air defense are a coordinated effort involving Army, Air Force, and sometimes Naval and Marine Corps elements under separate commands, in the Soviet tactical organization it is a fully integrated or combined effort. That is, in the Soviet groups of forces or combat fronts (equivalent to US World War II Army groups) the commanders "dispose of operational command over the 'tactical air armies' assigned to them." These tactical air armies include high-performance jet aircraft as well as tactical and medium-range bombers. In essence, then, the Soviet front commander (ground forces) commands and operationally controls all air defense forces and tactical air forces functioning within his area of operations. The Soviets apparently feel this simplifies the liaison and coordination aspects of air and air defense activity in the combat zone and makes everything responsive to one responsible commander.

Since its birth in World War II, electronic warfare (EW) has also added an entirely new dimension to combat. This form of combat "wizardry" has expanded in recent years even farther with the advent of infrared technology and electro-optics with the laser beam. The Soviet Union is not only staying abreast of but in some cases may even be pacing the rest of the world in "wizard warfare."

The Soviets are well aware of the state of American electronics technology, and indeed much of the Soviet capability apparently evolved from demonstrated and well-publicized American technology. Soviet systems were to some degree exposed to American capability in Vietnam and the 1973 Arab-Israeli War, just as American systems were to some degree exposed to the Soviet capability. It is like a game of "tit-for-tat" one-upmanship which neither side dares lose. In the following discussion of various Soviet weapon systems, some of the thus far publicized electronics, EW, and ECM aspects associated with specific systems will be included.

The Soviets have retained many older and obsolete weapon systems in the usable inventory, though not necessarily always with active Red Army units. As long as a system has utility for combat, it will not be scrapped simply due to obsolescence. In many cases, when replaced in the active Red Army, older equipment is transferred to Soviet reserve elements or sold or otherwise passed on to Warsaw Pact or other Allies. The problem this creates for any force opposing the Red Army or other Soviet-equipped forces in combat is that not only newly-developed systems must be defended against, but most of the previous systems as well. As pertains to the highly technical area of electronic warfare, vis-a-vis the Soviet air defense system, the impact was described by US Air Force Brigadier General Theodore S. Coberly as follows:

"The Soviet air defense system becomes more extensive and redundant every year. They often retain older equipment, and thus have an enormous number of radars of different kinds and frequencies, all working together for mutual support. For example, there is every indication that their early warning and acquisition radars are netted with fire control radars. You can't attack that kind of system piecemeal. You have to think about it as a system."

The Soviets are strongly offense-oriented, and generally, the rather ambitious roles that air defense forces and tactical air support forces will play in the offensive are set forth as follows:

"The basic missions of the grouping of PVO (air defense forces) means consist of covering the main grouping of troops, reserves, and control points. The increased capabilities of air defense means facilitate the successful conduct of the attack at high rates and to a great depth."

"Antiaircraft (forces) move right in the combat formations of the battalions behind the attacking (forces) and destroy the air enemy by firing from the march or from short halts."

". . . aviation can accomplish a wide span of missions. The most important of them is the destruction of the enemy's means of nuclear attack . . . an extremely important mission for air support remains the destruction of enemy weapons and personnel which are directly hindering the advance . . . Aviation will also accomplish such missions as destruction of control points, reserves, and radio technical means, and will also be used for the conduct of aerial reconnaissance and to cover the troops."

The war the Soviets are equipped to fight in Europe is not at all unlike German "Operation Sichelschnitt" in World War II which rapidly sealed the fate of France in just 10 days. As history subsequently revealed, the Nazis failed to adequately prepare for what was to follow the defeat of France by building a depth or diversity of capability; for while the offensive tactical support capability of the Luftwaffe proved ideal in the lightning defeat of France, it would later lose the battle of Britain. That the Soviets do not intend to fall into this trap of limited depth and lack of diversified capability is apparent in the nature of their present and on-going arms buildup (which has been going on since the mid-1960's). They have developed and deployed long-range intercontinental, medium- and short-range ballistic and cruise missiles; strategic air defense forces boasting over 10,000 surface-to-air antiaircraft and antimissile missiles, highly modern and sophisticated fighter-interceptors, reconnaissance aircraft, and the area we will concentrate on here, close tactical air support aircraft and tactical air defense weaponry.

With these characteristics in mind, let's look at some of the recently developed specific Soviet

weapon systems to be engaged in tactical air assault and air defense of tactical ground forces.

Tactical Air Support to Ground Forces

Some insight indicating the level of achievement and capability of the Soviets can be gained by looking at a few recently deployed air weapon systems. We'll review briefly the ground assault version of a high-performance aircraft (the world's fastest interceptor) and its reconnaissance variant; the new supersonic bomber, which even now appears to be posing some problems in the Strategic Arms Limitations Talks (SALT-II) between the USSR and the United States; and a Soviet assault helicopter gunship.

One entry in the Soviet tactical air support line-up is a version of a variable-geometry (VG) high-performance jet aircraft, the MiG-23 "FLOGGER-D." This ground attack variant has a speed of about Mach 1.7 and can fly at a ceiling of about 30,000 feet. Its armaments include bombs and rockets and the plane has an estimated operational radius of about 750 nautical miles. The MiG-23 has been deployed with the Soviet 16th Air Army fighter-bomber regiment at Kolobrzeg, Poland, on the Baltic Coast for potential use by Warsaw Pact forces facing NATO. There are an estimated 400 MiG-23's (all variants) already deployed.

The MiG-25, which we earlier identified as the world's fastest operational combat aircraft, is deployed in two twin-engine variants, a high-altitude fighter-interceptor (FOXBAT-A) and a photo-reconnaissance version (FOXBAT-B). FOXBAT-A has speeds up to Mach 2.8 to 3+ and FOXBAT-B up to Mach 2.3. Both can fly at altitudes of 80,000 feet. Combat range of FOXBAT-A is about 700 nautical miles, while FOXBAT-B is apparently greater due to lighter weight. The Soviets have deployed about 100 MiG-25's thus far.

The weapon system deployed on the FOXBAT-A consists of radars and four air-to-air AA-6 ACRID missiles (see Fig. 1). The air-intercept radar fitted on the FOXBAT-A is believed to be the "FOXFIRE." Each of the two wingtip pods are assumed to contain continuous wave (CW) illuminating radars for the AA-6 missiles. The radars can detect targets out to about 80 to 100 kilometers (km) and track targets to about 50 km. The AA-6 is mounted in two variants, one with semiactive radar homing and one with infrared (IR) homing, both with a warhead weighing about 200 pounds. Missile speed is about Mach 2.2 above that of the launch aircraft. Missile range is dictated by the seeker head, believed to be about 45 km for the semiactive radar version and about 20 km for the IR version. Common Soviet AAM firing tactics call for ripple firing two missiles at the same target at about a 1-second interval, the first being IR and the second radar-guided.

MiG-25 "FOXBAT"

In early 1974, the first production models of a new supersonic bomber ("BACKFIRE") were delivered to the Soviet Long-Range Air Force. US weapons experts hold that it certainly has strategic delivery capabilities.

The BACKFIRE is a twin-engine bomber with a crew of three. Its maximum speed is about Mach 0.9 at sea level and Mach 2 at altitudes above 40,000 feet. Service ceiling is about 59,000 feet. Combat radius at high altitude is about 6,000 km and with inflight refueling is about 8,700 km. Combat radius at lower altitudes is about 2,500 km. Armament includes a tail-mounted 37-mm cannon and two air-to-surface AS-6 missiles or fifteen 500 kilogram (kg) bombs in its bomb bay. The several radars associated with the BACKFIRE include a terrain-

following radar (type unknown), a bombing/navigational radar (the DOWN BEAT), a fire-control radar for the tail-mounted cannon (the FAN TAIL), an IFF (identification, friend-or-foe (the SRZO-2)), and a radar warning device (the SIRENA-3).

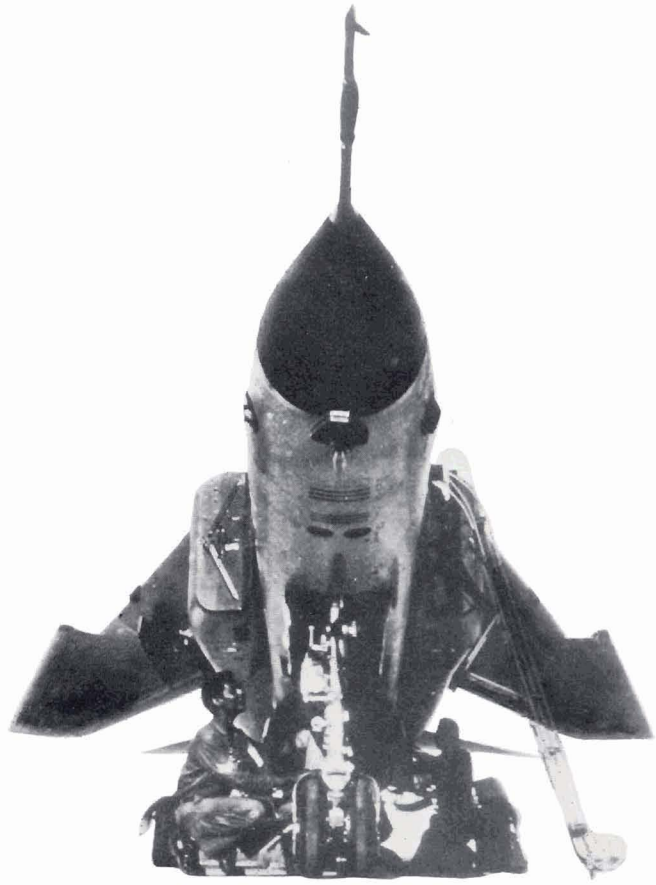
The AS-6 missile developed for the BACKFIRE is an impressive element of this weapon system. It appears to be an upgraded version of the AS-4 KITCHEN, principal armament on the Tu-22 BLINDER-B bomber. The AS-6 has a maximum range of about 250 km at sea level or 800 km at high-altitude/high-speed launch. Its maximum speed at high altitude is about Mach 2.5 above aircraft launch speed. Nuclear warhead weight is about 350 kg of the missile's 4,800 kg total launch weight. The missile has a solid-fuel rocket motor and inertial guidance system with a radar homing head in the terminal phase.

The EW systems on the BACKFIRE are also extensive, including numerous passive defensive features, together with active deception and jamming equipment and droppable electronic and infrared countermeasures.

In summary, the BACKFIRE is a sophisticated aircraft and represents a substantial step forward for the Soviets. A very important point to keep in mind is that the BACKFIRE is tested, deployed, and operational, while the US counterpart, the B-1, is only in prototype.

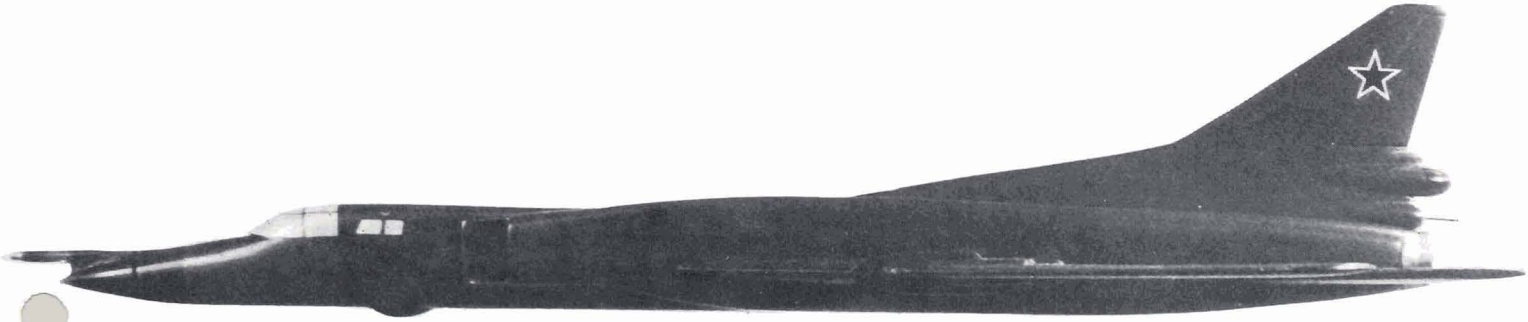
The helicopter assault-gunship came into its own with the US Army during the 1960's in Vietnam. Prior to that time, armaments had been added to helicopters, but in Vietnam the helicopter reached the stage of becoming a weapon system within itself. And it proved to be quite effective in that type of warfare. This, too, was a technology and history lesson not lost on the Soviet Union.

The Soviets began arming helicopters with weapons on a large scale. This included arming older and in some cases obsolete types such as the Mi-1 HARE, the Mi-2 HOPLITE, the Mi-4 HOUND, and the Mi-8 HIP with weapons such as 57-mm rocket pods and wire-guided antitank missiles such as the SAGGER. One novel use of helicopters was the dropping of up to 550-pound bombs from an altitude of about 328 feet. This improvisation stage lasted until about 1970. Experimentation with a new type combat helicopter was noted in 1971, and by Spring 1973 the first units with this new helicopter (the Mi-24 HIND-A) were being deployed with the Group of Soviet Forces, Germany (GSFG). Since that time, the gap between Soviet and Western technology in this field has significantly narrowed.



MiG-23 "FLOGGER"

The HIND-A has a three-man crew of pilot, copilot, and gunner and is powered by two shaft-turbine engines. Maximum speed is about 310 km per hour and maximum combat radius is about 360 km (with maximum payload lessened to about 90 km). Radar and fire control systems include a forward radar (not further identified), an IFF (SRO-2M), a command guidance transmitter for AT-2 SWATTER antitank missiles, and possibly an optronic or laser RF (range finding) system. Armor appears to include a steel plate on the front frame, the front canopy of bulletproof perspex, and armor protection for the main fuel tank.



Aviation Week & Space Technology

TUPOLEV "BACKFIRE"

HIND-A ATTACK HELICOPTER

Armament on the HIND-A includes a heavy 12.7-mm machinegun mounted in the nose, believed to have a 250-round magazine primarily for engaging ground targets. The remaining weapons are mounted on the 7.40-meter wing stugs, each of which is fitted with three weapon pylons. Each wingtip has a double guide rail for mounting radio-command SWATTER AT missiles. Wireguided SAGGERS can perhaps be substituted. From published photographs, the most common weapons carried are UB-32 rocket pods (each carrying 32 S-5 type 57-mm unguided rockets) on each side. Based on electronic equipment carried, it is felt the AS-7 KERRY can also be mounted (see Fig. 1). There would appear to be no problem in substituting any of the following weapons: unguided AS missiles such as the S-16 (160-mm), the S-21 (210-mm), or the S-24 (240-mm). Apparently, gun pods can also be fitted to the mounts, such as the GSch 23-mm twin-cannon pod found on the MiG-21 aircraft. And, of course, there is the capability for carrying conventional bombs up to the 250 kg (550 lbs) bombs carried by the older armed helicopters.

One important role for the HIND-A to play, based on weapons carried and firepower capacity, appears to be that of a tank-killer. At least 100 Mi-24 HIND-A's are already deployed with Soviet combat forces and the number is increasing steadily. The Soviets are now believed to have under development a new attack helicopter mounting antitank air-to-surface (AS) missiles and a 23-mm gun.

The momentum of Soviet tactical air deployment is indicated by a report that Soviet tactical air power in the European theater has increased by some 40 percent since the invasion of Czechoslovakia in 1968. Apparently, such deployments will continue and possibly increase as industrial and technological capacity increases.

Tactical Air Defense — The AAA and SAM Umbrella

Let's turn now to the ground weapons that make up a large and important part of the protective tactical air defense umbrella which moves right along with Soviet ground forces. These can be generally grouped into two categories, antiaircraft artillery (AAA), including antiaircraft machineguns (AAMG), and surface-to-air missiles (SAM).

Sprinkled throughout Soviet ground force units are numerous antiaircraft machineguns and artillery in a wide range of sizes (from 7.62-mm to 130-mm). These systems vary in number of guns/barrels per mount from one to four. The cannons have ranges from a low of 3,700 meters vertical range to 29,000 meters horizontal range.

The Soviets have long had self-propelled AA weapon systems with their great mobility advantage on a rapidly changing battlefield, particularly in a fast-moving offensive. A late entry in this area is the ZSU-23-4, a quad-mounted 23-mm automatic AA machinegun system on a tracked chassis. This system has its own self-contained target acquisition and tracking radar (the GUN DISH) to which the guns can be slaved for deadly accurate firing through an on-board fire control computer. This system appears to be replacing the older AA SP-systems, the ZSU-57-2 and the twin 14.5-mm heavy machinegun system. The ZSU-23-4 is currently being used in an integrated tactical air defense system with SA missiles, specifically the SA-9.

SOVIET AIR-LAUNCHED MISSILES*

AIR-TO-AIR (AA)

DESIG-NATION	NATO CODENAME	RANGE (Miles)	REMARKS
AA-1	ALKALI	3-4	All-weather, Speed between Mach 1 & 2, Believed radar guided, on MiG-17, MiG-19 and Su-9.
AA-2	ATOLL	3-4	IR homing, HE warhead, on MiG-21.
AA-3	ANAB	12	IR and radar versions reported, On Yak-28 and Su-9.
AA-5	ASH	14	On Tu-28P
AA-6	ACRID	22.5	On MiG-25, see text.
AA-7	APEX	17.2	On MiG-23
AA-8	APHID	3-4	On MiG-23 NOTE: All Soviet AAMs are solid-fuel.

AIR-TO-SURFACE (AS)

DESIG-NATION	NATO CODENAME	RANGE (Miles)	REMARKS
AS-1	KENNEL	63	Turbojet, Speed Mach 0.9, anti-shipping.
AS-2	KIPPER	100	Turbojet, radar-guided, Speech Mach 1.4
AS-3	KANGAROO	400+	Turbojet, Speed Mach 2, swept-wing, on Tu-95
AS-4	KITCHEN	185	Inertial guidance, on Tu-22
AS-5	KELT	100	Winged, on Badger, replacing AS-1
AS-6	———	250/800	On Backfire, See text
AS-7	KERRY	———	For close air support, on Su-7 and Su-20
AS-?	———	6	Anti-tank, on HIND-A, R&D(?)

*DATA SOURCES: "USSR Missiles," *Aviation Week and Space Technology*, March 15, 1976, p. 91, also dimensions and other specific data at this source. See also, *Jane's Weapon Systems 1974-75*, p. 153; and *Jane's All The World's Aircraft 1975-76*, pp. 639-40, for data on AS-7. See *International Defense Review*, October 1975, p. 641 for data on AS-6.

FIGURE 1

To enhance the effectiveness of these diversified AA guns, the Soviets have developed fire control radars (such as the SON-9 and SON-9A), range finders (the D-49), AA fire control directors (the PUAZO-6 and 12), early warning radars (the P-12 and P-15), and optical ground fire sighting devices. Several of these radar systems are also associated with and support SAM's. The P-12 SPOON REST long-range early warning radar is a VHF radar functioning between 147 MHz and 161 MHz, with a range of about 270 km. This radar can track up to six different hostile aircraft simultaneously and launch one or two SA-3 GOA missiles at each. It has a vertical beam width of 2½° and a horizontal beam width of 1°. The system is transported on two vehicles, generators with console in one and antenna on the other. The P-15 FLAT FACE is a GCI (ground control interception) radar in the UHF band between 810 and 850 MHz and 880 to 950 MHz with a 250 km range. It has a vertical beam width of 5° and horizontal beam width of 2° with an accuracy to about 100 meters. This system is fully contained on one vehicle. The P-50 BAR LOCK is an interesting GCI radar that operates on six different frequencies in the S-Band. It has a 300-km range with an accuracy to about 100 meters and 0.5°, is trailer-mounted, and rotates at up to 12 revolutions per minute (rpm).

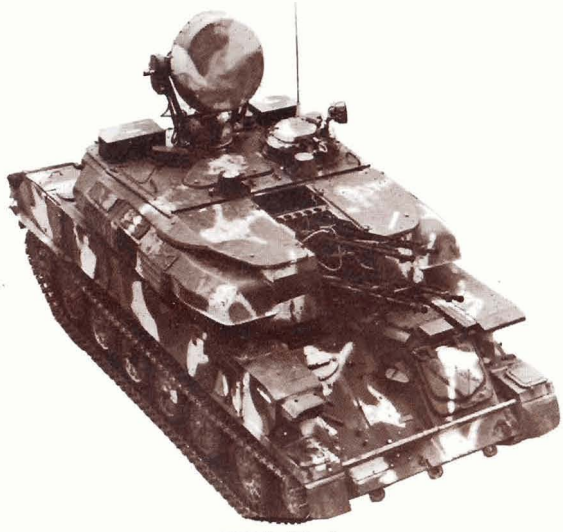
ZPU-4

Air Defense Missilery

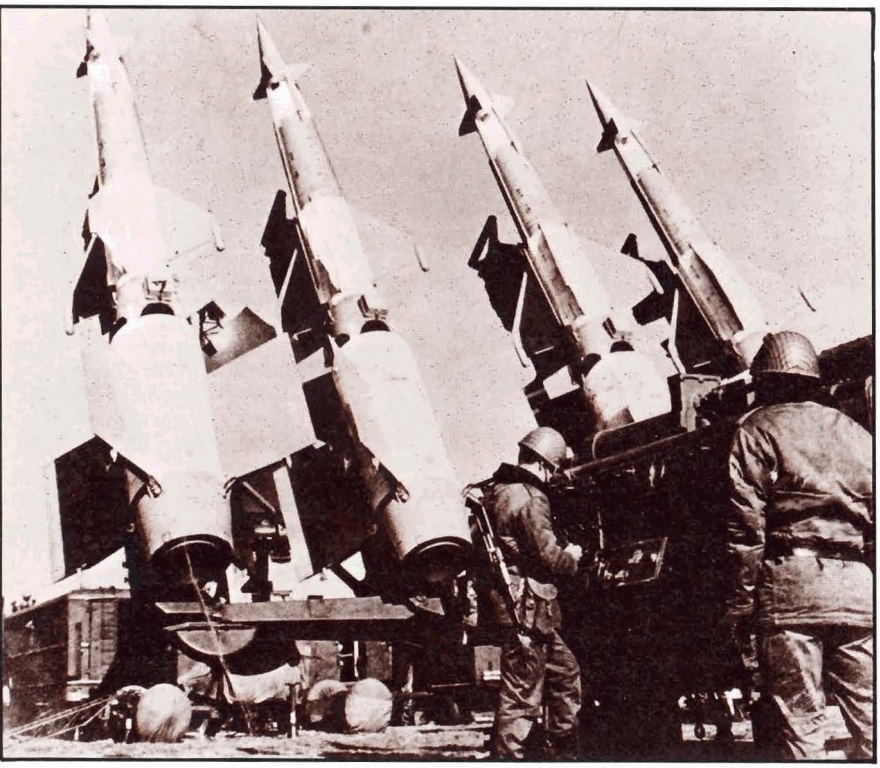
An area in which the Soviets have shown much progress is in surface-to-air AA missiles (SAM). Beginning with the SA-1 GUILD, first shown publicly in 1960 and now presumed obsolete, they have progressed to the SA-9 GASKIN, shown publicly in November 1975. Some of these SAM's have been around for several years and are quite familiar, such as the SA-2 GUIDELINE, the SA-3 GOA, and the SA-4 GANEF, so we will only briefly discuss them here. We'll concentrate on the new Soviet entries in the SAM field, those appearing for the first time in the late 1960's and thus far in the 1970's.

First, briefly the older SAM's and their attendant radars:

- The SA-2 GUIDELINE is a medium-range SAM which has been exported to Warsaw Pact members in large numbers. It is land-mobile on a Zil-157 cross-country semitrailer transporter-erector. Missile guidance is by radio. The missiles, about 130 kg in weight, carry a high-explosive (HE) warhead and



ZSU-23-4



SA-3 "GOA"

have a slant range of about 40 to 50 km. The radar associated with the SA-2 is the FAN SONG. The earlier variants of this radar (A through D) were encountered and for the most part effectively defeated by the US Air Force and Navy over North Vietnam. The current variant is the FAN SONG-E with a range of about 75 to 150 km. This radar operates in the C-Band from 4,910 to 4,990 MHz and 5,010 to 5,090 MHz with a peak power of 1.5 MW. It has a vertical beam width of 7.5° and horizontal beam width of 1.5°. The Soviets have added to this radar system a new ECCM (electronic counter countermeasures) feature, the lobe-on-receiver-only (LORO). A limitation of the FAN SONG is the short time allowed for locking the SA-2 on to the steering beam which must be done within 6 seconds after firing, otherwise the missile cannot be controlled.

• The SA-3 GOA is carried in pairs, has a range of 25 to 30 km, and is probably command guided; however, a homing system may be incorporated. The command guidance is apparently implemented through coupling to a TV guidance camera with a range of about 30 km. The LOW BLOW radar system provides short-range tracking and fire control for the SA-3 for distances up to 45 to 80 km. This radar is coupled to a TV guidance camera and operates at frequencies between 9,000 and 9,400 MHz with a peak power of about 250 KW. It has a vertical beam width of about 12° and a horizontal beam width of 1.5°. Other radars that may be associated with the SA-3 are the SPOON REST, the FLAT FACE, and the BAR LOCK. SA-3 launcher ramps can be reloaded from a truck in less than 1 minute.

• The SA-4 GANEF, which is twin mounted on a tracked armored launch vehicle, first made its public appearance in about 1964. The SA-4 is command guided with a range to about 70 km. The missile is 9 meters long with a launch weight of about 1,000 kg. There are two radars associated with the SA-4 system, a long-range surveillance radar (the LONG TRACK in the E-Band) and a target acquisition and fire control radar (the PAT HAND in the C-Band). Missile propulsion is provided by four solid boosters and a ramjet sustainer. The SA-4 may have a surface-to-surface capability.

• The SA-5 GRIFFON or GAMMON was first displayed publicly in 1963. In 1975 the Soviets completed a series of 60 tests on this system in an antiballistic missile (ABM) mode at the Soviet missile test facility at Kapustin Yar. Not enough information has been publicized to indicate whether these tests and their results make the SA-5 a potential threat to medium-range tactical ballistic or cruise missiles. Until evidence indicates otherwise, such a possibility should remain under consideration. The Soviets may be attempting to develop the SA-5 system into an ABM supplement to the ABM "GALOSH," not entirely unlike the US Sprint ABM was to the US Spartan ABM. A difference is that the United States counted the Sprint within its 100 authorized ABM's per site allowed by SALT-I while the SA-5 is not counted at all by the Soviets. If the SA-5 is being developed into an ABM-capable system, it could become a Soviet villain in future arms limitations talks since both the Soviets and the United States still count the SA-5 as an antiaircraft SAM and it is subject to no controls in production and deployment as ABM systems are under the SALT agreements. The Soviets were believed to have 900 SA-5's deployed in 1974.

Although first publicly displayed in 1967, the West got its first good look at the SA-6 GAINFUL in the 1973 Arab-Israeli War, where it was apparently used quite effectively. Of about 40 Israeli planes downed near the Suez Canal in the first 2 days of fighting, most were victims of the SA-6 batteries. The SA-6 system is fully mobile on two tracked armored vehicles. One vehicle carries three missiles on launchers, with radar and control equipment carried on the other. The SA-6 has a launch weight of about 550 kg and a high-explosive warhead weighing about 80 kg. The missile is about 6.2 meters long including tail cone. Missile range is about 35 miles. Missile guidance is by ground command plus semiactive radar homing and infrared homing.

The radar system associated with the SA-6 missile has been code named STRAIGHT FLUSH by NATO. The system must operate with another early-warning radar (not further specified, possibly LONG TRACK). The STRAIGHT FLUSH system uses two antennas, one circular and one parabolic, mounted one on top of the other in a manner affording independent rotation by each. For the search and acquisition function, the radar operates in the

C-Band at 5 GHz for low altitudes and at 6 GHz for high altitudes. Tracking and illumination are then performed at 8 GHz using continuous wave (CW) techniques. The missile uses the CW energy reflected from the illuminated target. In the missile's semiactive homing mode, the SA-6 homing head and rear-facing antenna receive command signals in the I-Band. Beacon signals are returned from the missile in lower frequencies from a tail-fin scabbed-on antenna. The final acquisition is performed by infrared homing against which radar countermeasures are impossible.

• The SA-7 GRAIL, Soviet name "STRELA" (Arrow), is a shoulder-launched, passive, heat-seeking, infrared rocket carried by the Red Army soldier and fired visually. Reportedly, it is merely a Soviet version of the US Army Redeye. The SA-7 was successful to some extent against US helicopters in Vietnam until countermeasures were found. The missile was again observed in the 1973 Arab-Israeli War in large numbers, where it was also used with apparently good results against Israeli armor. Range of the missile is about 3.5 miles.

• In November 1975, a new Soviet ground force all-terrain, all-weather, short-range missile for defense against low-level attack from the air appeared in public. Designated SA-8 by NATO, the system is fully contained on one three-axle, apparently amphibious, vehicle. Vehicle dimensions allow air lifting by Soviet airplanes (An-22, An-12 and Il-76) and the Mi-12 HOMER helicopter. Each vehicle has a quad launcher (four missiles).

The SA-8 missile is about 3.20 meters long and 210-mm in diameter. Launch weight is estimated at between 180 and 200 kg with the warhead at about 40 to 50 kg. Maximum estimated operational range is 10 to 12 km. Missile guidance is by four trapezoidal-shaped canard control surfaces (fins), while four larger trapezoidal stabilizer fins in the same plane at the tail provide lift. Two missiles can allegedly be fired, each guided on a different frequency, from the same carrier at a single target.

The radar and fire-control system for the SA-8 includes a surveillance radar, probably in the G or H Band (4-8 GHz) with an estimated range of 30 km, a tracking pulsed radar probably in the I-Band (13-15 GHz) frequency with an approximate range of 20 to 25 km, a beacon receiver also in the 13-15 GHz frequency, and a command transmitter probably coupled with the beacon receiver as ECCM in the I-Band operating frequency. There is also an optical target tracker with an approximate 180-mm dia-objective lens with extremely long focal length which provides picture transmission by a TV camera inside the vehicle. The lens is protected by a remotely operated flap while traveling and during missile launch. Dr. Malcolm R. Currie, US Department of Defense Director of Defense Research and Engineering, recently told the US Congress that the SA-8 is more sophisticated than any (SAM) in the United States.

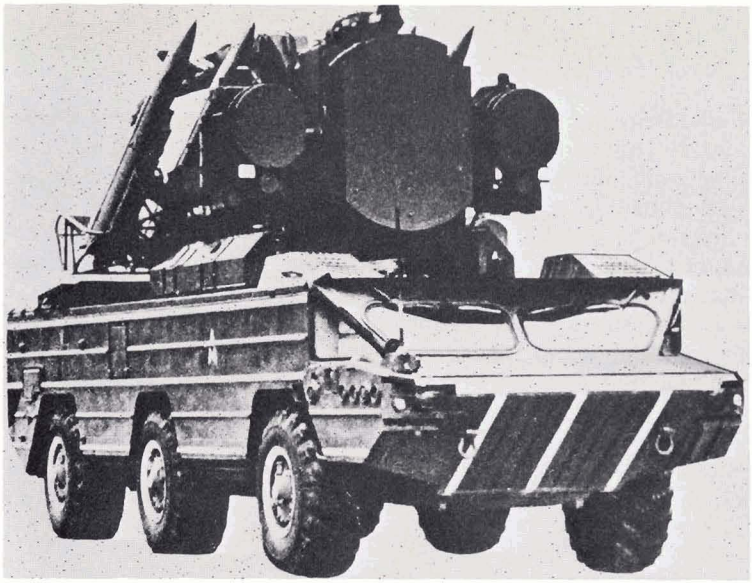
• Another recently deployed SAM is the SA-9 GASKIN. Two twin-launchers (four missiles total) are mounted on the amphibious BRDM-2 scout car chassis, a two-axle wheeled vehicle. The missile reportedly uses the same type IR homing head as the SA-7 GRAIL but has a larger warhead, faster rocket motor, and improved maneuverability. The range is believed to be similar to that of an improved SA-7, estimated about 7 miles. From those SA-9's observed, it has been reported that there are apparently provisions for rotation of the missiles and a target acquisition means in the form of an optical detection system inside the glass-fronted BRDM vehicle. It was also noted that high-speed aircraft cannot outfly the IR guided weapon.

Tactical Air Defense Deployment

Some insight into the interoperability of Soviet and Warsaw Pact tactical air defense systems was recently provided by an East German publication, *Militaertechnik*, which was subsequently reported and commented on in *Electronic Warfare* magazine.

"SA-9 batteries are deployed behind a network of ZSU-23-4 SP Shilka batteries with their Gun Dish radars. When static, the entire ensemble is under the control of an ESD-20 generator van with threat information passed around via radio link with automated launch a probability. The operation is also supported by an ESM (electronic support measures) van that is deployed in the same echelon as the SA-9's. However, when moving forward, all vehicles operate in the autonomous, free-wheeling mode

SA-7 "GRAIL"



SA-8 "GECKO"

with radio communication from the generator vehicle still provided but only on an informational basis.

The electronic interoperability of SA-8 and SA-9, coupled with the ZSU-23-4 SP AAA vehicle, adds new dimension to the offensive, all-terrain capability of Warsaw Pact forces, with the former two SAM systems providing new air defense coverage to a highly mobile strike force with rear echelon coverage provided by the medium-altitude SA-4 and SA-6 vehicles and high-altitude defense from SA-2 and SA-3 batteries."

This same issue of *Electronic Warfare* presented a probable organizational scenario for Soviet tactical air defense for the Group of Soviet Forces, Germany (GSFG), which would likely revert to a Soviet front in event of war. The GSFG presently consists of five armies stationed in East Germany, each army made up of three to four divisions. Each army is expected to deploy in a combat zone with a front of about 50 km and a depth of about 100 km. In addition to the air defense weapons common to all Soviet troop units (i.e., AAA guns and MiG's, SA-7's, and some 64 troops of SA-9's on BRDM-2's in the army), the following weapon systems are expected to be deployed and enmeshed throughout the army's sector:

- Nineteen batteries of towed ZU-23-2 (114 twin-cannon elements) along the front in a 5 km wide belt.
- Thirty-two batteries of the ZSU-23-4 (128 vehicles) along the front and throughout the zone.
- Twenty-three batteries (six guns each) of towed S-60 57-mm cannons with an effective range of over 4,000 meters deployed in three belts across the breadth of the sector at depths of 10 km, 15 km, and 25 km.
- Five batteries of SA-6's moving close to the front of an advancing army plus three batteries about 5 km behind the front and two remaining batteries deployed in depth about 10 km farther to the rear and filling gaps between the three forward batteries.
- Nine mobile SA-4 batteries deployed in gaps between the SA-6 batteries, three moving about 10 km behind frontal units with the remaining six in a lateral belt about 25 km behind the front.
- Three SA-2 batteries (six single mobile launchers each) deployed with two batteries about 45 km behind the front and the third located about 80 km back in the center of the sector.

Offensive mobility was again stressed in this article:

". . . [a] facet which became apparent in the 1973 Middle East War is the mobility of this [air defense] umbrella and its ability to keep pace with rapidly advancing troop formations."

All in all, it adds up to an impressive and formidable air defense capability and system; a system that is apparently still in a stage of expansion and density intensification.

Soviet Armaments Momentum and Possible Future Trends

Comments extracted from a rather interesting and enlightening summary concerning the momentum and recent trends in Soviet aircraft activity by the editors of *INTERAVIA* magazine provide some clues as to what may be expected in the future. There are certainly trends here that should interest Western World intelligence analysts and the decision-makers they serve. ". . . the most remarkable point is that the latest Soviet aircraft display a sophistication that was almost unthinkable a few years ago . . . aircraft such as the MiG-23 and -25 and the Sukhoi Su-19 are comparable to the latest American products. The Tupolev swing-wing bomber, code named 'Backfire' by NATO, is also an extremely advanced technology system . . . All these new technology types reflect a successful Soviet drive for quality . . . While there is no reason to believe that NATO lags behind the Warsaw Pact in terms of the capability of its latest military aircraft, in the numbers game it certainly does. Some 1,700-2,000 combat machines [aircraft] are being built annually by the Soviet Union . . . the cumula-

tive total for the five major manufacturing nations of NATO falls rather short of this figure . . ."

Given the burgeoning pace of technological advancement and the inherent "information explosion," there may also be impressive changes and innovations on the Soviet air defense horizon. Areas offering such potential appear to be electronic warfare and electro-optics. For example, as recently disclosed in an *Electronic Warfare* article,

"The highly publicized 'blinding' of US satellites by high-energy lasers in the USSR has caused wide concern that US warning satellites would not be able to detect Soviet ICBM launches. Two USAF data relay satellites in elliptical orbit were blinded by lasers, and in one case up to 4 hours, when their infrared sensors went down . . .

More important, the positioning and the interference suggest that Soviet laser technology is no longer experimental in nature and is already deployed in an electronic order of battle. *Defense and Foreign Affairs Daily*, a newsletter on strategic military affairs, suggests that the implications are potentially drastic for the West and perceives a Soviet technological breakthrough on the order of the lithium fusion or the Sputnik."

Are there also such breakthroughs in the Soviet air defense future? Will the Soviets be the first to harness the laser into a threatening destructive mode? . . . possibly an air defense mode? Of course, speculation is not fact, nor does it necessarily become fact, though quite often it does. On the latter hand, man's years of history (particularly recent history) make it obvious that human progress, be it in peaceful pursuits or toward implements of war, is limited only by imagination, determination, and physical capability. It appears reasonable to assume that if the Soviets perceive a capability to develop and field a particular dominating type weapon system they will go for it, despite socioeconomic pressures. Certainly they have proved capable of such breakthroughs in the past.

Other reasonable trend assumptions appear to be:

- The Soviets will continue to provide their soldiers, sailors, and airmen — to quote the late US Army Chief of Staff, General Creighton Abrams — "with weapons and systems that have sophisticated capabilities, the best that their modern technology can provide."
- Newly developed technology and/or breakthroughs (from any source) that can contribute to superior military power will continue to be exploited to the fullest extent.
- As American newly discovered and developed aircraft survivability and air defense technologies become known, the Soviets can be expected to devise and develop means and capabilities to counter, neutralize, or defeat them.
- As Soviet technological sophistication and industrial capacity expand, military uses and weaponry can be expected to continue claiming first priority for use of these resources.

This short look at recent Soviet trends could, of course, cover only some of those items that they have thus far exposed to the West and that have been openly published. Some pause and thought must also be given to what may exist outside our knowledge — that which hasn't been exposed to the Free World and will not be, short of confrontation or conflict. This speculation is a constant challenge to air defense artillerymen, aviators, electronic warfare specialists, intelligence collectors and analysts, and the Free World's electronic and weapons industry. As the ever-expanding Soviet air defense umbrella and tactical air capability grow more formidable, they must be studied and capabilities developed to neutralize or defeat them to insure the survival of US military forces in the event of conflict. It is another of those deadly games with high stakes in which we dare not be second-best.

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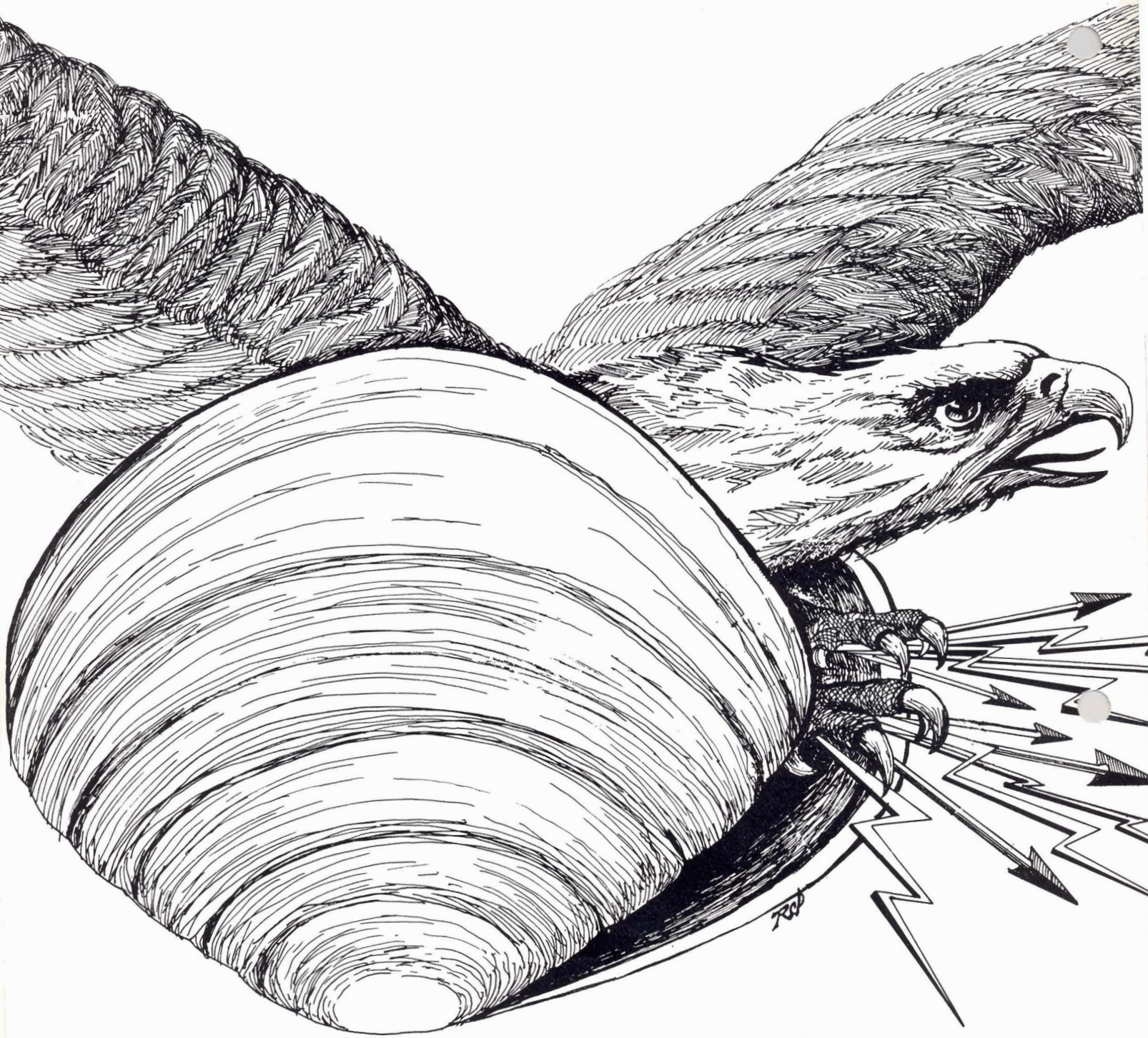
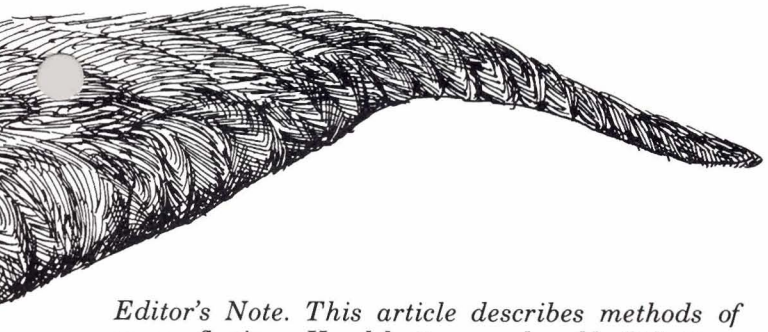


the hawk an clam

CAPTAIN



Editor's Note. This article describes methods of camouflaging a Hawk battery employed by B Battery, 2d Battalion, 55th ADA, that are to some extent a refinement of methods described in the article entitled, "The Bushmasters," appearing in the October-December 1975 issue of Air Defense Trends. It is in this respect a follow-on article to "The Bushmasters."

One of the most important factors affecting the Hawk system's ability to operate effectively on the modern battlefield is its capacity to survive the suppressive attempts of hostile forces. Survival action against suppression mainly includes:

- Camouflage. The most critical aspect of countersuppression and also the most difficult technique to master, especially for Hawk.
- Movement. Frequent, short moves to avoid detection.
- Deception. Dummy and decoy sites employed to confuse detection attempts.
- Fortification. Some means of protecting equipment and personnel must be provided in case all attempts to avoid detection fail.

Tactical doctrine as specified in FM 44-1 (US Army Air Defense Artillery Employment) requires frequent displacement of Hawk firing units as one measure of countersuppression. With very few exceptions, a Hawk unit would never remain in the same location more than 24 hours; and, dependent upon the tactical situation, the unit could expect to move as often as every 8-12 hours. The burden of frequent displacement becomes even more severe when one considers the effort required to camouflage the battery at each new location. The task of effectively camouflaging a Hawk unit is considerably more complex than that faced by most other Army units.

During a field exercise in 1975, Battery A, 2d Battalion, 55th ADA, established the viability of total camouflage for Hawk units. The Battery proved that it is possible to camouflage all Hawk equipment and still be a tactical threat on the battlefield.

Generally, the technique included drawing camouflage nets over all items of equipment and supporting them with free standing poles, then adding desert vegetation to complete the concealment.

Although the technique was effective as far as countersuppression is concerned, a drawback existed from the standpoint of mobility because it was necessary to remove the nets completely during march order and replace them during emplacement.

A sister unit, Battery B, 2d Battalion, 55th ADA, decided to adapt the basic principles developed by Battery A to a field mobile system of camouflage that would better support the principles of rapid and frequent displacement. Unit personnel designed and supervised construction by Fort Bliss Maintenance Division personnel of swing-away, permanently mounted metal support frames for each Hawk radar. They were named "clamshells." The frames were constructed of $^{3}/_{16}$" steel strap and $^{3}/_{16}$" steel rod which were attached to existing mounting points on each chassis. They consist of two sections that pivot at the chassis base and join along the longitudinal axis of each item. Lightweight camouflage nets were attached permanently along the top of each rotating section and joined with quick release clips. Wooden and metal poles were emplaced along the base of the radar, pointing away from the center to facilitate rapid swing away of the cages. Because the nets remain attached to the cages, recamouflage can be quickly accomplished by swinging the cages back into place and repositioning the ancillary poles. Rapid deployability is maintained because the radars are normally ground and airmobile with the cages installed. Nets are rolled to clear road wheels and tied to the cages during march order.

Battery B personnel were given an opportunity to test their "clamshell" design during Brave Shield XII at Fort Hood, Texas. Although the system had been field tested briefly in desert terrain at Fort Bliss, it was not clear what difficulties would be encountered in a more wooded area such as Fort Hood. In preparation for deployment, all battery equipment, including radars and launchers, was camouflage painted a woodland paint scheme as specified in TC 5-200 as an added measure of

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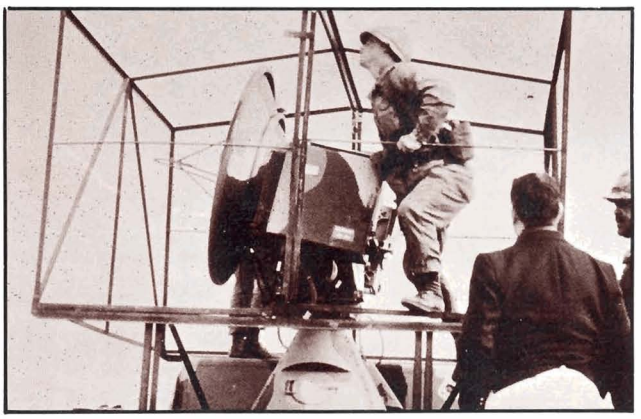
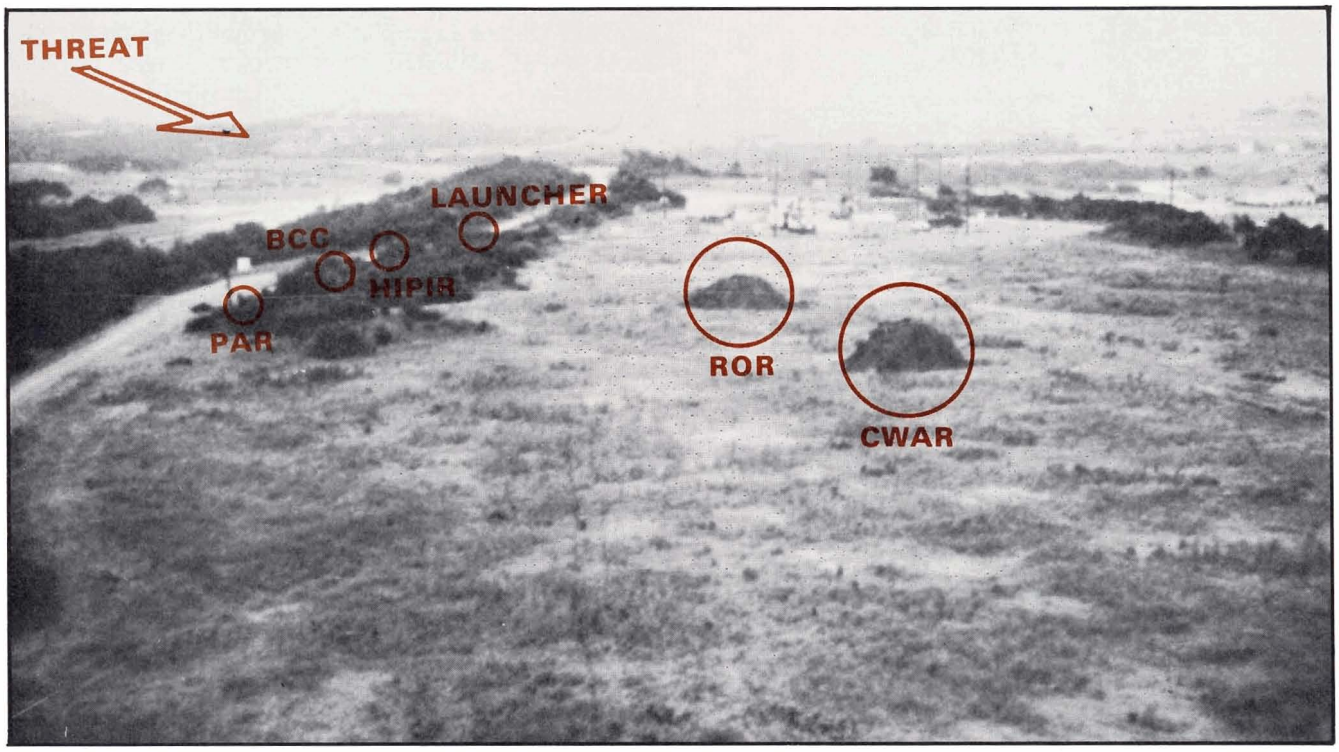


"Clamshell" over the Range Only Radar (ROR)



Battery B in position at Fort Hood, Texas, during BRAVE SHIELD XII.

camouflage effectiveness. Wooden 2"x2" support poles were cut to 6', 8', and 12' lengths and painted green. The poles were fitted with 6"-square end plates designed to prevent the poles from working through the mesh of the nets when emplaced. All canvas and bows were removed from vehicles. The cab tops were stored in the OVM compartment along with sandbags to be used in the field to cover lowered windshields, mirrors, and head lights to prevent glare. Nets and poles were distributed for each prime mover based on the requirements of the vehicle and its towed load.

Upon completion of the aircraft load plans for the deployment, it was determined that the upper cage framework for the CWAR and ROR would have to be removed and stored in the bed of their respective prime movers because they extended above the loading height restriction of C-141-type aircraft. The HIPIR cages were left installed because they would not interfere with loading on C-5A aircraft.

Aerial view of Brave Shield XII position before occupation by Battery B.

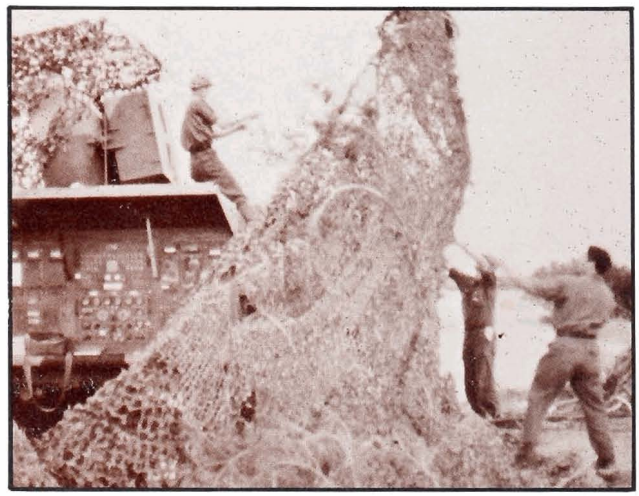
After arrival at Fort Hood, the unit assembled in a staging area and then deployed to the field location. The Battery was positioned along a ridgeline road with equipment as close to the treeline as possible. Each position was selected for optimum equipment dispersion and maximum use of terrain features. Immediately after achieving an operational condition, final camouflage of all equipment began. To achieve maximum camouflage effectiveness, cut shrubs and brush were used along with lightweight nets to blend equipment into the natural terrain. The initial camouflage time (2 to 3 hours) may seem excessive; however, this was the first time the unit had been deployed with the complete "clamshell" system. Actually, after mastering the techniques of the system, only 20 minutes are added to overall Hawk system emplacement time.

During the exercise, the unit often adopted the role of "Snap Shoot" battery, operating all equipment in standby. while fully camouflaged. When early warning indicated the presence of a threat within the assigned sector, the "clamshells" would be swung away, equipment brought to full radiate, and the threat tracked and engaged. Unit crews became so proficient in these procedures that it was possible to acquire and track targets within 2 minutes after notification and to complete a simulated engagement in less than 5 minutes. This performance demonstrates that effective camouflage need not detract from unit capabilities and validates the

"Snap Shoot" concept as an effective countersuppression technique. Battery personnel were able to recamouflage all equipment within 10 minutes after each engagement.

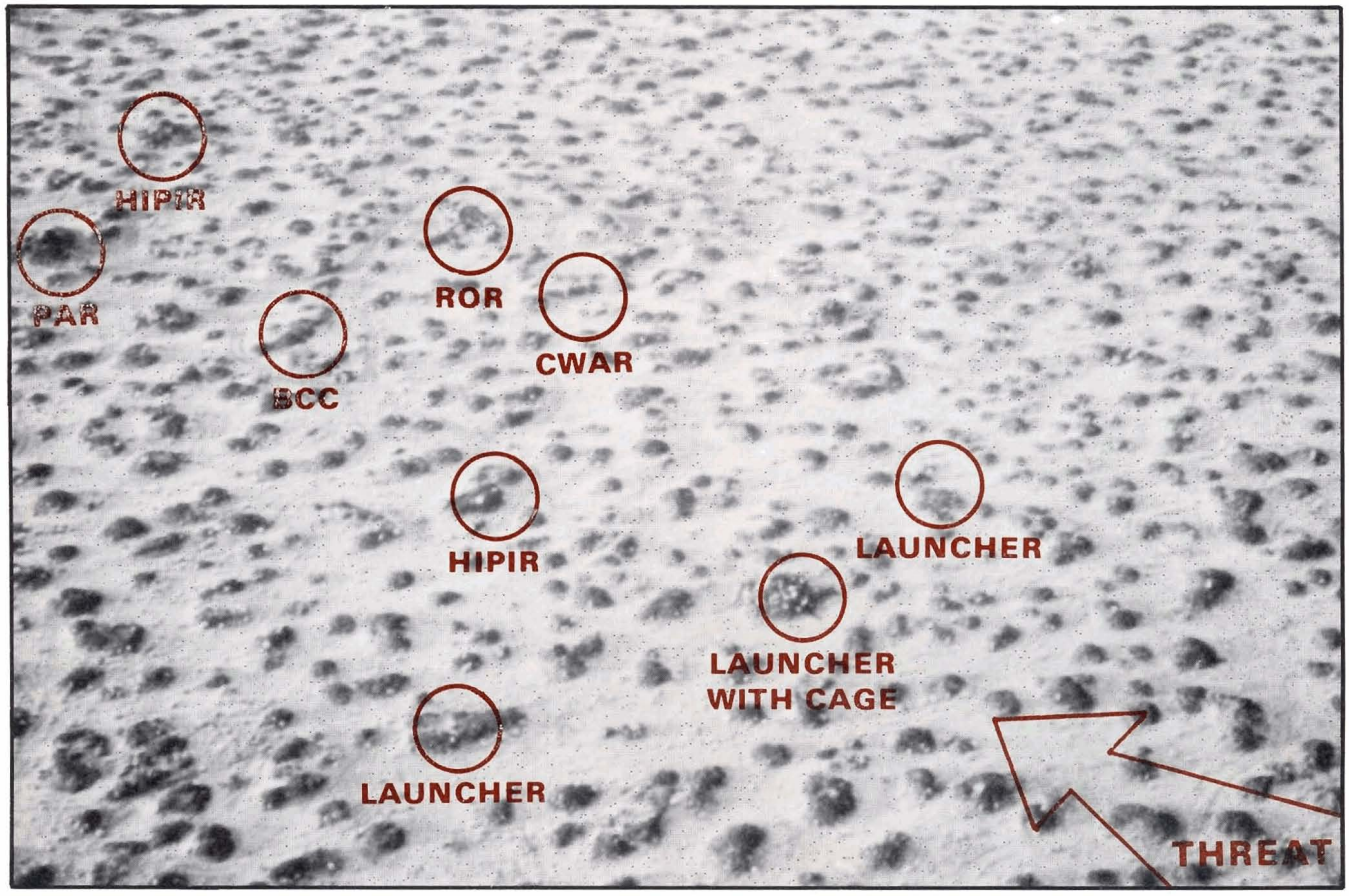
In addition to the emphasis placed on camouflage, the Battalion's participation in Brave Shield XII provided an excellent opportunity to exercise and sharpen the skills required to provide support to a division. In its direct support role to the 1st Cavalry Division, the Battalion was able to provide an integrated system of air defense and airspace management by establishing liaison positions for divisional Chaparral/Vulcan and air traffic management personnel in the Hawk AADCP.

Battery B had an additional opportunity to test its camouflage techniques in February 1976, this time in desert terrain near Fort Bliss, Texas. The system tested at Fort Hood was used again; however, "clamshells" for Hawk launchers were added. Designed to function in the same manner as the "clamshells" for the Hawk radars, it reduced drastically the time required to camouflage and uncover the Hawk launcher. Similar to Fort Hood, this desert test proved the ability of Hawk to achieve total camouflage while still maintaining battlefield effectiveness. Several key elements of effective camouflage have been identified as a result of the experience gained at Fort Hood and Fort Bliss.

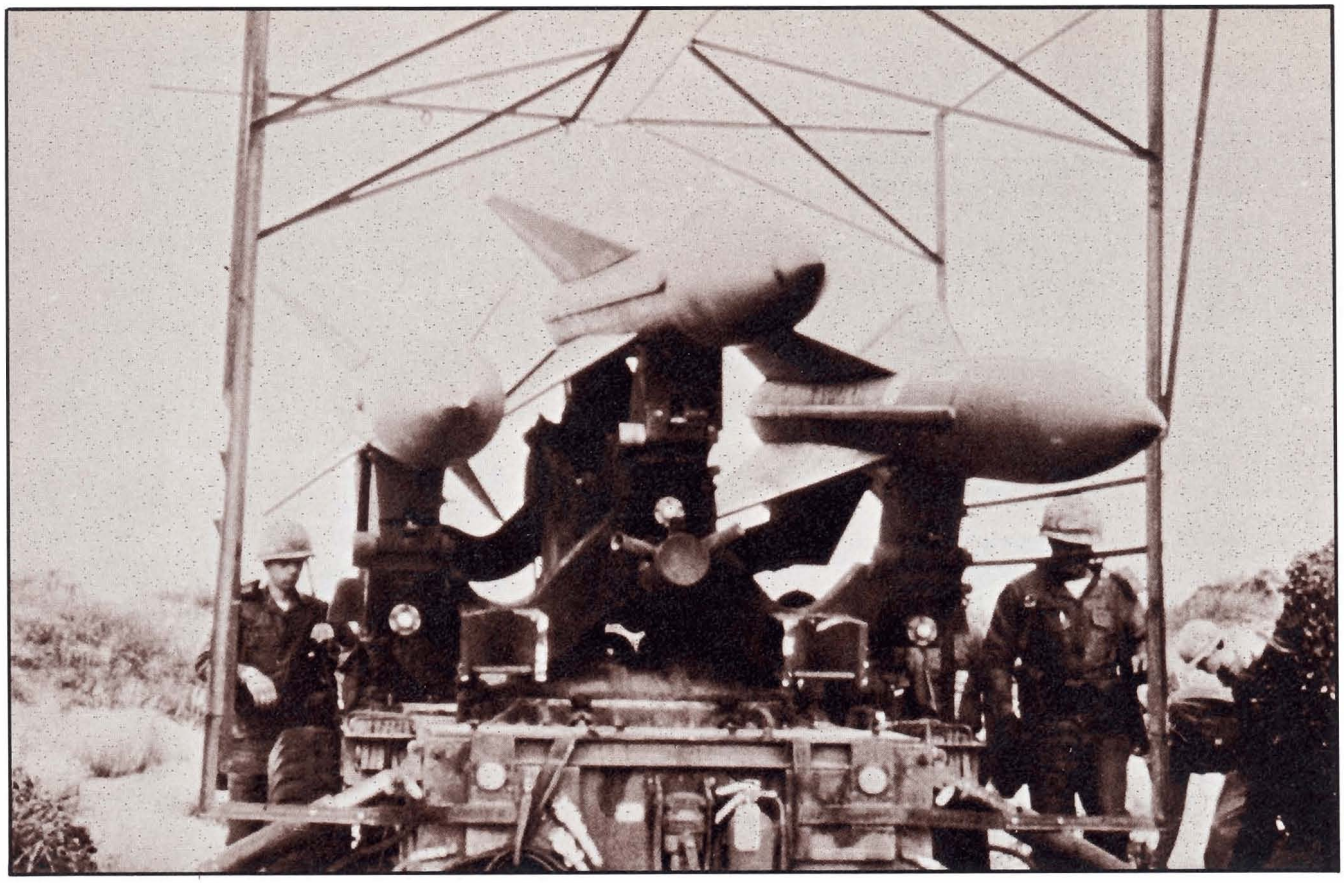


Battery B personnel camouflaging the HIPIR.

• Site selection becomes critical. Not only must sites be selected to provide adequate air defense coverage, they also must be selected for terrain features that aid unit camouflage efforts. Whenever possible, a position should be selected with trees,



Battery B blends into the desert terrain near Fort Bliss, Texas.



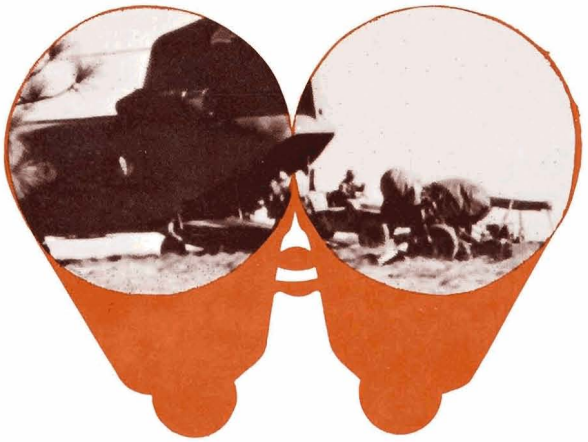
The "clamshell" cage greatly reduces the time needed to camouflage Hawk launchers.

brush, sand dunes, etc. that approximate the height of Hawk equipment without masking radars and launchers.

- Equipment position must be considered in detail. Reconnaissance, selection, and occupation of position personnel must be trained to select individual equipment positions that aid camouflage by blending equipment into the natural terrain features and avoid casting telltale shadows.
- Track discipline and light discipline must be rigidly enforced. The most effective camouflage can be negated by vehicle tracks or violations of light discipline.
- Planning for camouflage is imperative. Nets and poles must be prepositioned on each prime mover. Brush and shrubs to be used as garnishment for the nets should be precut some distance from the site and picked up by the convoy elements during road march. Care must be taken to select the same variety and colors of vegetation common to the site location.
- Training and indoctrination of *all* battery personnel are essential. Everyone in the unit must understand the importance of camouflage as well as the techniques that are to be used.

Although the "clamshell" design is a very effective means of providing a field mobile camouflage system for Hawk, a shortcoming in the metal cage system was identified; i.e., requiring the cage work to be swung away before the radars could be fully energized and thereby exposing the equipment to visual detection. A third generation system is currently being designed and constructed to overcome this limitation. Battery B and Fort Bliss Training Aids Service Office personnel collaborated on a design for a cage system that allows the radars to radiate and rotate while fully camouflaged. It is constructed of plastic tubing that forms a dome over each antenna. The cages are designed to be fully transportable while installed on each item of equipment. Camouflage nets would be rolled from the ground up and secured at the base of the radar, facilitating emplacement at each successive location. It is anticipated that this system will be field tested soon, and it may become the prototype for evaluation by the Directorate of Combat Developments during a Concept Evaluation Program currently scheduled for the latter part of 1976.

Captain Hawkins received a direct commission in the Regular Army in 1971 in the Air Defense Artillery. A graduate of St. Martins College, he is now attending the ADA Officers Advanced Course. He has command experience in both Hawk and Nike Hercules units.



VIEW from the FIELD

CAPTAIN PAUL M. VUKSICH

During the initial phases of the 1973 Middle East War, the Israelis found that their air defense gun and missile forces were stretched to the limit. In response, all sorts of nonair defense weapons, to include small arms, were brought to bear on the massive air threat. What began as a frustrated response ultimately was credited with a significant airplane kill record. The current reemphasis on small arms for air defense (SAFAD) training throughout our Army is a direct result of the Israeli experience.

Examples of soldiers employing equipment in unorthodox methods with great success are not rare. Soldiers have always made their equipment do more in combat than it was designed to do. But why do we wait until the shooting starts to thoroughly research extension of equipment capability? Tactical units know what tactical equipment they will have in combat. If this knowledge is coupled with known aspects of enemy threats, it is possible to formulate plans for systematic development of innovative employment of TOE equipment.

The 3d Battalion (Vulcan/Redeye), 4th Air Defense Artillery, 82d Airborne Division, has put such a plan into action by initiating an aggressive program to explore additional capabilities for the Vulcan 20-mm air defense system (VADS) and the Redeye missile system. As the only airborne ADA unit in the US Army, the battalion is confronted with the possibility of having to employ equipment in other than textbook situations. The implicit task is therefore to develop capabilities commensurate with the unique missions of the 82d Airborne Division.

Fortunately, the structure for innovation has been clearly established in the 82d. The Division Commander has tasked each brigade to act as the proponent for a specific area of development. The 1st, 2d, and 3d Brigades are tasked respectively to develop airborne, airmobile, and antiarmor concepts. Within this framework, the battalion plan has been to assign broad areas for innovative projects to each firing battery based upon its normal configuration in support of the brigades. Each battery was tasked to derive and evaluate selected new concepts for employing its equipment.

Current doctrine calls for Redeye delivery during heavy drop. The problems associated with separating the paratrooper from his equipment made this method less than desirable in terms of timely air defense protection. A Redeye enlisted man in A Battery conceived the idea of a Redeye jump container and brought his good idea to the attention of his chain of command. With the help of the 1st Brigade, the Redeye jump container prototype was fabricated. It was then tested in jumps from various aircraft containing an inert Redeye. All jumps to date have been successful, and the XVIII Airborne

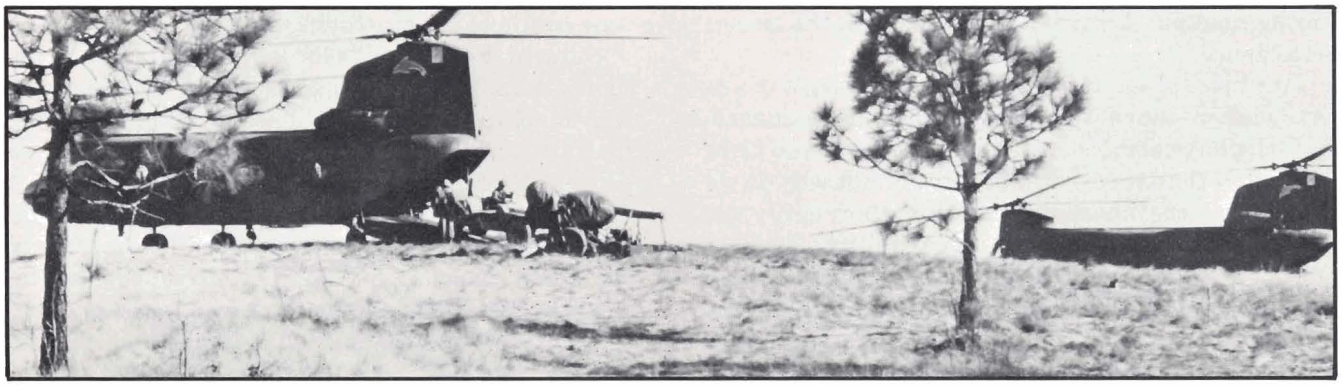
SSG Tommy Hatcher demonstrates the positioning of the Redeye container prior to an airborne jump.

Protection of the jump zone can be provided as soon as the trooper lands and removes Redeye from its container.

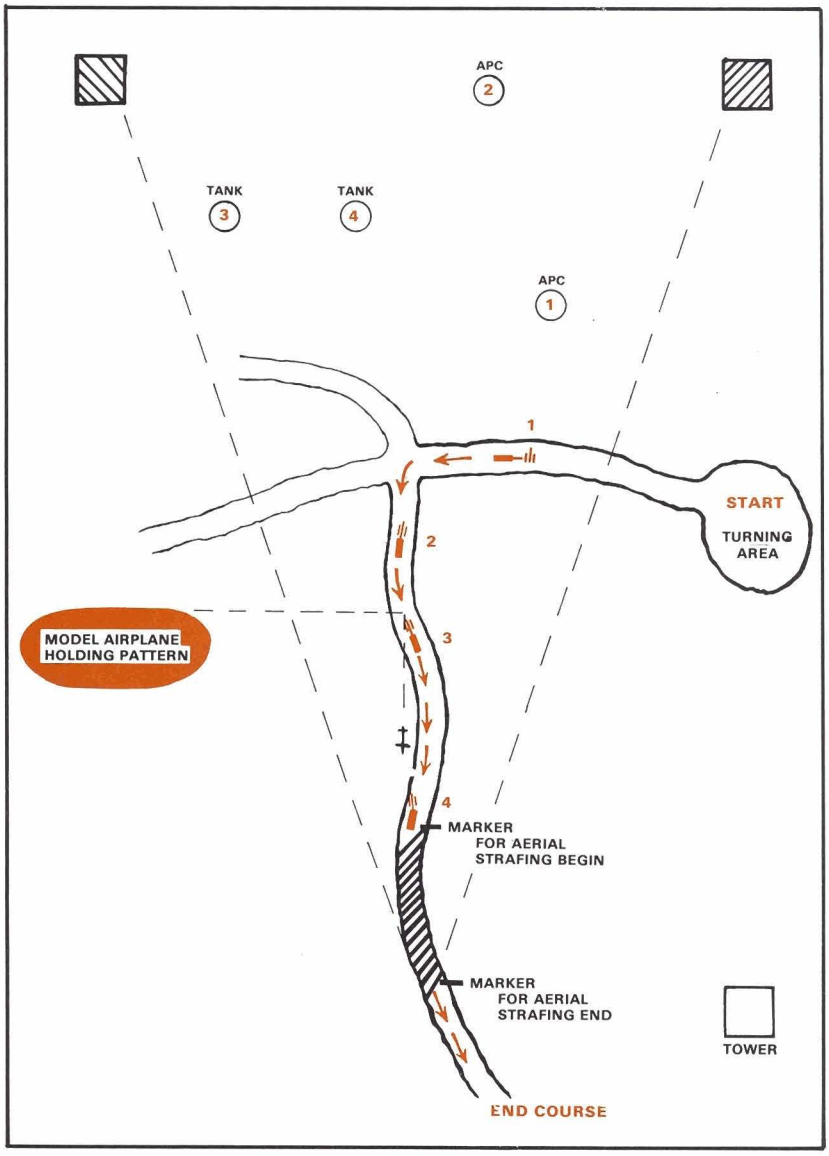
Corps has requested authority to conduct follow-on tests using a combat-ready Redeye.

B Battery has responsibility for developing new airmobile concepts for the battalion, and recently produced an official Army training film on Vulcan Airmobile Techniques. The concept involved a revised method of internally loading two VADS into a CH-47 helicopter. A problem preventing internal loading of the VADS has always been height. A VADS in the travel position will not clear the rear door of a CH-47; however, if the VADS is carefully lowered on its hydraulic system, the height problem is overcome. The advantages of internal loading are more initial firepower on the landing zone and greater low-level maneuverability for the CH-47 than with external carry. As a result of this new internal load capability, organizing VADS for successful airmobile insertion has significantly improved.

The US Air Force uses armor piercing ammunition in its 20-mm guns. C Battery has taken this fact into consideration in the parallel development of the VADS and the Air Force version of the 20-mm Vulcan cannon and decided to test the armor piercing round in the VADS against hard targets. They naturally do not expect to fire at tanks, but they are confident that range firings will prove the VADS



The internal loading of the VADS into CH-47 Chinook helicopters has resulted in more effective deployment of airmobile air defense.



TOWED VADS MOVEOUT GUNNERY COURSE

has the capability to destroy light armor. At present, C Battery is seeking certification to fire antiarmor rounds from the VADS. Once permission is granted, this concept will be rapidly tested and evaluated.

The major advantage of the self-propelled VADS over the towed version is the ability to fire on the move. Current doctrine calls for the towed VADS to be properly emplaced prior to engaging aerial or ground targets. The doctrine is sound, but it does not provide for an aerial or ground ambush while on the move. In answer to this threat, D Battery has developed a towed VADS moveout gunner course that includes both ground and aerial targets. Initially, the range will be used to test towed VADS firing techniques. Once the techniques are perfected, practice on the VADS moveout gunnery range will become standard training.

Innovative ideas applied to TOE equipment will ultimately pay dividends in combat. Therefore, the 3d Battalion (Vulcan/Redeye), 4th Air Defense Artillery, is actively seeking additional ideas from all levels and examining all the possibilities that are surfaced.

Captain Vuksich graduated from the US Military Academy in 1973. He has previously served as platoon leader, executive officer, S2, and S3 in Air Defense Artillery units, as well as Aide-de-Camp to the Commanding General, 19th Support Brigade in Korea. Captain Vuksich wrote this article while assigned as Assistant S3, 3d Bn, 4th Air Defense Artillery at Fort Bragg, North Carolina. He is currently attending the Psychological Operations Course at Fort Bragg.

SUKHOI SU-7B

MARK LAMBERT, INTERNATIONAL EDITOR
FLIGHT INTERNATIONAL

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When even the countryside east of the Nile delta is obviously sensitive and prohibited to foreigners, except along well defined routes, it was a privilege for *FLIGHT* to be welcomed at the Egyptian Air Force training academy at Bilbeis, north of Cairo, and to be able to watch at close quarters the operations of its formidable Sukhoi Su-7 fighter—bombers.

A glimpse of a front-line Egyptian squadron is rare and fascinating. Though the Sukhoi Su-7, powerful and "built like a battleship", has gained a doubtful reputation in service with other air forces, the squadron commander at Bilbeis, an alert, aggressive and experienced fighter pilot, was evidently confident of his ability to achieve results in the Su-7 and to survive in a missile environment. He had flown more than 50 reconnaissance missions during the War of Attrition as well as attack missions during the 1973 war. Other squadron pilots looked mature and intelligent.

The Su-7 without external stores will go supersonic at any height in level flight and can just touch Mach 1 with stores carried. Since the battlefield is so close at hand in the Sinai sector, the Su-7's range is adequate. Its internal armament of 30-mm guns is very useful for ground attack, but both bombs and rockets are also used. The ripple rate of the rockets can be pre-set before take-off to match the area of the target. A large gyro sight, assisted by ranging radar in the nose bullet and yaw and angle-of-attack information automatically provided from vanes on the pitot boom, allows accurate delivery in dive or shallow attacks. Forward toss-bombing, using a pre-calculated attitude and pull-up programme, has been attempted but is not very accurate.

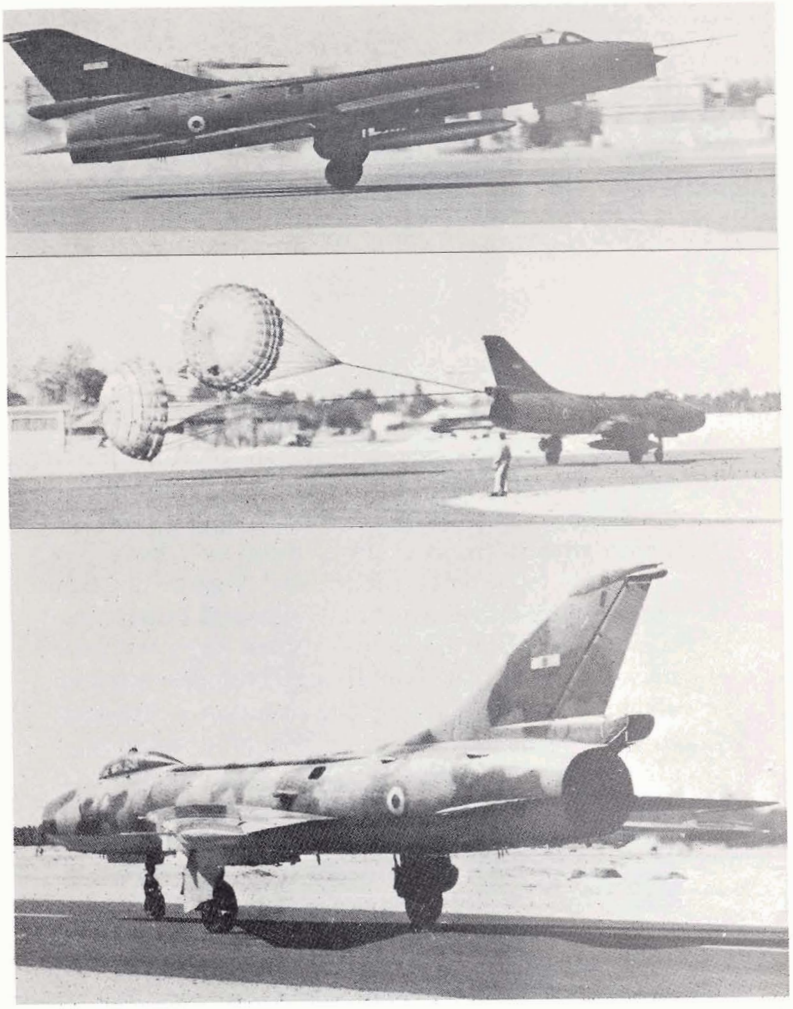
The Su-7 is regarded as one of the best aircraft currently available for high-speed flight at very low altitudes, being stable and easy to turn. The squadron commander referred to violent manoeuvring at a height of 20m. The Su-7 has no autostabilisers but

the slabtail gearing is automatically varied according to height and speed. Both spring and hydraulic artificial tailplane feel is fitted. In the MiG-19, on the other hand, there is a manual gear-change operated by the pilot at the appropriate speed.

Su-7 attacks are always escorted by intercepters, the arrival of these being calculated to occur at the moment for which an enemy reaction is predicted. Though the Su-7 can stay comfortably below the radar, visual observation posts in the front will pick it up as it emerges from the friendly missile belt into enemy territory. On the whole, enemy intercepters proved to be the least trouble, with the Hawk missile the next strongest threat and the light 40-mm antiaircraft gun rated the strongest; only two or three Su-7s were lost during the war while operating at low level, however.

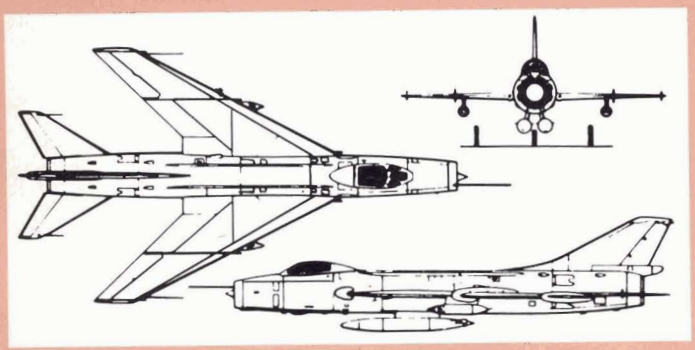
The squadron commander had often seen Hawks fired. By staying right "on the deck" he had been able to avoid their radar until he was inside their 2km-radius minimum range. He was then able to pull up in a manoeuvre which outpaced the tracking radar before delivering weapons in a fast dive. The Israeli counter to this was to launch one Hawk vertically upwards to explode in the centre of the "dead" zone as the attacker zoomed through it. If a good radar lock-on and launch were obtained the Hawk would soar into the sky and arc down at the passing fighter, but if it made a frontal approach the missile often exploded harmlessly astern. Sometimes salvos of three, six or nine Hawks were fired in ripple to enlarge the lethal area of their bursts, a tactic which considerably improved their effectiveness.

The tactic against guns was to approach at extremely low altitude, zoom violently to escape the tracking radar, climb to 2,000m (6,500 ft) beyond effective gun range and then dive steeply out of the sun.



Above, an Egyptian SU-7B makes a firm touchdown and deploys two very large drag chutes. As the "Fitter A" taxies by, the passive radar-warning aerial can be seen in the tip of the fin. The IFF "combs" are visible under the front and rear fuselage.

SUKHOI SU-7B
NATO code name: "Fitter A"



Pavel O. Sukhoi, creator of the SUKHOI SU-7B, has been engaged in aviation design since the early 1930's. His SU-2 attack airplane played a major role with the Soviet Air Force during World War II. Sukhoi's SU-7 first appeared in Russia on 24 June 1956 and has since seen squadron service with the Soviet Air Force and its allies.

LENGTH (without pilot tube/overall): 15.6/18.6 meters

WINGSPAN: 9.4 meters

RADIUS OF ACTION (hi-lo-hi/lo-lo-lo): 500/150 kilometers

MAXIMUM SPEED: Mach 1.6

COMBAT CRUISE SPEED: Mach 0.7

ARMAMENT: Cannons—2 NR-30MM, in wing roots with 70 rounds each

Bombs — 2 X 750 Kg and 2 X 500 Kg

or

Rockets — 4 X 16 57 mm rockets or

4 X 240 mm rockets or

10 X 160 mm rockets

Guided Missiles — 2 X AS-7 KERRY (air-to-surface)

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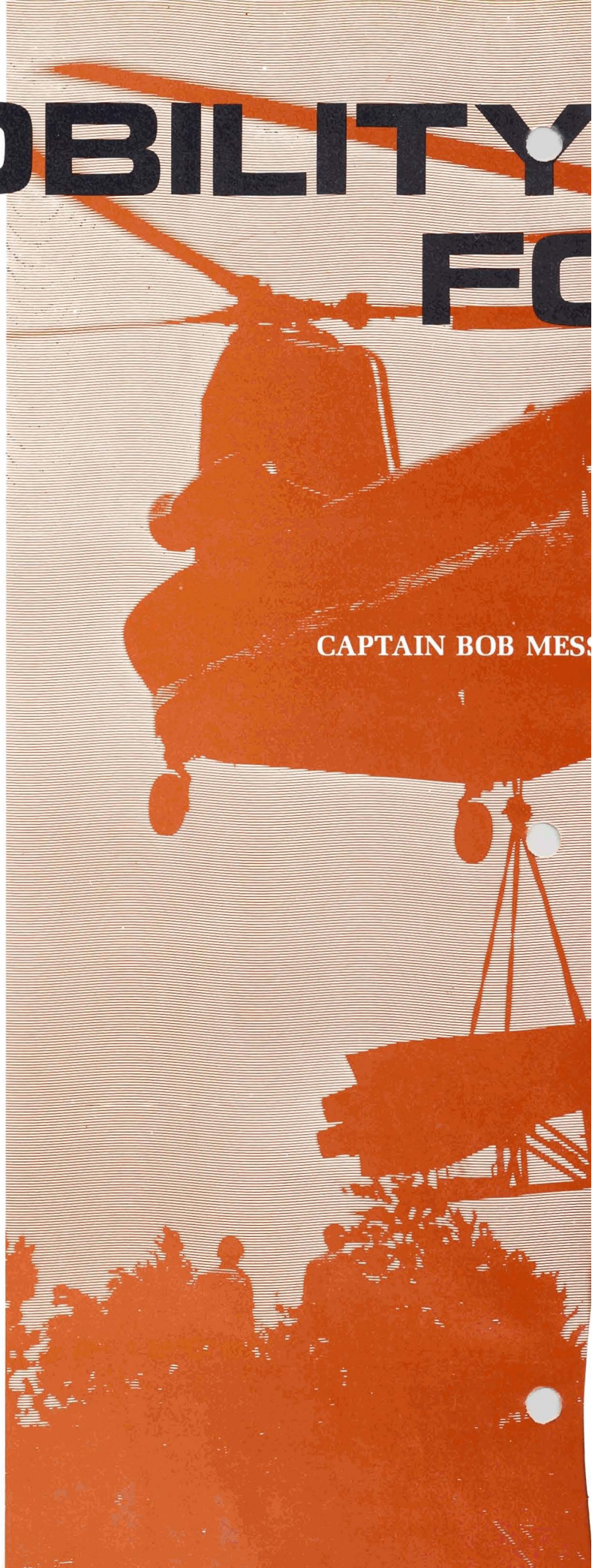


CAPTAIN BOB MESS

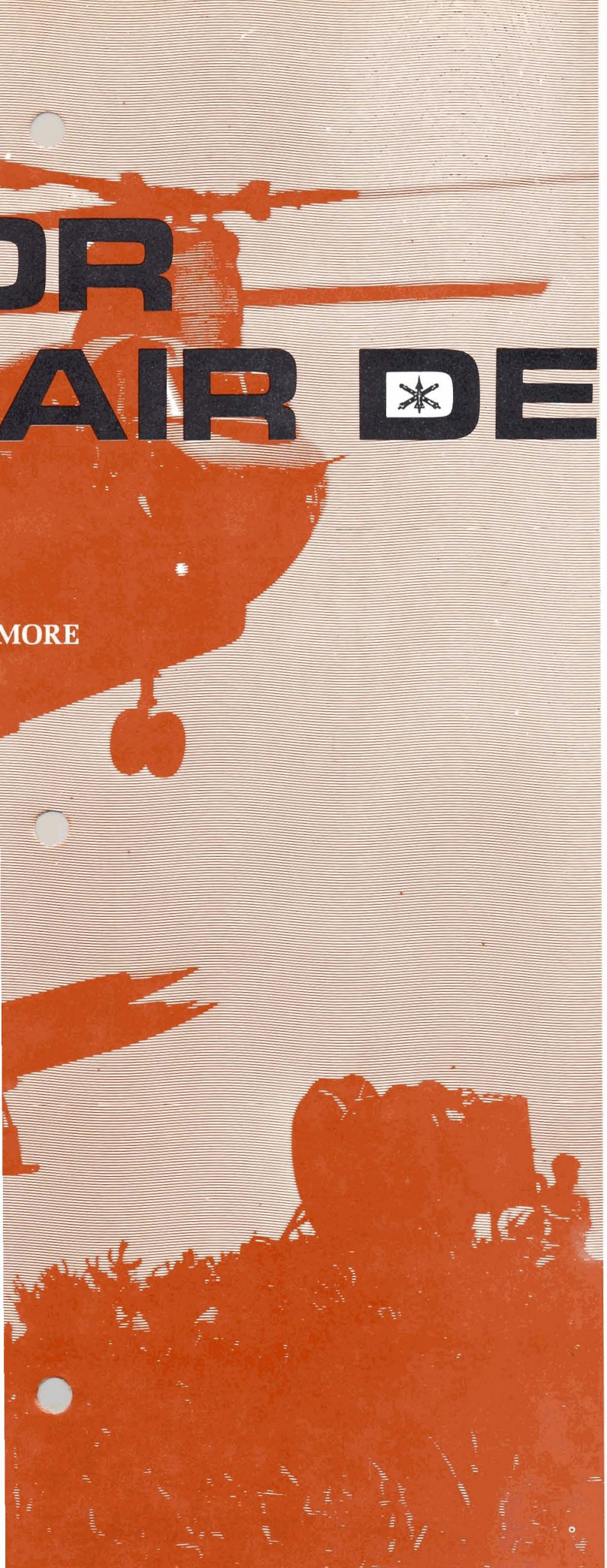
Many air defense artillerymen probably have never given serious consideration to air mobility of air defense weapons — or even thought it possible. Those with division tours of duty may have had airmobile experience with towed Vulcan units or possibly the movement of a Chaparral launch station by air. But Hawk and Nike Hercules were moved only by road even though both possessed an airmobile capability. Now the situation is different. In 1974, using newly developed rigging techniques, airmobility of the Hawk missile system was proven to be reliable, simple, efficient, and quick. Using similar techniques, a Nike Hercules battery in a surface-to-surface role was moved with similar results. Thus, no matter what the weapon, air defenders now have a proven tactical technique to add to their "bag of tricks" in providing the best possible air defense. This article discusses the contribution of airmobility for air defense to the air defense mission.

As shown in the last Middle East war, air defense is essential for success in combat in a high intensity conflict. But to fight effectively, air defense units need first to survive. Therefore, the latest air defense employment doctrine stresses the need for all air defense units to intensively use all available countersuppression techniques — mobility, concealment, deception, fortification, and cover — to enhance their survivability on the battlefield.

In the area of mission effectivenes, the new FM 100-5, Operations, states that to win a battle, three prerequisites must be met:

- Adequate forces and weapons must be concentrated at the critical times and places.
- The battle must be controlled and directed so the maximum effect is obtained from both firepower and maneuver.
- The battle must be fought using cover, concealment, suppression, and combined arms teamwork to maximize the effectiveness of our weapons and to minimize the effectiveness of enemy weapons.

Airmobility for air defense has a role to play in support of both increased survivability and fulfillment of the above prerequisites. But to increase our



DEFENSE

survivability and ability to support the ground battle requires that first we develop techniques and then train our personnel. Air defenders appear to be doing well with both Vulcan and Chaparral. Movement of towed Vulcan and the Chaparral launch station by air has been perfected to the extent that training literature and films have been developed to assist any unit desiring to train and execute such moves. Movement of these weapon systems by air has increased the ability of supporting air defense units to maintain a constant shield over their division. Leading the way in this effort are the battalions organic to the 82d Airborne and 101st Airborne Divisions (Air Assault).

But how about Hawk and Nike Hercules? A detailed discussion of Hawk will suffice since the principles employed and benefits gained are the same for Nike Hercules.

During the summer of 1974, the 2d Bn (Hawk), 71st ADA, 38th Bde, located in Korea, accomplished in rapid succession a total of 16 moves. These moves proved that not only was the Hawk missile system easily airlifted, but, most importantly, air mobility provided an excellent means for Hawk to accomplish its mission of air defense for the corps or the division while greatly enhancing its own survivability. To justify this statement, let's take a close look at how airmobility of the Hawk missile system helps satisfy the three prescribed prerequisites for winning the land battle.

The first prerequisite is that adequate forces and weapons must be concentrated at the critical times and places. The speed of airmobile deployment insures full support of this prerequisite and was proven in Korea. An operational Hawk battery could be prepared for airlift, moved 50 km by five

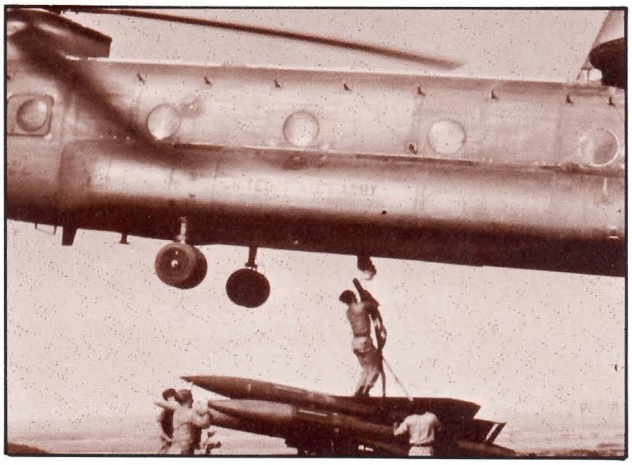
CH-47 helicopters, and become fully operational at the new location in about 3 hours. Equipment was picked up at the original site, moved the 50 km in 35 minutes, and set down at the exact location from which it was to operate. The additional time was required for the CH-47 to return to the original site for more loads. In another exercise using three CH-47's, an augmented assault fire unit (AAFU), which consists of only the basic elements needed to engage hostile aircraft, was airlifted 40 km and become operational in 45 minutes, to include the move. These example demonstrate that in comparison to ground movement a vast decrease in the time required for a Hawk unit to move and become operational is possible.

Besides the time saved in moving by air, march ordering and equipment emplacement are much faster. Radars are airlifted in an operational condition with vent hoods on and jack legs down. Most radars require only to be landed and provided power to become operational at their new locations. Much time is saved by not having to remove the loader transporter and missiles from trucks. Only a few minutes are needed to place missiles on the loader transporter from a pallet after they have both been

airlifted to a new location. A bonus effect of airlifting Hawk was less damage to equipment compared to minor damage that might be experienced during a road march.

The second prerequisite is control and direction of the battle so that maximum effect is obtained from both firepower and maneuver. The Hawk missile system, having the capability to shoot, move rapidly to a new location, and engage hostile targets in a relatively short time, is well adapted to this prerequisite. But the quicker action facilitated by airlift gives the system superb capability in fulfilling the control and direction of battle requirements.

In Korea, while the AAFU was being moved to a new location, the remainder of the unit, termed the Btry (-), remained operational. Once the AAFU was operational the Btry (-) was moved to its new location. This use of two separate fire units enhanced



the unit's survivability and helped provide better coverage for the defended area. Also, one fire unit could provide defense for the airmobile operation of the other.

The third prerequisite for winning the battle involves the use of cover, concealment, suppression, and combined arms teamwork. Airmobility of AD systems is highly contributory to all aspects of this prerequisite. The Korea airmobile moves showed that cover and concealment can be enhanced by airlifting into a location that is inaccessible by vehicle due to the nature of the terrain. This also allows fire units to be emplaced at key locations and avenues of approach that are not otherwise available. The camouflage and concealment aspects of suppression were made easier through airmobility because airlifting equipment into an area eliminates the need to camouflage 30 or more trucks. For example, in one instance in Korea the radars and

generators were set into a small 5-foot high grove of trees, with only the radar antennas showing above. Also eliminated were the hundreds of telltale vehicle tracks that give away the best camouflaged site.

Turning now to airmobility of Nike Hercules, the use of airmobility in support of a surface-to-surface role was also tested in Korea. After determining that the CH-47 could lift the vans, tracking radars, launchers, and missiles, a move of 30 km was accomplished with outstanding results. The battery components needed for the surface-to-surface role were moved 30 km by air over mountainous terrain and became operational in a total time of 4 hours. The same move by vehicles would have taken 6 hours in travel time alone because of the 200 km of winding mountain roads to the field location. As with Hawk, the equipment was picked up from its operational location with the minimum of preparation, especially the launcher and missiles. This

greatly decreased the emplacement time at the new location. All the other factors of airmobility mentioned in the Hawk system apply equally to Hercules.

Another advantage favoring airmobile moves is that personnel are easily trained for airmobile operations. The two Hawk batteries and one Hercules battery moved by air received only 1 day's instruction on rigging procedures, site preparation, and conduct of airmobile operations before executing a move. Outstanding results were achieved each time. As mentioned before, training manuals and films have been produced on airmobile techniques for towed Vulcan and Chaparral. New manuals on Improved Hawk now contain airmobile rigging procedures and work on a training film has begun at Fort Bliss, Texas, on airmobile operations for Hawk. We are making progress in educating our people on the use of air mobility as an important battlefield tactical technique.

In summary, it is evident that the use of airmobility at the right time can enhance the air defense role in the field force's primary mission—to win the land battle. Airmobility gives decreased movement and emplacement times, accessibility to new sites, and location of equipment in exactly the right place. As important, it enhances the unit's survivability by facilitating better camouflage, concealment, and rapid movement.

Captain Messmore is a graduate of Ohio State University. He has commanded both Towed Vulcan and Hawk units and has airmobile experience with Vulcan, Hawk, and Hercules units. He is currently assigned to the Forward Area Weapons Branch, Tactics Division, Tactics Department, US Army Air Defense School.

WHAT DO YOU DO NOW,

LIEUTENANT?

Prepared by
TACTICS DEPARTMENT, USAADS

As Lieutenant Newman was leaving the IBCC following his first combat duty shift, the BC's driver (acting as the Command Post Runner) ran up—

"Sir, Captain Brown wants to see you right away in the CP."

Lieutenant Newman sighed, putting aside thoughts of a cup of coffee in the maintenance van and a few hours sleep before his crew's next van shift, and walked to the BCC as he buckled on his webb gear.

Captain Brown looked up from the coded message format sheet as Lieutenant Newman came in.

"Sir, Specialist Gonzalez said you wanted to see me."

"Yes, Jim, we just got a movement warning order from battalion. The XO is tied up at battalion trying to straighten out our missile resupply and parts supply problem, so you're elected to recon the new position."

"Yes, Sir," said Newman, trying to remember what they'd said in his RSOP class at Fort Bliss, and began making notes as Captain Brown briefed him on the situation (enemy and friendly), mission, execution (including the recon plan), service support, and command and signal. Lieutenant Newman made notes on his map on the new location, route, start point, checkpoints, and release point. He shook his head "no" when Captain Brown asked if he had any questions.

As he left the CP, Lieutenant Newman, remembering his basic course days, thought, "What do you do now, Lieutenant?"

SFC Washington met LT Newman coming out of the CP and reported, "Sir, the Old Man told me we had a movement warning order and that you would be going with us. I've got the recon party together in the mess tent so we can have a cup of coffee while you brief us."

LT Newman said a quick thank you prayer for good NCO's and replied, "Good, Sergeant, let's go."

As they walked toward the mess tent, SFC Washington handed LT Newman a briefing folder, saying, "Sir, this is the battery RSOP SOP, your CEOI, crypto material, some paper for strip maps, vehicle loading plans, and an outline for your briefing. We've been at this reconning for a while so we know pretty well what to do. I'll brief you on what the recon party personnel do before your briefing, and afterward I'll show you the equipment and vehicles during your safety inspections before we pull out. If you have any questions, just ask."

LT Newman thanked SGT Washington, deciding he might just make it without having his career ruined after all.

In the tent, after someone handed him a cup of coffee, LT Newman sat down with the folders, his notes from the BC's briefing and from SFC Washington, and began his preparations. After explaining the route and new locations to the NCOIC, Newman had him make strip maps for each vehicle while he put the briefing together, referring to the battery SOP and asking SFC Washington questions on procedure. A few minutes later he was ready and began the briefing.

"Men, we are presently in a defensive operation with the main enemy forces located north of the FEBA, as shown on this map, 20 km north of our present location. The enemy forces are composed of four divisions from the 1st Aggressor army. We can expect enemy air action in our sector at any time. Air defense suppression runs are expected to begin no later than 0600 tomorrow; however, remember that we are subject to this type of enemy action at any time. There are reports that local enemy sympathizers will probably try to disrupt our operations with guerrilla activities."

"We are in direct support of the 52d Mech Division which will conduct the main attack at 0500 tomorrow. Battalion HQ and BOC are located at PA825236, B Btry at PA832249, C Btry at PA916285, and D Btry at PA855410. We are located at PA710427."

"Our mission is to provide low to medium air defense for the 52d Mech Division. To insure the battery can give the best possible coverage, we are going to move to a new location here at PA763458."

"We will depart this location at 1600 to recon the route and new site location. SFC Washington has a strip map for each vehicle with checkpoints noted on it. I will notify the battery as we clear each checkpoint. Insure that you maintain a 100-meter interval between vehicles and have an air guard on alert."

"When we arrive at the new location, offload your vehicles and conduct a security and NBC sweep of the area. SGT Smith, you are in charge as security NCO. After the area is secured and outposts set up, guides will return to my location to assist in the layout of the battery. SGT Smith, the guides will act as the reaction force if necessary. After equipment locations are picked, I will shoot the known reference point (KRP). The equipment guides will verify distances and set up marking stakes, using night marking devices since the battery will arrive after

dark. SFC Washington, I want you and the admin guards to spot locations for the motor park, mess hall, latrine, and bivouac area."

"As a reminder, if we are attacked by ground fire while in convoy, keep moving and return fire from your vehicles; if we are attacked by aircraft, herringbone off the road, dismount, seek cover, and return fire according to SOP."

"Extra ammo, food, and water will be distributed among the three vehicles. Each of you should have one C-ration meal, a full canteen, and your ammunition basic load. The mine detector and NBC gear will be in the second vehicle. The M2 aiming circle, equipment stakes, engineering tape, etc., will be in my trailer."

"Signals are per SOP except for ground attack. The ground attack signal will be small arms fire. Current CEOI's are in effect. I have a copy and Washington has a copy. Primary communications with the battery will be by the FM radio located in my vehicle, Washington in the second vehicle, and Smith in the last vehicle."

"Are there any questions?"

There were no questions, so LT Newman continued, "SFC Washington and I will inspect the vehicles now and meet you there at 1555 to leave. It is now 1530."

As he started outside, he could see SFC Washington smiling as he came toward him. Washington led him to the vehicles where they checked the loading plans, blackout drive, turn signals, and brake lights of their vehicles and ran a commo check with the CP.

LT Newman then reported to CPT Brown, "Sir, we are ready and plan to leave at 1600."

"Sounds good," CPT Brown replied, "let me know when you clear the checkpoints and when you have completed the reconnaissance. We have a tentative release time of 1730 and I hope to leave here no later than 1830. Do you have any problems?"

"No, Sir."

"Good luck, I'll see you about 2000."

LT Newman returned to the recon party, had them load up, and led them back to the main road and toward the new battery location.

The party arrived at the new location without incident and quickly accomplished its security sweep and NBC checks. After quickly walking over the area and discussing the possibilities with SFC Washington, LT Newman spotted the locations for major items of equipment—the ICWAR on the little knoll and the IHIPIR's along the ridge. He checked for radar minimum mask distances and launcher safety distances while the equipment guides placed the stakes and measured to be sure the cables would reach.

When he was satisfied and SFC Washington nodded in agreement, LT Newman took the aiming circle and moved to the IPAR stake to shoot the KRP, reminding himself to orient the battery to true north. Using a church steeple about 5 km away, he shot a KRP of 1636 and a night/low visibility KRP of 3624 to the right side of a telephone pole 500m away, then recorded these in his note book.

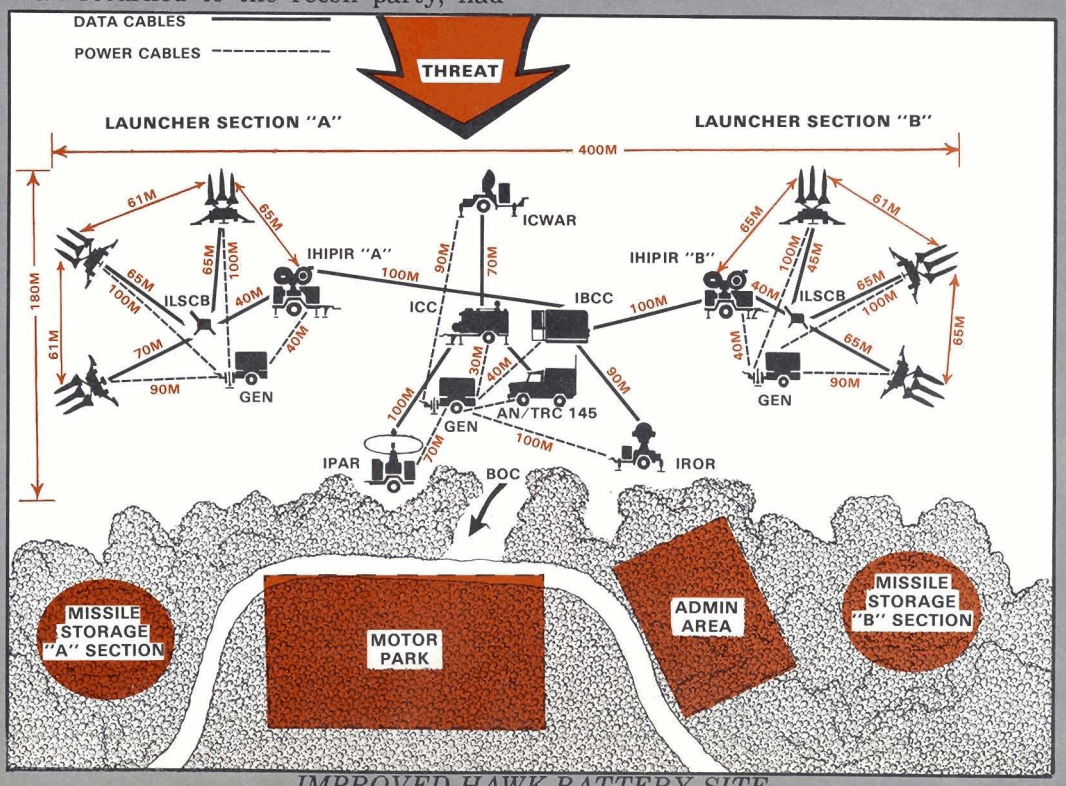
LT Newman was on the radio informing CPT Brown that he was ready when SFC Washington returned from spotting the administrative areas.

Newman and Washington used the time while waiting for the battery to thoroughly brief the equipment guides to preclude any random involvement, improve the OP positions, lay perimeter wire for the ground defense, check flashlights and night marking devices, run engineer tape along the routes to equipment locations, and to eat supper and relax a few minutes.

The main body arrived and with little confusion occupied the new position and rapidly became operational.

Later, over a cup of coffee in the CP, CPT Brown slapped LT Newman on the back saying, "Good job today, Jim, you'll be an air defense officer yet. Isn't it time for your shift in the van?"

"Yes, Sir," replied LT Newman as he picked up his helmet and headed out to relieve LT Mills in the BCC.



IMPROVED HAWK BATTERY SITE

DIVISIONAL AIR DEFENSE -

HOW MUCH IS ENOUGH?

LTC WILLIAM O. STAUDENMAIER

The views expressed in this article by the author do not necessarily represent the views of the US Army Air Defense School or the Department of the Army.

There is a growing feeling among military analysts that the day of the long conventional war is past. Norman R. Augustine, Assistant Secretary of the Army (R&D), in Congressional testimony, has stated: "The Soviet Union and Warsaw Pact forces are blitzkrieg oriented. All of their offensive tactics are based on rapid penetration and exploitation. Hence, our fortunes in a conflict of this nature are predicated on the weaponry we can bring into play immediately." In a very real sense, in a future European war, the first battle and the last battle may well be the same battle. The short duration of the Arab-Israeli war was a preview of the future that pointed out the indispensability of forces in being, particularly air defenses. During the 1973 Middle East war, the Arabs, using Soviet air defense weapons and tactics, fielded thousands of sophisticated SAMs and AAA that initially provided freedom of action to their maneuver units. Even today, the Egyptians have more air defense weapons deployed in the Sinai than the United States has in its entire inventory. While proliferation is the answer, there is obviously a limit. How much is enough? — depends on the mission of the air defense forces, the quantity and quality of the air threat, the characteristics of the air defense weapons, the conditions of their use, and the proficiency of weapon crews.

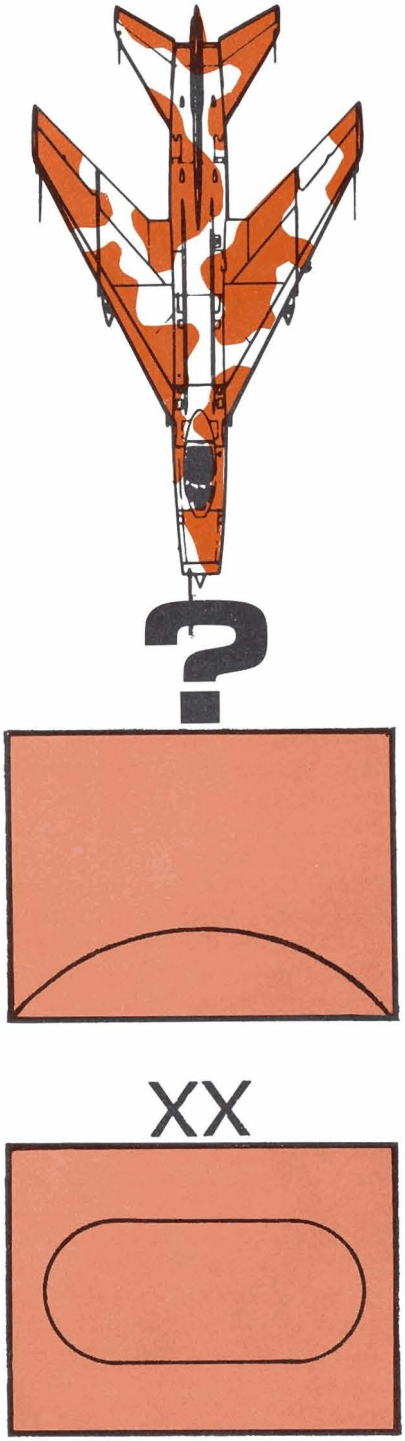
Ground-based air defense forces may be given the mission to deny penetration of friendly air space by hostile aircraft or the more limited one of assuring freedom of action for the maneuver units. The first mission implies an attrition role and the second a damage-limiting one. The mission selected will dictate the characteristics of the weapon system needed. The accompanying table shows some of the weapon systems' characteristics for each mission, based on currently fielded weapons. U.S. air defense systems planned for the 1980's promise to upgrade the radar, fair weather, and visual restrictions of the damage-limiting air defense weapons, which will make the difference between attrition and damage-limiting systems less distinguishable. Examples of these types of weapons are the SA-6, Roland II, Crotale, Rapier with Blindfire, and the 35-mm Oerlikon-Contraves antiaircraft tank.

The long- and medium-range air defense systems that are assigned to the theater army and corps — Nike Hercules and Hawk — as well as their planned successor, PATRIOT, can perform the attrition mission appropriately. However, the nature of division tactics, which is mobility and mission oriented, requires air defense weapons that can move and fight with the division in the battle. Because air defense weapons cannot guarantee the inviolability of the division's airflank, and because the pace of division operations frequently precludes deliberate, centralized air defense operations, divisional air defense must orient on mission accomplishment by limiting the damage to those *people and things* that contribute most to it. So the damage-limiting mission of divisional air defense can be stated as the neutralization of the hostile air force's ability to interfere with the freedom of maneuver of the ground forces.

Speaking of the air threat to NATO, General George S. Brown, Chairman of the Joint Chiefs of Staff, estimated that the Warsaw Pact would hold a 2:1 edge over NATO air forces during the opening stages of a future war. Thousands of these Red aircraft are located less than 1 hour's flying time from NATO's critical Rhine River logistical and airfield complexes. More ominously, the quality of the Communist tactical air threat has progressed rapidly since 1965. Today, the new Soviet aircraft, which are replacing older models opposite CENTAG, are better at ground attack missions. The FENCER, a much improved version of the SU-7B FITTER, and the MIG-23 FLOGGER are designed for low-level strike missions in a heavy ECM environment. The USSR has fielded its first attack helicopter, the Hind-A, which, together with the increased performance of the new low-level strike aircraft, has increased the threat to NATO's maneuver units to the point that for the first time in over 30 years the US soldier may have to face enemy air attack. Today, this low-level strike threat is generally limited to clear weather conditions, but with the rapid improvements in terrain-following radars, navigational aids, and aircraft attack systems, the day is not far off when even the mobile divisional forces will be in danger of accurate air attack, even under adverse weather conditions or at night. Certainly, forward area air defense systems programed for the 1980's must possess an all-weather capability.

The Soviet low-level attack profile features aircraft approaching the division at altitudes below 300 meters and at speeds of about Mach 1. The aircraft will rise only slightly higher to begin its ordnance run and will slow to 300-400 mph to release its napalm, missiles, or fragmentation bombs. This won't allow a gunner much time to acquire, identify, track, and fire at an attacking enemy. Foreign military analysts believe the acquisition-to-fire time in Central Europe will vary from 25 seconds in the relatively flat northern plains region to about 10 seconds in the more hilly and broken region that characterizes much of the U.S. area of responsibility to the Federal Republic of Germany.

The low-level air defense problem is complicated by this short acquire-to-fire reaction time, coupled with the increasing qualitative threat of Soviet aircraft which are able to fly lower and faster in adverse weather than was thought possible a few short years ago. The fact that the armies of the world are increasingly turning to surface-to-air guided missiles to solve this problem does not signal the demise of the AAA gun, since the experience of the Middle East war indicates that a mix of AAA and SAM's is needed to solve the air defense problem in the forward area. In fact, the air defense gun accounted for



almost one-third of the Israeli aircraft losses during that war. The air defense gun for the 1980's should be an all-weather, 20-40 millimeter weapon, mounted on an armored vehicle, with a combined rate of fire from all barrels of at least 1,100 rounds per minute. This would give the gun a high kill probability out to a range of 4,000 meters, enabling it to engage standoff attack helicopters armed with antitank guided missiles. It should have on-board acquisition and track radars and an electronic IFF capability that would shorten the acquire-to-fire reaction time to about 10 seconds. It must have built-in ECCM and an optical backup feature to enable it to function in a heavy ECM environment. This gun, serviced by a protected crew of 3-4 soldiers, must have a short emplacement/displacement time on the order of 5-10 minutes, must have tracked mobility, and must be able to engage hostile aircraft while on the move.

Similarly, the SAM must be forward firing out to a range of 5-6 kilometers and have tracked mobility and armor protection. It requires the same radar, IFF, and quick reaction requirements as the gun and should be capable of firing a second missile within 5-10 seconds after launch of the first missile. Its kill probability should be on the order of 85 to 90 percent.

The shortcomings of the current divisional air defense weapon systems (Chaparral and Vulcan) will largely be overcome as weapons similar to the ones described above come into the Army inventory. The Roland II, whose design has been selected for the Army's replacement for Chaparral, should fill the bill as the division's SAM system. Primarily, it overcomes the Chaparral's inability to engage in adverse weather, and the Roland II can engage hostile aircraft on an inbound course. While a new air defense gun has yet to be developed to overcome the limited range and low kill probability of the Vulcan, the Army is moving in the direction of an all-weather, radar-directed gun. The Oerlikon-Contraves 35-mm tank is the type of divisional air defense gun that could do the job, although this is purely a personal view. Given the type SAM and air defense gun described above, one other divisional weapon should be considered — the self-defense SAM. The primary drawbacks of this type weapon, which were dramatically illustrated by the poor performance of the Soviet SA-7 during the Middle East war, are the low-explosive charge and the tail-chase characteristics that caused Mr. Augustine to refer to our Redeye as a revenge weapon. Stinger is being engineered to correct these deficiencies. The Swedish Army is experimenting with a laser assisted, man-portable air defense system — the RB-70 — that has promise for the future.

Assuming that weapons similar to those described are fielded, the next question is how would they be employed? Essentially, there are three methods within the division: point defense, unit defense, and defense of assets within a given area.* Point defense is normally used to defend well-defined, relatively static targets such as logistic complexes, division headquarters, or nuclear launchers. Unit defense, as its name implies, is the defense of a specific unit such as a cavalry squadron; or an infantry, armored, or field artillery battalion. Defense within an area is coverage of assets within a geographic area, regardless of the units that pass through it. Route defense, although not included as a special type of defense, can be either unit or area, and often is a combination of the two. Conventionally, SAM's have generally been given an area mission in the division and air defense guns have fulfilled the point and unit defense missions. However, given the damage-limiting mission that was

Current terminology is critical assets and organization defense.

discussed earlier, divisional SHORAD units should use either a point defense or unit defense mission. The philosophy behind mixing both SAM's and guns in unit and point defenses is that with limited air defense resources we will be defending well those "people and things" that the commander feels are important to his mission. Experience with Chaparral indicates that the large tactical area of a division, and the need for mutual defense for air defense weapons, made it almost impossible to achieve a suitable area coverage of the committed brigades, let alone the entire division area.

But how much is enough? Clearly, one battalion at division is not enough. Even after World War II, which was characterized by guns for air defense and almost complete air supremacy, many US combat commanders stated that the division needed at least two air defense battalions. Russia and her satellite armies are wedded to a doctrine of air defense proliferation in the forward area. A Soviet Army group in Europe would field 80 AAA batteries and 17 SAM batteries, which does not include either the SA-7 or SA-3. The Arabs, during the 1973 conflict with Israel, deployed an air defense regiment with each division, a battalion with each separate brigade, and 75 more nondivisional battalions of SA-2, SA-3, and SA-6 SAM's. Clearly, this level of effort is inconsistent with the damage-limiting mission.

If this level of effort is too much and the current 48 weapon systems are not enough, how, then, should the division be organized for air defense? I propose an organization consisting of 36 missile fire units and 36 AAA fire units, organized as shown in figure 1. There would not be any change to the current organization of a Hawk battalion. The general support (GS) battalion would be composed of 2 missile batteries of 12 fire units each and 1 gun battery of 12 air defense guns. It would habitually operate in the division rear protecting the division CP, the GS field artillery battalions, logistical complexes, the MSR, and critical bridges. It would also coordinate with the Hawk battalion, affording it additional protection in much the same way that the Arabs used the ZSU 23-4 to assist the SA-6 during the Middle East war.

The direct support (DS) battalion would be organized into 2 gun batteries of 12 guns each and 1 missile battery of 12 fire units. Each battery would be identified with a maneuver brigade and would

DIVISIONAL AIR DEFENSE

(DIVAD)

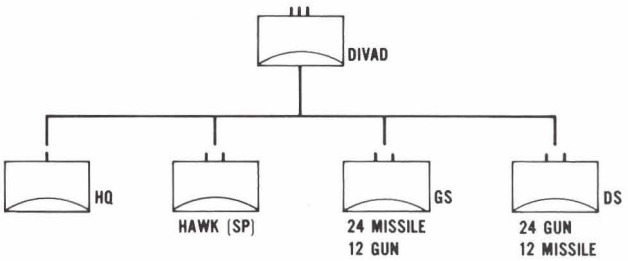


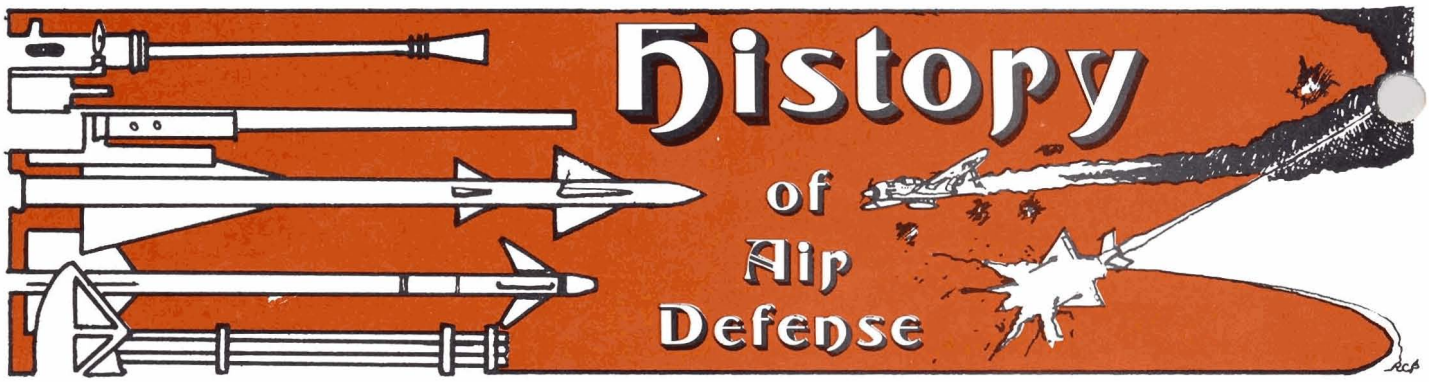
FIGURE 1

normally operate with that brigade. The missions assigned the DS battalion would normally be organizational defense. Both the DS and GS units would form air defense task forces by crossattaching missiles and guns, both inter- and intrabattalion, in much the same way that brigades combine armor and infantry companies into battalion task forces.

The Hawk battalion would be used in the same way as if it were supporting the division under current air defense doctrine. Making it organic to the division gives the division commander control of the resources required to protect his air flank; however, the same effect could be achieved by Hawk being assigned to the division in a DS role from corps or theater army assets. The point is, the division needs LOMAD protection that it can count on, primarily to extend the commander's influence over objectives that may be 30 kilometers or more deep in the offense, to protect the cavalry squadron in the defense, or to conduct movement to contact operations. The MANPAD (Stinger or Redeye) would remain organic to the maneuver and field artillery battalions, but would be under the operational control of the DIVAD commander, who would exercise his control through the DS and GS SHORAD battalion commanders.

The object of this article has been to stimulate discussion on division air defense organization. Obviously, more detailed discussion is needed before any organization or doctrine is adopted. However, my conviction is that the Army needs divisional air defense forces of the type and magnitude described, either organic or supporting, to allow the division the freedom of movement it needs to accomplish its combat mission.

Lieutenant Colonel Staudenmaier has had several major articles published in service magazines dealing with a variety of military subjects. See the April-June 1975 issue of TRENDS for his article, "Learning From the Middle East War." Formerly assigned to the Ballistic Missile Defense Program Office, Headquarters, Department of the Army, he is currently an instructor at the Army War College.



The capture of Antwerp and the opening of port facilities there provided the Allies with their only port facilities besides those established at the various Normandy beachheads. Antwerp rapidly became the main supply base for the 12th and 21st Army Groups, and its importance to the Allied forces was recognized by the Germans. One of the prime objectives of the German Ardennes offensive, launched in December 1944, was the capture of Antwerp.

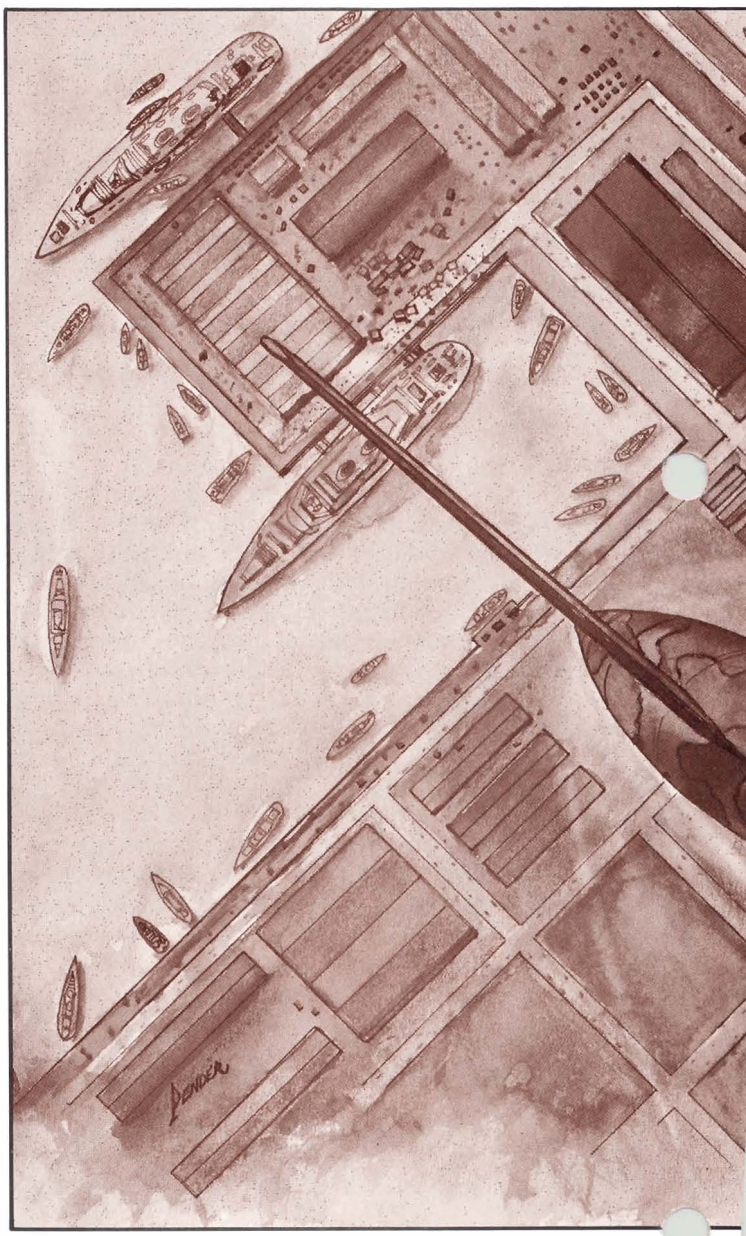
Antwerp V-1 Defense (1944-1945)

German attempts to neutralize Antwerp and its port facilities began on a large scale on 24 October 1944, when the first V-1 was launched against that city from sites to the east and southeast. The attack was almost continuous until 30 March 1945, with approximately 4,883 V-1 missiles launched against the single target city of Antwerp. Only 211 V-1's fell within the designated Antwerp vital area.

The antiaircraft defenses of London against V-1 attacks had proven so successful that antiaircraft units were used as the primary defense of Antwerp. The V-1 missile flew at altitudes from 450 to 9,000 feet (average about 3,300 feet) and at speeds from 250 to 400 mph (average about 360 mph), thus placing its performance capabilities well within those of AA guns and automatic weapons and associated fire control equipment. In addition, V-1's attacking Antwerp presented an ideal target in that they flew on a predetermined course and in relatively straight and level flight at constant speed. Approach routes to Antwerp from the launching sites were determined, and available units were sited in depth along these routes outside of Antwerp.

Antiaircraft units used in the Antwerp V-1 defense were equipped with the 90-mm or 3.7-inch gun, the 40-mm gun, the caliber .50 machinegun, and searchlights. A few 20-mm guns were used. By 6 December 1944, the defensive strength included over 11,500 personnel. By 10 March 1945, the number of American and British weapons available was as follows:

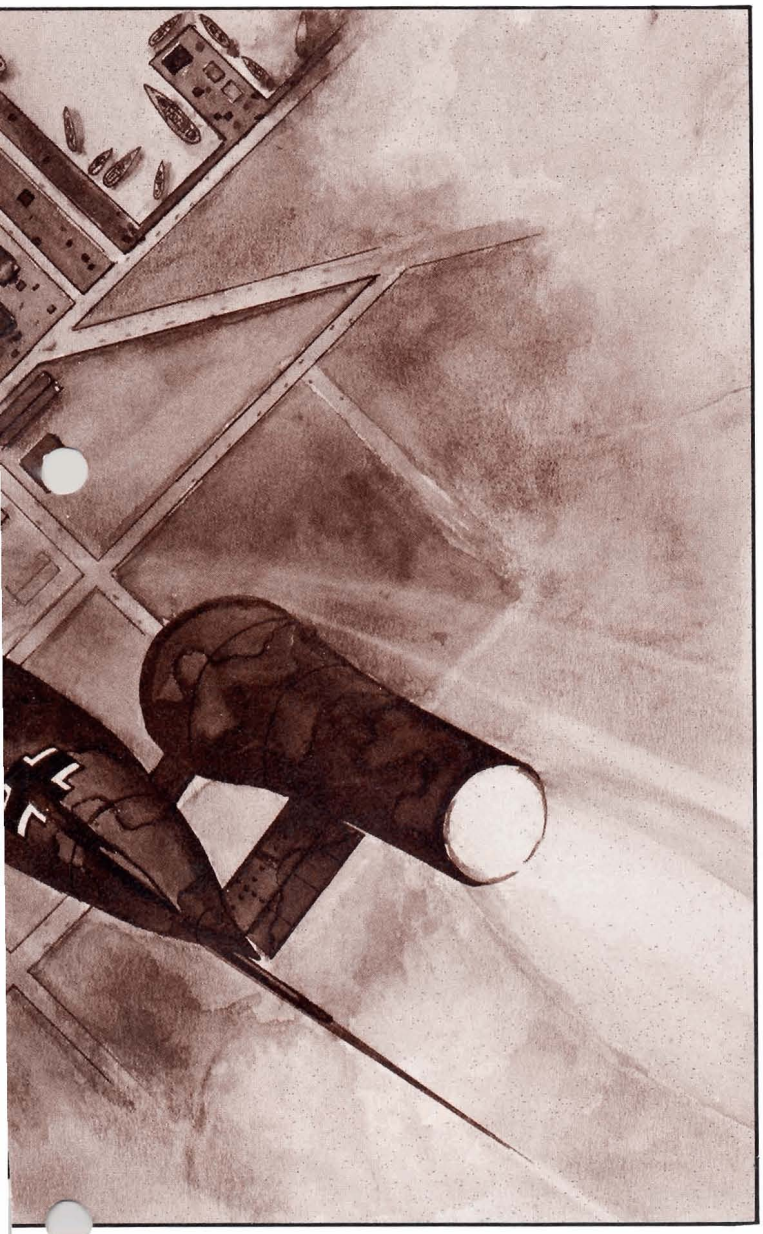
90-mm guns	208
3.7-inch guns (British-manned)	128



German V-1 "flying bombs" were used to make a fi

Automatic weapons	188
Searchlights	72
Caliber .50 machineguns	Many

Although the Antwerp defense against the V-1 threat was primarily by antiaircraft weapons, the effectiveness of the defense was degraded considerably in the early days of the action by restrictions placed on fire to protect friendly aircraft operating in the area. There were a number of airfields in the vicinity of Antwerp which complicated control and protection of friendly aircraft from antiaircraft fire. Until 5 November 1944, weapons were either totally restricted from firing to protect friendly aircraft or were limited to targets visually recognized as V-1's. During this initial period, adverse weather prevailed, making visual recognition difficult. In addition, deployment of units was being made, and the size of the area within which they were located was increasing. Because of these factors, V-1 defenses at Antwerp (and a similar defense by the British at Brussels) at first achieved a rather low degree of effectiveness.



nonth air assault against the vital port of Antwerp.

To eliminate this mutual interference, an Inner Artillery Zone was established to include the area covered by the defense and the adjoining area in the directions of approach of the V-1's. Although this reduced mutual interference, friendly aircraft continually violated the limits of the Inner Artillery Zone. Data available for the period 26 November - 11 December 1944 indicated that 375 friendly aircraft in 129 flights violated the zones.

During the latter stages of the defense, the Germans attacked Antwerp from the north, as well as from the southeast and northeast. Deployments were changed to meet the newer threats. The northern attack direction was in the vicinity of a large Allied airfield located north of Antwerp. To eliminate interference with the antiaircraft defense, the airfield was closed to air operations.

Antiaircraft provided a highly satisfactory means of defending Antwerp from attack by the V-1 missile. Weapons, fire control systems, and searchlights available for use were capable of battlefield operations to match the capabilities of the enemy missile system. Gun batteries, equipped with the SCR-584 radar and M9 director, were able to place accurate and sustained fire against individual missiles within range of the guns during day and night operations, including inclement weather and times of poor visibility. Use of the proximity fuze increased the effectiveness by at least 10 percent over results obtained with the mechanical time fuze.

When automatic tracking with the SCR-584 was used, there were times when track was broken by the clutter of shell fragments in the vicinity of the target. Some modifications (N-squared gate, 16-pole changeover switch) improved the tracking capability in such cases; however, optical tracking, with no decrease in effectiveness, was frequently required as backup to radar tracking when radar was unable to maintain lock.

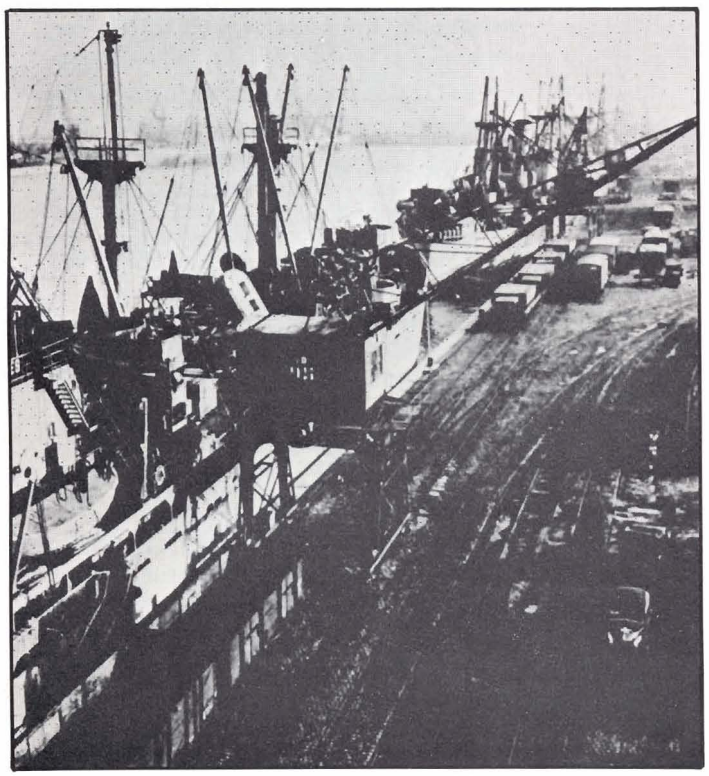
An early warning system of visual observers and surveillance radar was established and maintained to provide warning of the approach of V-1's. Searchlights were used to illuminate targets at night, primarily for automatic weapon units, since AA gun units could detect, track, and fire effectively on unseen targets.

Units were deployed astride known V-1 approach routes to the Antwerp vital area, a circle of 7-mile radius. Deployment was changed to meet new directions of attack. In the early stages of the defense, all V-1's within range of defending weapons were engaged. Later it was determined that V-1's approaching the outer edges of the antiaircraft defenses on headings which would insure that they would not

strike the vital area, were not, in fact, a threat to the vital area. These targets were referred to as flankers and were not engaged, or, in some cases, engaged only one or two batteries. Priority of fire was given to those targets approaching on headings that would pose a threat to the designated vital area.

V-1's flying at altitudes of 3,000 feet or below avoided the full-range capability and mass of fire from gun batteries; however, the lower altitudes increased their vulnerability to concentrations of the more short-range fires of automatic weapons. In this manner, the use of both guns and automatic weapons in the defense allowed the capabilities of each to offset the limitations of the other. The mobility of AA weapons allowed the defensive strength to be shifted quickly to meet new and expected threats from various directions. This capability also allowed for rapid massing of defensive strength and for rapid withdrawal of units to meet more serious threats in some other battle zone.

The use of antiaircraft as the primary defensive means eliminated the requirement for large numbers of interceptor aircraft, thereby making them available to support other actions. Use of interceptor aircraft in the V-1 defense of London had proven certain limitations in countering the V-1 threat. The low altitudes of the V-1's limited attacks on them from below and made attacks from above dangerous because of the possibility of the diving aircraft striking the ground after completing the attack. These limitations were even more serious during darkness which had no effect on the reliability of the V-1 system. Periods of low visibility severely limited interceptor capability to detect as well as attack the V-1 missile.



During the period 22 October to 3 November 1944, 71 V-1's were engaged, of which 19 (26.8 percent) were destroyed. Late on 1 November, a restricted area against friendly aircraft was established which covered the likely routes of V-1 approach to Antwerp. This allowed antiaircraft units almost complete freedom of engagement, and highly successful and continually improved results were obtained. During the period 10 November to 6 December 1944, 92 percent of V-1's within range of the defense were engaged and 57 percent were destroyed. Of those which threatened the vital area, 87 percent were destroyed, and only 13 bombs landed within the vital area.

During the period 6-27 January 1945, 74 percent of 360 V-1's were engaged, and 54 percent of those engaged were destroyed. Of 153 of those engaged which definitely threatened the vital area, 103 (67 percent) were destroyed, while only 17 continued through the defense and landed in the vital area.

On 16 February 1945, the day of heaviest activity, 41 (56 percent) of 73 vital area threats engaged were destroyed. On 23 February 1945, the second heaviest day of activity, 61 (88 percent) of 69 vital area threats engaged were destroyed. During the last 6 days of the attacks on Antwerp, 25-30 March 1945, 78 (94 percent) of 83 vital area threats engaged were destroyed.

For the entire period, 1,766 (70 percent) of 2,523 vital area threats engaged were destroyed. Of a total of 4,883 V-1's launched against Antwerp, only 211 (4.3 percent) hit the vital area.

Field Marshal B. L. Montgomery highlighted the success of the Antwerp defense in a letter of 12 April 1945 to United States BG C. H. Armstrong, commander of the 50th US AAA Brigade which operated the Antwerp defenses, in which he stated, "Success of the defense kept in full operation on the main supply base for 12th and 21st Army Groups has profoundly influenced the present battle and made the success of present operations administratively possible."

Although large amounts of antiaircraft equipment, ammunition, and personnel were required, the effectiveness of the defense was so great that it more or less rendered the V-1 obsolete for such a tactical situation. The defense of Antwerp again proved that the SCR-584 radar, the M9 director, and a power controlled gun were the most suitable equipment to cope with a missile of this type. The SCR-584 automatic tracking radar and the proximity fuze were the most notable equipment developments which accounted for the defense effectiveness.

Despite heavy attacks from the German "V" weapons, the port of Antwerp discharged cargo which was badly needed by the forces fighting along the German frontier.

Principles and Practices of Leadership

GENERAL GEORGE V. UNDERWOOD, JR. (US ARMY RET)

This article is adapted from a recent address by General Underwood at Fort Bliss, Texas before an audience of officers and senior enlisted men.

Introduction

Leadership is an awkward subject to discuss. Anyone who talks on the subject automatically appears to present himself as an expert when, in fact, there are very few real experts on this slippery subject. I certainly don't profess to be an expert, but I have had some experiences that may shed some light on the principles and practical aspects of leadership.

If I say something that appeals to you, fine — it's yours for free. But be sure it will fit you as a specific person because the style and technique that work for one person can be unnatural and ineffective for someone else. If I say something that you disagree with, then discard it as excess saliva from a worn-out pachyderm.

One further point—I think it is more important to develop yourself as a person than it is to invent what you think will be effective leadership devices. The higher you rise in the Army, the more your responsibilities increase, thus it becomes more important to have a sound character, a good mind, a wholesome moral outlook, a solid professional base, and a genuine concern for the soldier than to have the cutest bag of leadership gimmicks.

So much for the warmup. Now here comes the pitch. My game plan is to discuss certain principles, or self-evident truths, and certain practices, good and bad, which I have observed or applied.

Be of Strong and Sound Character

The first principle is to be of strong and sound character. Your ability to lead is only as strong as your character. The nature of your character sets limits on what it is possible for you to accomplish as a leader.

The most important aspect of character may be integrity. The troops will quickly discern if you have it, and your superiors will soon discover if you lack it.

Integrity was the main root of General Marshall's strength as a leader. He was a man of towering intellectual honesty, interested only in the best solution to a problem based on open-minded examination of the merits of the issue. General Marshall never stooped to consider what would be the most popular solution or what would advance his own self-interest. His basic concern was always what was best for his command, his troops, his Army and his nation, and not the fallout on him personally.

At any rate, without basic integrity you cannot face facts or live comfortably with yourself. Integrity you must have, if you are to enjoy the confidence and respect of your troops and staff.

Integrity involves not only refusal to cheat or steal or tell an outright lie, but whether you have intellectual honesty. Will you conceal your mistakes or will you admit them candidly? Will you tell your superiors what the situation really is or what you think they would like it to be? Are you willing to tactfully disagree when you think a wrong decision is about to be made? Will you be true to your convictions, even if you think they are unpopular with your boss? Will you fight for what you think is right as long as a subject is open for discussion? Your answers to these questions will reveal much about what sort of leader you might become.

Know Your Job

My second principle is to know your job. This is another way of saying be professionally competent. For an Air Defense Artillery officer, knowing your job means especially to know your equipment, tactics, and doctrine. Without such knowledge, you will never be a real commander; the best you can ever become is a confused manager.

I don't mean that you have to know how to repair equipment, but you must be able to determine if it is operational and if it is working within prescribed tolerances.

Incidentally, I found that a frequent cause for a nonop missile unit was a platoon or battery commander who was so deferential with respect to the technical expertise of the maintenance personnel that he would accept their reports as to the condition of the equipment on faith, without running his own checks. This is the short route to failure and overlooks the fact that no human is above error or letdown. The readiness inspection is the commander's best friend, and it gives the Air Defense Artillery a better check of equipment and personnel readiness

than is possible in any other combat arms branch in the Army.

When the commander, and now I'm talking about the battalion commander on up, when he himself goes out and conducts his own inspection and then critiques it with the inspected unit, he reaps a lot of dividends. He not only gets his own direct measure of the true state of readiness of the command, he not only finds out if maintenance and crew checks are being properly and faithfully performed, but, best of all, he is able to demonstrate what he thinks is important. And you all know that what the commander emphasizes is what gets done. I don't mean that the commander should replace his normal inspection team, but I do mean that he should gather up some help and go out and get his own readings periodically. If he doesn't, he is flying blind and headed for trouble eventually.

Turning now to another aspect of knowing your job, if you are really to learn your job as an Air Defense Artillery man, you must not be afraid to ask questions. Too often, officers hesitate to ask questions of the more seasoned hands around them, thinking this to be a sign of ignorance or weakness. Not so at all. There is a limit to how much you can master through self-study alone, especially where complicated gear and advanced techniques are concerned. Actually, asking questions has a hidden benefit. You will find your interest appreciated if you have in fact done some homework and your questions are worthwhile. But in the process of asking them, you will also find out who knows his business and who is faking or confused, and this is high-value information to the commander who wishes to avoid ugly surprises and guard against euphoria brought on by overly optimistic reports of others as to the state of his command.

You can't count on the Army being able to send you to school every time you need to know something new or every time there is a new development in your branch. You have to fill the gaps on your own by self-study and by asking pertinent questions of the right people.

In my case, I was confronted with four different and drastic changes of equipment during my time—seacoast artillery guns, antiaircraft guns, surface-to-air missiles, and antiballistic missiles. The best I could ever get was a short orientation course at Bliss on my way to an unsuspecting unit. Thus, in each assignment to command duty up through the grade of lieutenant general, I had to and did take time out early in the game and turn myself over to the experts in the command and challenge them to teach me what I needed to know to be up-to-date on the equipment. In fact, you're looking at a commander who was trained informally, on-the-job, by countless helping hands.

Set The Example

The next axiom on my list is—set the example for your command. The troops, the staff, the subordinate commanders, all look to the commander's personal actions as a key to him as a person, as an index to the behavior he expects from the command, and as an indication of what he considers important. I seldom found a unit that needed much prodding to get it moving. Most outfits are eager to do what's wanted, if someone will only give them a clue as to what ought to be done and in what priority. When you find a unit that is floundering or dispirited, you will also find, more often than not, a commander who has confused that unit as to what is desired.

I mentioned earlier that what the commander emphasizes is what gets done. But the commander must be careful that what he emphasizes is what he really wants done, or, given the natural responsiveness of the American soldier, he can get the command marching smartly in the wrong direction.

The commander must also be careful that he does not emphasize more things than the unit can possibly accomplish, with the result that the unit is overwhelmed. There is a finite limit to how many home runs people can hit per day.

During my time of command responsibility I observed that ADA commanders naturally stressed care of equipment and readiness to launch missiles. This is understandable and of high importance. However, I must also say that I found too many commanders whose personal example did not show comparable concern for the well-being of the soldier. Now, no one really enjoys inspecting messes, supply rooms, day rooms, barracks, and recreational facilities as much as checking the unit's ability to engage targets, but the commander at any level who overlooks these things is risking the respect and confidence of the soldier. The soldier will interpret the commander's slighting of these areas as indifference toward his welfare and his importance as a human being. Eventually, this indifference will rub off on his motivation and the way he performs. So set the example, but be careful where you put the emphasis because this determines the response you will get from the command.

Be Accessible

My next point—be genuinely accessible to those who look to you for leadership. We all probably agree on the wisdom of this principle, but violation of this principle is responsible for many breakdowns in leadership. The soldier who writes his Congressman is apt to be the soldier who has difficulty seeing his commander. The subordinate commander who needs guidance with a tough problem but can't make timely contact with his boss is apt to be the one who goes off on his own, without benefit of counsel, and goofs off with some unsound action. And the staff officer who wants to alert his commander to some potentially bad news but can't get in to see him is left with a bomb ticking in his hands and no way to defuse it.

Interestingly, all commanders agree on the need to adopt an open door policy, but they don't always check to make certain that their open door policy is not being nullified by a closed door policy on the part of their 1st Sergeant, or executive officer, or chief of staff. Granted, the commander can't see everyone instantly, but he had better institute a system which permits people with real problems or vital

information to receive expedited handling or he'll soon be presiding over a first class flap.

Look at Your Command and Staff From the Bottom Up

Being accessible is fine, but it is no cure-all for the commander who wishes to stay abreast of the situation within his own command. Which brings me to my next point — the need for the commander to get away from his desk and look at his command from the bottom up.

You simply can't sit at your desk and operate off oral and written reports from others. You must get out to the end of the line and look back on your operation. When you do, you will often find that the view from the bottom up is more realistic and less comforting than the view from the top down.

One problem with operating primarily from your desk is that you will not learn about bad news in time to deal with the consequences effectively. Even the best of people hesitate to report bad news to the commander, primarily for fear they will be seen as partly responsible for the bad development. Good news you can wait to hear about forever because it won't get you in trouble. What you as a commander need most is a warning system that will alert you to what is going wrong so you can act before maximum harm is done. This requires the commander to encourage his staff and subordinate commanders to cut him in when they smell trouble and to assure them that they will not suffer for so doing. This is a hard sell for the commander, and the larger the command, the harder the sell.

Beware of Putting Too Much Pressure on People

My next point relates to the one just made. It was my experience that battery commanders in an outfit on alert, with few exceptions, were strongly motivated and dedicated to maintaining a high degree of combat readiness. This is probably a reflection not only of the quality of the battery commanders but also of the sense of mission that permeates a unit deployed in the field on around-the-clock alert.

Under these conditions, the commander must take care that he does not apply so much pressure and raise standards so high that sensitive, well-meaning subordinate commanders either cheat to avoid failure or overreact to correct defects. An example of overreacting to deficiencies is pertinent here.

The scene is in Europe. A Hercules battery commander has just flunked a TPI because of a violation of the two-man rule in one launcher section. How did this hard-charging, ambitious BC react? You won't believe it. He hauled off and issued instructions that for the next week the whole launcher platoon would be roped together in pairs whenever they were present in the launcher area, no matter what they were doing.

The errors here are obvious. The battery commander had the best of intentions but he overreacted and applied his overreaction to some people

who had not even been involved in the two-man rule violation.

Don't Cream Junior Officers the First Time they Make a Mistake

This leadership principle, all lieutenants will find mighty acceptable. The best way to amplify this principle is to quote General Omar Bradley.

Years ago he made a speech to a military audience in Washington calling for restraint and understanding in handling junior officers when they erred. He said we must not be so quick to criticize young officers that we make them so cautious they would fear to exercise initiative. "Remember," he said, "that good judgment comes from experience, and experience comes from bad judgment." Reflect on that. It is worth remembering and living by. He was saying that to develop good judgment you must first live long enough to make enough mistakes to have an experiential basis for knowing what is right and what is wrong, what is sound and what is not, what works and what doesn't.

What the Army needs is not commanders who can get the job done if given the very best personnel, but commanders who can take whatever kind of people

they are given and motivate them to perform at the peak of their potential. The Army can't afford commanders who holler for top quality personnel in every position. After all, there has to be a place in the Army for average people. Which reminds me of a priceless efficiency report an infantry friend of mine received on a 2d Lieutenant. It said, "This officer may not be a very good platoon leader, but I am convinced his men will follow him wherever he goes — out of sheer curiosity." He went on to win the Medal of Honor and to become a major general.

Don't Overcontrol

This principle rests on the theory that there is a limit to how much a commander can prescribe without getting his command so tied down that it can hardly operate on its own when it must. It also recognizes that the commander who likes to direct everything personally and in great detail may reduce his command to a collection of unimaginative robots who have difficulty adapting themselves to new situations.

Pay Attention to Details

In avoiding overcontrol, the commander must not go overboard and fail to pay attention to details. Deciding how much attention to pay to which details is a tough call for the commander. If he concerns himself too much with too many details, then he drives his command wild with nitpicking and with unrealistic demands for perfection.

I may be a poor one to talk about this subject because there are probably some folks who felt that I overemphasized attention to details. They may be right and are certainly entitled to their own impressions. I'll only say this. It was my experience that the big problems are often the easiest ones to handle. The importance of big problems is usually recognized and the commander finds advice and information plentiful. Everybody likes to be in on the big ones. But I found that it is the details and the small caliber problems that can get you into trouble, particularly if you don't hop on them before they expand into full-blown crises.

The commander must learn where to strike the balance in his specific situation between overcontrol and inattention to details. This is a delicate setting indeed, but then they wouldn't call it active duty if there were no tough problems to be solved.

Make Good Use of Your Time

If a commander is to do all the things I've been talking about, then he certainly needs to make good use of his time. He can't do everything himself and he must delegate the right responsibilities to the right people. How best to use one's time is probably the one problem that plagues all commanders at all levels. A distinguished World War II cavalryman had a marvelous system for managing his paper work. "I take all the papers on my desk," he once explained, "and divide them into two piles, those that are important and those that are not. I give the unimportant papers to someone else and keep the important ones myself. Then I divide the important papers into two piles, one that consists of papers I have no chance of doing anything about and the second that includes those few papers the outcome of which I might possibly be able to influence. Again, I give the first pile to someone else and concentrate on the second pile."

Not a bad system. Try it sometime, especially if you have a lot of talented "someone elses" available to you.

Don't Lose Heart Because of Setbacks and Bad Breaks; Expect Adversity and Learn to Live With It

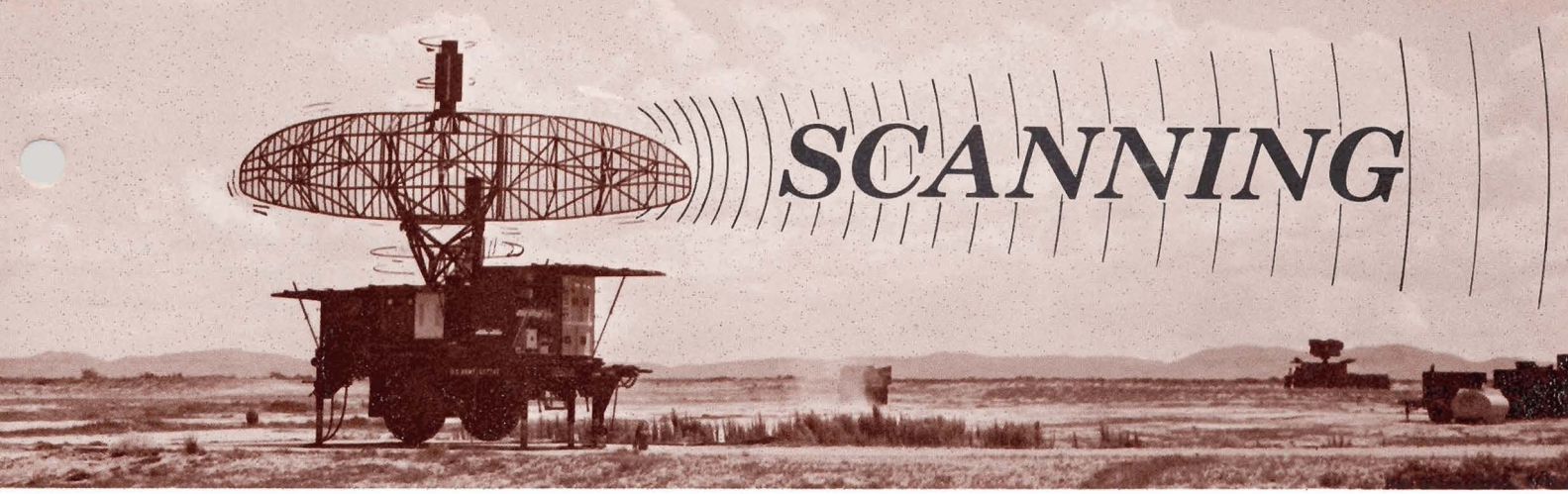
My last point is not a leadership principle, but it may be the best advice I offer today. That advice is— don't lose heart because you encounter setbacks and bad breaks along the way; expect adversity and learn to live with it.

Because life in the Army is so competitive, many officers brood excessively and become prematurely disheartened when they hit a bump along their career path. Certainly you should keep your standards high and pursue lofty objectives, but don't let the system or the occasional heartbreak get you down. Just because you run into an obstacle is no excuse to come unglued. Be resilient in the face of adversity, keep your cool and keep charging, knowing that if you continue to do your best, form will tell in the long run in the Army just as it does in a race between thoroughbreds.

I have had a number of setbacks along the way, including some harsh remarks on efficiency reports and a formal reprimand for an escapade. But, the point is — expect setbacks, don't get downhearted when they occur, keep charging, keep doing your best, learn from your experiences, and hope for compensating good breaks farther down the line.

One final suggestion. Don't toss in the towel just because you fall on your face now and then. It happens to the best of people, particularly if they are innovative and willing to exercise initiative. If this should ever happen to you, remember there is no requirement to lie there on the floor licking your wounds eternally. If you just have the presence of mind and agility to leap quickly to your feet, you will be pleasantly surprised to find how few people remember that was you on the floor a minute ago.

General Underwood is a former commander of Fort Bliss and Commandant of the US Army Air Defense School. During his long Army career, he served in numerous important high-level positions both at home and abroad. At the time of his retirement, he was Commander of the US Forces Southern Command in the Canal Zone.



IMPROVED CHAPARRAL MISSILE

The US Army Missile Command recently awarded a $21-million contract covering initial production of the Improved Chaparral missile (MIM-72C). The missile, with its new guidance system, will supplement and eventually replace the earlier model Chaparral missile now operational with Army units worldwide.

The missile has significantly improved performance. In addition to the new guidance section, it uses a fuze developed by the Army's Harry Diamond Laboratories and a warhead developed by the Army's Picatinny Arsenal. Final assembly of the missiles will be performed at Red River Army Depot, Texarkana, Texas.

FAAR IPT

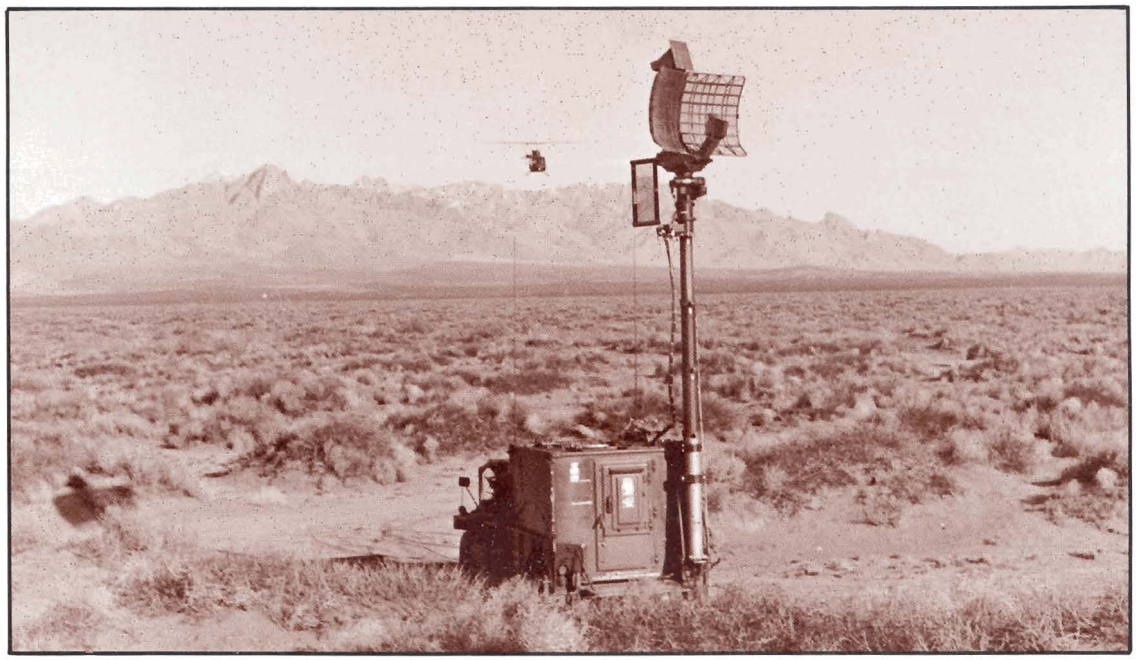
The initial production test (IPT) of the second buy Forward Area Alerting Radar (AN/MPQ-49) was started at White Sands Missile Range this summer. Under the direction of the US Army Missile Command, Redstone Arsenal, Alabama, the test will be performed by the US Army Test and Evaluation Command (TECOM) as a customer test.

As currently planned, the IPT will consist of two phases. Environmental testing will include low temperature, high temperature/solar radiation, humidity, icing, vibration, and shock. Field testing will consist of a maintenance evaluation, road testing, aircraft tracking, and hands-on troop operation. The troops were supplied by the 2d Bn, 55th ADA, Fort Bliss, Texas.

Another series of tests (First Article Configuration) will be performed concurrently with the IPT environmental tests at Redstone Arsenal by MICOM.

The units of the FAAR system to be evaluated by TECOM include the FAAR Radar AN/MPQ-49; Support Maintenance Test Set AN/MPM-57; Organizational Maintenance Test Set AN/MPM-59; and Target Alerting Data Display Set AN/GSQ-137.

The IPT will be supported for engineering services during the test by Sanders Associates, Inc. of Nashua, New Hampshire.



VULCAN TRAINING SYSTEM

A system designed to assist in training Vulcan gunners while saving dollars is under consideration for adoption by the US Army Air Defense School. Called the Vulcan Training System (VTS), it is intended for use at unit level with either the Self-Propelled or Towed Vulcan.

The VTS comprises four major components, three of which are standard in the Army inventory:

- Mini-VADS is the standard Army M134 7.62-mm minigun complete with a 3,000-round ammunition storage and handling system.
- The television trainer (TVT) is the standard closed circuit television (TV) system presently issued to each VADS battalion, consisting of a camera, TV monitor, and video tape recorder for instant replay.
- The training target employed is the radio-controlled miniature aerial target (RCMAT), 3,000 of which are being readied for Army-wide distribution through the TRADOC Training Support Center, Fort Eustis, VA.
- The Vulcan Gunner Monitor Unit (VGMU), which is designed to monitor and display the specific operations performed by the gunner during an engagement. This item is not standard in the Army inventory and must be procured along with miscellaneous items such as cabling, minigun mounting brackets, etc.

The 7.62-mm minigun mounted beside the Vulcan's 20-mm cannon and the TV camera mounted in front of the gunner's position (note gunner's helmet).

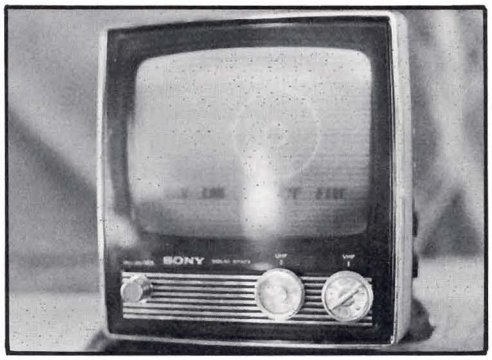
The radio-controlled miniature aerial target and the controller (on left) and his assistant just before launch.

The VTS functions by allowing engagement of the RCMAT targets with the 7.62-mm minigun which substitutes for the 20-mm cannon thus allowing a great saving in the cost of ammunition. All indications to the gunner appear just as they would in engagement of a full-size target, given that proper scaling of the RCMAT size and speed have been accomplished. And here, another great saving in training cost is effected because of the differences in cost between the RCMAT and the ballistic aerial target system (BATS) along with operating radio controlled aerial targets (RCATS), both used in regular Vulcan gunner-training.

The TVT system, in conjunction with the VGMU, allows constant monitoring of all gunner actions and constant communication between gunner and instructor for on-the-spot corrections. The video recorder of the TVT allows playback critique of gunner performance.

USAADS evaluation of the VTS is to define its actual training value. A question repeatedly asked is whether the miniature target and 7.62-mm weapon training will actually translate to 20-mm firing against a high-performance aircraft and to what extent. With a favorable answer to this question, it is likely that USAADS will recommend immediate procurement of the system for issue to C/V units in the field.

VTS INSTRUCTOR STATION. Units from left to right are the video tape recorder, TV monitor, and Vulcan gunner monitor unit.



This close-up of the TV monitor shows that the gunner has activated the radar, achieved radar lock, received ready-to-fire command, and is firing the weapon.

VULCAN SQUADS IN HIP SHOOT

During the month of March 1976, three self-propelled Vulcan squads from Battery A, 1st Battalion (C/V), 55th Air Defense Artillery, commanded by CPT Charles W. Hurd, participated with the US Army Air Defense Board in the concept evaluation of a new Vulcan quick reaction gunnery range (short title: Hip Shoot). The range is under development at North McGregor Range, Fort Bliss, Texas, and is designed to develop the proficiency of Vulcan gunners to engage helicopters employing low-flying and pop-up attack techniques. For this purpose, the project included the comparison of a number of prototype target systems.

Both CPT Hurd and LTC John W. Moore, Commander, 1st Battalion (C/V), 55th Air Defense Artillery, are extremely enthusiastic about their squad's participation in this project because it sharpens their gunnery skills and marksmanship and offers a variety of targets to engage during the unit's tactical training. They and SSG William Atteberry, NCOIC of the three Vulcan squads, are certain that this range will be an excellent training aid for quickening the reaction time and improving the proficiency of Vulcan squads undergoing training at Fort Bliss.

68TH ADA UNIT SHOOTS PERFECT SCORE

What do you do when your battery is already tops in the brigade? You make sure it stays that way. Apparently that's the way Battery A of the 3d Battalion (Hawk), 68th Air Defense thinks.

A/3/68, during its annual service practice (ASP) at Fort Bliss in June, achieved the highest score possible—100 percent. The battery is proud but not surprised, for it's not the first time for this unit. In April of 1971, A/3/68 (previously A/8/15) distinguished itself by receiving the only Hawk ASP score of 100 percent on brigade record (which goes back to 1967). Now they've done it again!

"We took 41 people to Fort Bliss," said 1LT Phillip C. Day, "and those 41 people pulled together and did a great job." COL Henry F. Morris, Acting Brigade Commander, commended the battery on its "outstanding achievement that the entire battery can be proud of" and added, "it takes a total effort on everyone's part to earn such a score which becomes the goal that other units strive to equal."

In 1971, LTG Richard T. Cassidy (Commanding General of US Army Air Defense Command) presented A Battery with a plaque and honored them with these words, "This is an outstanding achievement, not equaled by any other battery worldwide . . ." For their most recent achievement, A/3/68 will receive letters of commendation from the Battalion and Brigade Commanders.

A Battery proved, once again, that perfection is achievable.

PATRIOT — ANOTHER STEP FORWARD

In minutes, soldiers from the Mobility Equipment Research and Development Command at Fort Belvoir, Virginia, drove the truck-mounted PATRIOT equipment from Raytheon's Bedford, MA, plant and emplaced it in a wooded field nearby, showing the ease and speed of readying the Army's newest air defense system for action.

Equipment included the radar, engagement control station, and power supply. (A complete tactical platoon would include missiles and launchers.)

A key feature of PATRIOT is the multifunction phased array radar that scans electronically, unlike conventional radars that rotate mechanically using dish-like or mesh antennas. The PATRIOT radar is mounted on an XM-860 trailer and is towed by an M818 tractor.

The engagement control station, mounted on an M814 truck, is the operations center of the PATRIOT fire control section and tactical firing platoon and is the only manned station during engagement operations. The principal elements are a display and control system, a high-speed digital computer, and communications equipment. Radar and launching stations are operated remotely from the engagement control station.

The power plant consists of four 60-kilowatt, 400-Hertz, 208-volt, 3-phase turbine driven generators mounted on two pallets, each with an integral 200-gallon fuel tank. Three generators are required for system operation with the fourth for backup. Power equipment is mounted on the M814 truck which may also tow an auxiliary 600-gallon fuel tank trailer.

PATRIOT will be the cornerstone of Army air defense on the battlefield in the sophisticated, highly technical land warfare environment predicted for the 1980s and beyond.

MANAGEMENT BY OBJECTIVES . . .

Much has been written about the best methods of management for military application. From the myriad of books directed toward leadership and management, from the accounts written about past wars comes the observation that the best managers and leaders have used some form of management by objectives (MBO).

General Douglas MacArthur, from his graduation from West Point in 1903 until his retirement from the Army some 50 years later, was an outstanding example of the commander employing the mixture of MBO techniques. From strategic planning to tactical implementation, his methodology for planning, establishing objectives, delegating tasks, and constant follow-up, his techniques closely paralleled MBO implementation.

Specifically defined, management by objectives goes beyond being a set of rules, a series of procedures, or even a method of managing; it is a particular way of thinking about management. George S. Odiorne, in his book *Management by Objectives*, defines this concept as a system of management whereby the superior and subordinates jointly identify objectives, define individual major areas of responsibility in terms of results expected, and use these objectives and expected results as guides for operating the unit and assessing the contribution of each of its members.

Effectively applied, MBO fosters communication up and down the chain of command, promotes understanding, accommodates change, and maintains flexibility. MBO enhances motivation, increases performance, reduces internal conflict, and achieves overall unity and team effort. The MBO process is easily useable, definitely achieves results, and has military application.

This article outlines 10 basic steps for implementing MBO in a military unit, emphasizing specific responsibilities at the commander, middle manager, and subordinate levels.

The key step in the MBO process is the commander's responsibility, Step 1, *that of establishing the overall unit plan*. The plan is the broad outline of the unit's mission, its "reason for being." The unit plan reflects rationale and philosophy and provides the cohesiveness that ties everything and everyone together—but the plan is not the objective. The plan is the compilation of all that the commander wants to accomplish in his unit. It does not necessarily relate directly to specific people or sections. Rather, it is conceptual and provides the basis for determining specific objectives and who should be responsible for actual completion.

Step 2 is *the actual establishing of the unit objectives*. To be effective, the commander should write the objectives down in terms of the results he expects to achieve. Thus, objectives are related to individuals who have the responsibility for completion within specific time frames. Objectives are discussed face-to-face with the managers responsible for implementation. There is not necessarily one big list of objectives in rank order. Priority action items move along a continuum, changing their order of importance in relation to time. A very simple method of addressing priority and routine objectives is to make two lists. This assures that no objectives are overlooked and allows routine objectives to be completed in conjunction with priority functions at the discretion of those who are responsible for actual implementation. A simple example of a routine management objective is having janitorial supplies available for shop clean-up so that clean-up can take

place while awaiting parts delivery for a priority repair.

After the commander and his middle manager (officer-in-charge), who is responsible for completing an objective, have written down the objectives to their mutual satisfaction, it is time to move to Step 3, *devising a feedback system with the middle manager*. The thing to remember here is to keep it simple. View the feedback in terms of the objective involved. More than one method of feedback may be needed to cover the various priorities. Some may require weekly briefing, some written reports, yet others only quarterly section inspection. But remember, it is important for the commander to agree with his manager and to write their agreement down for future reference.

The section officer in charge or the staff officer is the middle manager of the MBO system. He has the responsibility for linking the unit objectives to the production phase. Acting as a catalyst, he ties resources and people together to achieve timely results.

The manager begins his part of the process by Step 4, *relaying the commander's objectives to subordinates*. This gives the worker a direct look at the commander's objectives, priorities, and suspenses and allows him to see where his section fits into the overall unit plan. In turn, the worker can relate to the part he plays in the overall success of the unit.

Looking back to the face-to-face contact between the commander and manager where the objectives were set and the feedback method agreed upon, it could be said that a "contract" was developed. Since it was between two specific parties, commander and manager, it is doubtful that large portions will be directly transferable to the worker level as written. There will be a need for "subcontracting," i.e., the manager and subordinate need to negotiate section objectives that place the objectives in terms that are understandable and agreeable to both of these parties. This is Step 5, *writing section objectives*. Objectives written at the manager/subordinate level should tell who, what, when, and where. Objectives should be written down and discussed in face-to-face negotiation to alleviate any possibility of misunderstanding.

Now that the section objectives have been set, it is time to address Step 6, *the section feedback system*. Again simplicity is the rule. A philosophy of managerial control must be based on truth and reality to create an intelligent, unified, cooperative understanding between management and workers so that control will be effective. The section feedback system is the responsibility of both the subordinate and the manager.

It is important at this point to say a word about manager/supervisor/subordinate relationships. No management system can provide a checklist that will guarantee success where there are personality conflicts, inequitable balance of supervisor/subordinate responsibility, or any other similar situation that may exist in a working environment. A good relationship is one where the manager, supervisor, and subordinate have a vested interest in meeting the objectives and a respect for each other's position and function in the MBO process. The manager is tasked with the responsibility of fostering this rapport. Effective managers consistently meet this challenge in such a way that all parties develop the intuitive understanding necessary for the subordinate to fulfill his responsibility of Step 7, *getting the work done*.

It is generally accepted that the worker level has the responsibility for getting the work done. But it is this area of responsibility that often is given the least opportunity to improve. Steps 8 and 9 of the

... a practical approach

CAPTAIN HOWARD H. MILLER (USAFR)

MBO process relate very much to the manager/subordinate relationship and are a shared responsibility, but most often the subordinate bears the most burden for success. Step 8 is *monitoring production to make sure everything goes as planned*. When it does not, use the feedback system agreed upon in Step 6 to provide the information necessary for the decision to be made at the correct level of responsibility. Follow the contract. If things get off track, let it be known. More important than monitoring is Step 9, *recommending change to improve production*.

The subordinate is a critical component in any military unit. Besides doing the actual work, it is at his level that progress is made, innovations take place, and opportunity evolves for creativity. But very often the changes most associated with military organizations are those that originate at the top. The contribution the subordinate worker can make in improving the product, operating procedures, or expediting the entire operation is lost if his responsibilities are not clearly understood. An effective MBO system is one where the subordinate worker not only knows he is responsible for doing the work but also that he is equally responsible for recommending favorable change whenever he can. This step marks the difference between mediocrity and excellence among military units. Changes made at the lowest level can normally be implemented expeditiously with a minimum of adverse effects because the span of control is smallest and most direct. It then follows that changes implemented at the unit level will often be less costly with gains not only in production but in personnel motivation as well. Changes follow the same feedback chain (Step 6). Remember to give credit where due. Everyone stands to gain.

The commander has the responsibility of Step 10, the final step, *review and update*. In the final analysis it is the unit commander who sets the pace, alters the objectives, changes the priorities and makes sure the unit sticks to the overall plan. John W. Humble, in his book on management by objectives, sets these guidelines for successful review:

- Concentrate on performance rather than personality.
- Concentrate on action for improvement.
- Encourage genuine participation — let the jobholder take the initiative.
- Keep the review in the line.

The unit commander completes the cycle of the MBO system. He remains the initiator and the evaluator, the center of the process in a military unit. Success of the unit depends very heavily on the commander's ability to set sound objectives and make reasonable, timely decisions.

Management by objectives is a realistic approach appropriate to use in the military setting. Systematic in application, practical in design, MBO complements military thinking and methodology in a straightforward way that lends to understanding at all three unit levels: commander, manager, worker. Properly implemented, the MBO system establishes understanding and teamwork throughout the unit which allows the entire organization to move forward in a consolidated, coordinated effort in support of common objectives.

Captain Miller has 12 years' service in the US Air Force, including assignments ranging from squadron to wing level. A graduate of the Air Command and Staff College, he also holds Bachelor of Science degree from the University of Pittsburgh and a Master of Arts in Industrial Management from Central Michigan University.

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ENLISTED CAREER NEWS

BNCOC SHIFTING TO ACADEMIES

Changes underway in the structure of the basic NCO course (BNCOC) will allow a greater number of soldiers—primarily E-5's—to complete an important step in their NCO education. The revised BNCOC will shift from the service schools to local academies in January 1977.

Combat arms soldiers — in MOS 11B, 11C, 11D, 11E, 12B, 13B, 13E, 16P, and 16R—will receive the BNCOC at installation/division NCO academies. Courses will be conducted as an extension to the combat arms primary NCO course.

Basic NCO courses for combat support and combat service support (CS/CSS) will still be conducted at service schools but will be shortened and renamed the primary technical course (PTC). Additionally, a primary leadership course of about 2 weeks will be started at NCO academies to offer supervisory/management courses to soldiers with CS/CSS skills. These courses should start during the first half of 1977.

To allow the service schools time to develop various BNCOC training packages, cadre courses, and associated course materials, the BNCOC at schools was discontinued April 1.

Service schools are now developing a series of precourse tests that will alert soldiers to their MOS skill level before starting the basic NCO course. These will be available to units and assist soldiers in improving weak skill areas.

BNCOC now reaches only about 10 percent of the NCO's. Expansion will provide for increased attendance and improved professionalism among NCO's.

COMBINED TRAINING FOR MEN AND WOMEN

Men and women soldiers on their first hitch may be training together from "day one" if a test combining basic combat training (BCT) and basic training (BT) proves successful. The tests, which get underway in September at Fort Jackson, SC, involve a general core program of instruction applicable to men and women. It will be augmented to meet specific needs for both sexes. There will be no slackening of standards in preparing soldiers for duty.

BCT, designed for male soldiers, now includes offensive as well as defensive training while BT for women includes only defensive training.

The change will not bring women soldiers any closer to combat roles but is intended to train women for the roles they currently fill. Women are now being assigned to 384 of the 419 MOS in the Army and the combined training will prepare them for their assignment to Category II and III units.

The combined training will include training on offensive weapons but women are not expected to be assigned to combat units where their use would be necessary. Because of the fluid nature of the modern battlefield, support units may be vulnerable to attack; therefore, women must be prepared to defend themselves and their units.

Army Enlisted Promotion Criteria, FY 77

For Promotion To	Minimum Time In Service	Minimum Time In Grade÷	Selection Method	Selection Level	Frequency Of Selection	Frequency Of Promotion	Level Of Qualification
Grade E2	6 mos.*	———	Commanding Officer	Unit	Daily	Daily	Fully Qualified
Grade E3	12 mos.#	4 mos.	Commanding Officer	Unit	Daily	Daily	Fully Qualified
Grade E4	24 mos.c	6 mos.	Commanding Officer	Unit	Daily	Daily	Fully Qualified
Grade E5	36 mos.&	8 mos.	Semi-Centralized&	Local Selection Board	Monthly	Monthly	Best Qualified by MOS
Grade E6	6 yrs.&	10 mos.	Semi-Centralized&	Local Selection Board	Monthly	Monthly	Best Qualified by MOS
Grade E7	As Announced In Zone	As Announced In Zone	DA Board	DA	Annually (Convenes 11 Jan 77)	Monthly	Best Qualified
Grade E8	As Announced In Zone	As Announced In Zone	DA Board	DA	Annually (Convenes 27 Oct 76)	Monthly	Best Qualified
Grade E9	As Announced In Zone	PZ-31 Jul 72 SZ-1 Aug 72 to 28 Feb 74	DA Board	DA	Annually (Convened 8 Sept 76) FY 7T-77 CSM Board Adjourned 24 Jun 76	Monthly	Best Qualified

* Accelerated advancements permitted in training base.
# Field commanders may promote soldiers with less than 12 mos.; limited to a percentage of assigned and attached E3.
c Field commanders may waive to 15 mos.; limited to a percentage of assigned E3 and E4 who have at least 15 mos. but less than 24 mos. time in service.
& Meet eligibility criteria and attain local list status based on 1,000 point standardized scoring system. DA announces monthly cut-off scores and those with highest scores within MOS receive available promotions. E5 waived have at least 24 mos. but less than 36 mos. E6 waived have at least 48 mos. but less than 72 mos.
÷ May be waived by one-half.

EPMS POINT OF CONTACT

The accompanying chart (page 53) shows the relationship of all MOS that are presently in CMF 16. With the implementation of EPMS, the operator MOS were realined and combined within a weapon system at the grade of E-7 (skill level 4). An example of this is in the Hercules system where the 16C becomes a 16B at skill level 4. This requires the E-7 or the E-6 trying to obtain his skill level 4 to be knowledgeable in all areas of both MOS.

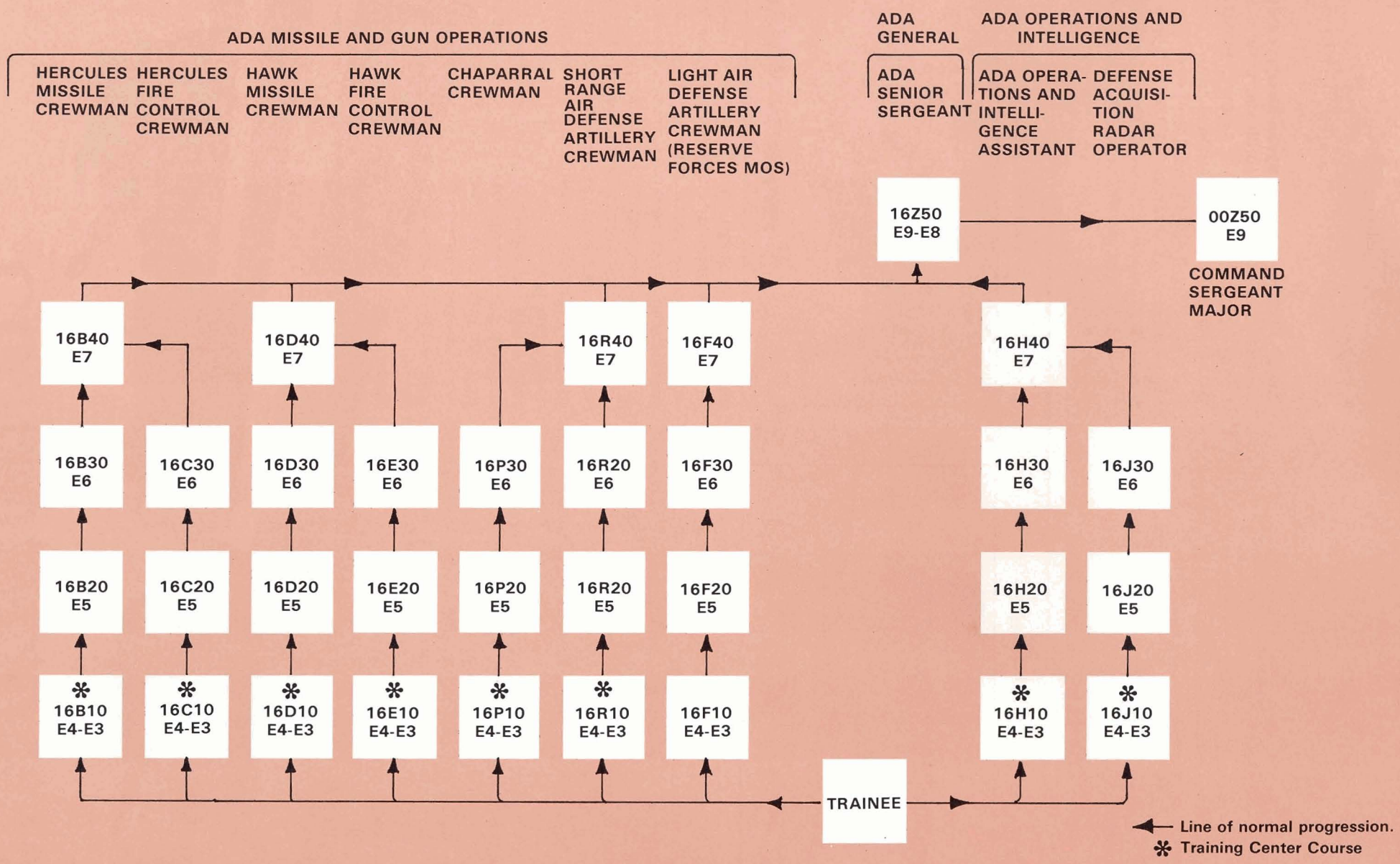
In the Chaparral/Vulcan MOS, 16 R and 16P the additional skill identifier (ASI) R-6 has been deleted. The ASI R-6 had been used to identify those persons with training in Redeye. The skills required for Redeye have been incorporated in the 16P MOS; therefore, skill level 4 implies a knowledge of all three systems.

The 16H MOS encompasses a great many areas. The command and control MOS, 16K, has been deleted and those persons who had this MOS were converted to 16H with the ASI of G-7. The 16J MOS covers both the electronic search central (ESC) and the forward area alerting radar (FAAR). The 16J MOS combines with the 16H at skill level 4. This makes the skill level 4 man responsible for the ESC, FAAR, and command and control in addition to operations and intelligence fields. One other word on the 16H field, the TOEs for a C/V unit have been changed. They now call for a 16H platoon sergeant for the FAAR platoon. Another point: guidance received by the schools in regard to SQTs is that ASIs will not be tested.

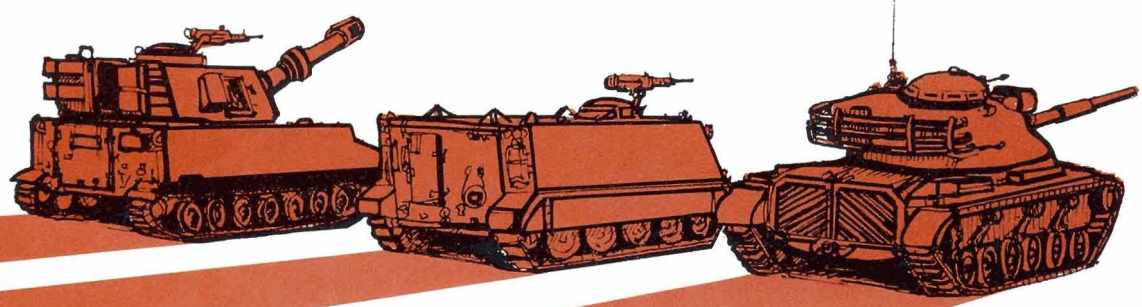
Army Personnel Letter No. 6-76, dated June this year, goes into detail explaining the SQT system. The 16J Soldier's Manual has been distributed and there are two more being printed. These are the 16P and the 16R. Distribution on both should begin within the next 90 days.

FRANCIS R. PAVAO
SGM, DTD
US Army Air Defense School

CAREER MANAGEMENT FIELD — AIR DEFENSE ARTILLERY (16)



COMBINED ARMS CORNER



ADVANCED ATTACK HELICOPTER FLYOFF

A 4-month flyoff — called government competitive testing — between two versions of the advanced attack helicopter (AAH) began in June at Edwards AFB, California. The AAH is designed to be the Army's main armed helicopter of the future with special emphasis on its tank killing features.

The competing helicopters were built by Bell Helicopter of Fort Worth, Texas, and Hughes Helicopters of Culver City, California. The winner — to be named later this year — will build three more aircraft for continued development/testing of armament, avionics, and other aircraft subsystems. Limited production is targeted to begin in late 1980.

Either AAH will carry a two-man crew — pilot and co-pilot/gunner. Designed to fly in marginal weather, it's a 24-hour combat vehicle with improved survivability, safety, reliability, and maintainability over the current attack helicopter, the AH-1 Cobra. Armament can include either the Hellfire laser-guided missile or 2.75-inch rockets along with a 30-mm gun. The AAH is powered by twin 1,500 horsepower General Electric gas turbine engines. It will perform its mission effectively in all climates, particularly a hot weather environment.

It will carry up to 16 Hellfire missiles and 1,200 rounds of 30-mm ammo, cruise between 145 and 175 knots (167-210 miles per hour) and have 1.9 hours of mission time.

Designed to withstand .50 caliber fire, the AAH also will have an infrared suppression system, a radar warning system, forward looking infrared (FLIR) for limited visibility flights, system redundancy, and crashworthy design. Vulnerability will be further decreased by nap-of-the-earth employment. The Army expects eventually to buy about 500 AAHs.

Bell YAH-63

Hughes YAH-64

VIPER

The Army's Missile Command has established a project office for engineering development this year on a new lightweight antitank weapon called the Viper. The new tank killer weighs 6-7 pounds, but is substantially more powerful, accurate, and effective than the M72 LAW.

Viper is a direct fallout from a short-range, manportable antitank weapon technology program conducted throughout the Army Materiel Command in 1972 to establish an up-to-date Army technology base. Viper represents something new in MICOM missilery since the new rocket was designed, developed, and demonstrated almost completely with MICOM facilities at Redstone Arsenal.

— Infantry

NEW HELMET BEING TESTED

Troops in the field have always had something to complain about, and one major item has been wearing the "steel pot." It now appears that some relief may be on the way.

Soldiers at Fort Benning, GA, are scheduled to begin testing a new helmet for troop use this September. The helmet, which strongly resembles the old WW II German helmet, is considered a radical design by members of the Army Natick R&D Command. The new "pot" covers more of the soldier's head, supplies better protection, and offers a better fit and more comfort.

The test helmet is made of laminated Kevlar (a new fiber) and fiber glass, so it is not suitable for boiling the morning shaving water. Unlike the steel helmet, the new model does not have a liner.

The Kevlar pot would come in three sizes. The large size helmet, about the same as the "steel pot," weighs 63 ounces; the medium helmet weighs 49 ounces; and the small helmet only 47 ounces.

The helmet would give the troops the first new combat headgear in more than 35 years. The old M-1 shell and liner were adopted in June 1941. An improved nylon liner was added in 1961.

ANTITANK MISSILE TEST

How well an antitank gunner can track an evasively maneuvering target is one of the questions being asked by the US Army Combat Developments Experimentation Command (CDEC) in the Antitank Missile Test. The experiment is being conducted on the 166,000 acres of CDEC's scientific field laboratory at Hunter Liggett Military Reservation and is part of a continuing evaluation of the TOW, Dragon, and Shillelagh antitank weapon systems. Data gathered during the test will be analyzed to determine the extent of performance loss caused by each target's evasive maneuvers.

Three target vehicles with various levels of mobility will be utilized: the M60A1 tank, the XM-808 "Twister" and the XM-800 armored reconnaissance scout vehicle.

The M60A1 will provide the lowest degree of mobility and will establish a base against which the other targets can be compared.

The XM-808 Twister, a wheeled vehicle with two bodies joined by a pivotal yoke, will represent the upper end of the mobility spectrum. The yoke allows full movement between the bodies, permitting independent movement in yaw, pitch, and roll. The Twister is capable of traveling over reasonably open terrain at speeds in excess of 55 mph.

The XM-800 scout vehicle bridges the mobility gap between the M60A1 and the Twister. Like the M60A1 it is an armored track vehicle but is much lighter and considerably more maneuverable.

The target vehicles will be tracked by the TOW, Dragon, and Shillelagh antitank missile systems as well as the standard M60A1 tank. Special attention will be given to the comparative efficiency of the Shillelagh systems of the M551 "Sheridan" and the M60A2, considering the effects of differing optics, turret drives and gunner environments. All tracking systems will be collocated during the trials and will track a single target during a given period.

The entire experiment is being conducted as part of CDEC's unique blend of military and civilian scientific professionals, dedicated to the development of the Army of the future.

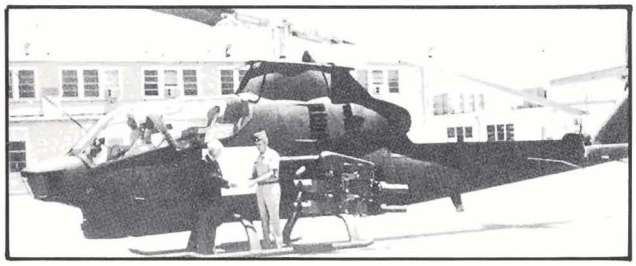
— Field Artillery Journal

ATTACK HELICOPTERS BOLSTER ANTIARMOR CAPABILITY

The AH-1S "Snake" packs the TOW missile system and has a heftier engine, transmission, and tail rotor than the AH-1G. It is part of a projected fleet of 198 AH-1S modified helicopters to be delivered to the Army by mid-1977.

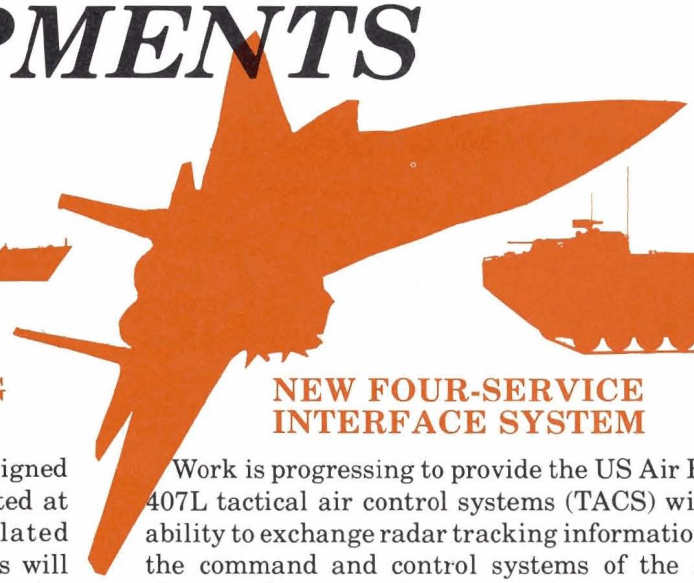
Since June 1975, 92 Cobras have been modified to TOW configuration AH-1Q. Plans for additional modifications include conversions to both the AH-1Q and AH-1S configurations. When all conversion plans (which extend well beyond 1977) are completed, the Army will have an attack helicopter fleet of 795 TOW-equipped Cobras. Only a handful of the Vietnam-proven AH-1Gs will be left for possible escort missions and training.

The Cobra TOW-equipped fleet is an interim measure until the advanced attack helicopter (AAH), now under development, begins to enter Army inventories in the early 1980s.



AH-1S Cobra

DEVELOPMENTS



SPACE SHUTTLE TRAINING AT WHITE SANDS

A training program for astronaut-pilots assigned to the space shuttle program will be conducted at White Sands Missile Range. The simulated shuttlecraft descents and landing approaches will be practiced at a wide and relatively flat area in the middle of the range. The training program will continue through the life of the space shuttle program.

A specially modified Grumman Gulfstream-II jet aircraft will be used in the training program. Designated the Shuttle Training Aircraft, or STA, the aircraft has been modified to match the drag and lift characteristics of the shuttle craft.

The space shuttle craft is a reusable launch vehicle, resembling a high-speed aircraft, that will have expendable propellant tanks and solid rocket boosters. After performing a normal space mission, it will re-enter the earth's atmosphere and coast to its landing site like a large glider.

Since the shuttlecraft does not have normal aircraft engines, the pilots will have to be proficient in controlling the orbiter during descent. Their final approach will have to be made at just the right speed, altitude, and sink rate.

A typical training flight approach starts at an altitude of 40,000 feet, with the STA's drag devices set up to match the shuttlecraft's handling characteristics. The student pilot then will control the STA down to an altitude of about 30 feet above the ground, about the same eye-height as that of the pilot in an actual shuttle orbiter at touchdown. The STA will not be landed, however; instead it will be flown around and be taken back up to 40,000 feet where the descent will be repeated.

Normally, two sets of training flights will be conducted each week. The astronaut-pilots and instructors plan to land the Grumman STA at Holloman AFB for servicing between missions.

Support for the training program also will be provided by the Army-operated National Range at White Sands, which will furnish range control, restricted air space, range communications support, and range scheduling functions.

NEW FOUR-SERVICE INTERFACE SYSTEM

Work is progressing to provide the US Air Force's 407L tactical air control systems (TACS) with the ability to exchange radar tracking information with the command and control systems of the Army, Navy, and Marine Corps. TACS provides an Air Force component commander with the organization and equipment necessary to plan, direct, and control tactical air operations, and coordinate those operations with other services.

In a program called TACS/TADS (tactical air control system/tactical air defense system), the present TACS system is being upgraded to permit it to exchange digital information with the other three services on a secure real-time basis.

The 26-month production phase contract calls for four sets of message processing modules (MPM's) and modification of 14 existing 407L transportable control and reporting centers (CRC's) already in the field, plus associated training and support facilities. One MPM is now in test at the Air Force's TACS/TADS location at Camp Pendleton, California.

Modifications to the CRC's — officially called AN/TSQ-91V — include adding increased memory capability for the HM-4118 computer and increasing the data processing and digital communications capability.

TACS/TADS will reconcile present data exchange problems inherent to the different communications techniques required by the different services.

TACS/TADS calls for an HM-4118 computer in each MPM to control one secure TADIL-A terminal set and 10 secure TADIL-B digital communications sets. The computer translates one set of data received from either communications system into the formats, types, and content understood by the other. It then passes the data to the MPM for processing and transmission to the other services.

The $21-million project will provide an interface for data between the 407L CRC's and the Army control and coordination system (AN/TSQ-73), the Naval tactical data system/airborne tactical data system, the Marine air command and control system, and other classified systems.

NIGHT ATTACK MISSILE TEST

The Navy's new night attack missile scored a direct hit on a moving M48 tank, marking the second successful nighttime demonstration of the night attack weapon system. The missile was launched from a Navy A-6 aircraft at the longest range yet recorded for any contemporary infrared air-to-surface weapon. The target was a standard, unaugmented M48 tank moving perpendicular to the aircraft flight path. Detection of the tank was accomplished using a forward looking infrared system (FLIR). Handoff from the FLIR to the missile seeker was accomplished automatically, using the weapon system boresight computer.

The night attack test missile is a modified Air Force Maverick. The Maverick electro-optical (TV) seeker has been replaced for Navy application by a nonimaging, long wavelength infrared seeker developed jointly by Naval Weapons Center and Raytheon Company.

The seeker is being developed for use with powered and unpowered series of airframes. It will be compatible with the Air Force's Glide Bomb Unit (GBU) family of glide weapons.

Design objective of the night attack nonimaging Maverick system is to provide a first pass multiple launch capability at AAA standoff ranges against such tactical sea/land targets as tanks, trucks, and patrol boats. Test results to date have validated that capability. Tests against ship targets are scheduled to continue the validation process. Against larger sea and land targets that may be SAM defended, the nonimaging seeker used in unpowered or GBU vehicles will enable launching at standoff range.

Low cost of the night attack system in direct attack missions is inherent in the nonimaging seeker as compared with imaging systems currently in development. Production cost estimates favor the nonimager 3 to 1.

TOMAHAWK SETS RECORDS

A fully guided US Navy Tomahawk Cruise Missile set new records for flight duration and range during a recent successful test flight. Following its launch from a Navy A-6 aircraft, the missile was airborne for 1 hour and 24 minutes and navigated itself on a race track pattern over the desert for 574 miles.

The flight marked the second successful test of the Tomahawk equipped with a terrain contour matching (TERCOM) navigation system. The guidance system compares measured terrain heights with heights stored in an on-board computer and corrects the missile's course and altitude based on the navigation fix obtained.

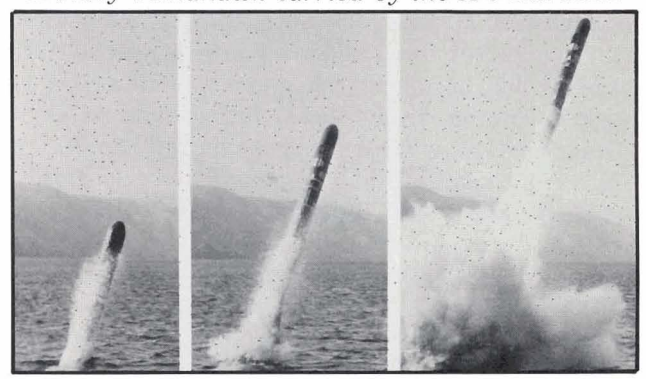
Primary objective of the test was to obtain information on the TERCOM navigation system. It marked the first use of the system's terrain avoidance capability. The missile's TERCOM system also was used to navigate the A-6 launch aircraft from take off at Point Mugu, California to the predetermined launch point over the range.

The flight was successfully completed over all geographic checkpoints. The Tomahawk missile then guided itself to a designated landing zone within White Sands Missile Range and activated its parachute descent system. It was recovered after a soft landing in the desert. After post-flight analysis and refurbishment, the missile will be flown in follow-on test flights.

In addition to the two successful tests of the fully guided missile at White Sands, an antiship Tomahawk has been launched four times over the Pacific Missile Test Center headquartered at Point Mugu, California. The first three antiship missions, all successful, confirmed flight characteristics at varying altitudes and integrated systems performance. A fourth test obtained valuable data on Tomahawk's low-speed, high-angle of attack performance.

The Tomahawk cruise missile is being developed for the Naval Air Systems Command by General Dynamics Convair Division, San Diego. The versatile weapon is designed for launch for existing submarines, surface ships, tactical and strategic aircraft, and land platforms.

A Navy Tomahawk carried by the A-6 Intruder.



The Tomahawk during its first underwater launch.

BARS to STARS

OPMD UPDATE

SECONDARY ZONE SELECTION RATES TO VARY

Variable secondary zone (SZ) selection rates — first used by DA boards for senior warrant officer promotions this year — have been extended to field grade officer hike selections. Under the new SZ procedures, eligible officers will continue to be nominated by a screening board 4 to 6 weeks earlier than the regular board. Each officer in the SZ will be evaluated and 10 percent will be nominated for consideration by the primary board.

It is at the primary board stage that major changes occur. The board will get minimum and maximum numbers it can select from the SZ. The numbers will be based on a variable selection rate of 5 to 15 percent for each list. To insure that only outstanding SZ officers are selected, the board must find each selectee to be clearly competitive in overall quality with the upper half of the primary zone. Furthermore, SZ selected officers will be in addition to primary zone selections. Past promotion boards have received only a maximum SZ selection figure and actual selections have generally been at or close to the top figure.

Reasons cited for the move to variable SZ selection rates include:

- Only outstanding officers — compared to the top half of the primary zone — will be selected to insure future competitiveness with new peer group.
- Making it clear to the officer corps that the boards are not given mandatory numbers to be selected regardless of quality.
- An SZ "window" and consistent primary zone selection rates give all officers equal selection opportunity.
- Allowing consideration of high quality overstrength captain year groups (1967-70) becoming eligible for promotion to major in the next 3 to 5 years.
- Allowing boards, which are in the best position to judge quality, to make selections based on different quality found in different year groups.
- Shortstopping challenges that allege younger SZ officers have displaced primary zone officers on promotion selection lists.

SPECIAL OER CHANGE

The Army has moved to reduce the stream of special OER's "with last minute exhortations" that flow into MILPERCEN when officer promotion boards are announced. A recent regulation change limits special OER's to reports that cannot await recognition through the normal reporting system.

A rater can no longer initiate a special OER merely because an officer is in a zone of consideration for promotion or for school/command selection. Specifically, a rating officer must assign the maximum score of 70 for demonstrated performance of duty, although a maximum score of 30 is not required for potential. The reviewing officer will serve as the final approval authority for submission of a special OER. Where there is no reviewer, the report must go to MILPERCEN for approval. If the reviewer or MILPERCEN disapproves the special, it must be returned to the rating officer with an explanation. The rated officer is notified and the report destroyed.

Another change in the regulation establishes a "complete-the-record" OER for primary zone officers to insure that important information that should be considered by promotion boards is available. Complete-the-record OER's submitted to update an officer's performance do not require a specific score. The officer must have served at least 120 rated duty days in a position as of a date that will be announced before the promotion board convenes.

The rated officer cannot have had a previous report for service in that position. This may be waived only in cases where the officer's performance displays a marked change since his last report. In this event, the reviewing officer must attest to the change in an accompanying inclosure.

If complete-the-record OER's prove helpful to promotion boards and the administrative burden is manageable, the policy may be expanded to allow submissions when an officer is being considered for school/command selection.

HARDSHIP SHORT-TERM EXTENSIONS

Commissioned officers desiring short-term extensions for extreme hardship reasons may now, under a recent policy change, be permitted to extend under a broader range of conditions.

Since the July 1 change to AR 135-215, officers can obtain 1- to 90-day extensions if their previous extensions of service were withdrawn by HQDA or if they are scheduled for release under the provisions of paragraphs 3-58A or 3-65 or AR 635-100 (degree of efficiency and manner of performance or second nonselect for AUS promotion). However, officers separated for cause are ineligible for extensions under this policy change.

Short-term extensions still may be granted to officers completing an initial or extended obligated tour of duty. In all cases, though, extensions will be approved only if an extreme hardship would result from the officer's release and if retention would not conflict with federal law or cause the officer to be reassigned.

Other changes to the regulation include the elimination of extensions based solely on a dependent's medical problem if separation would not cause an extreme hardship on the officer. Also, provisions for officers whose wives are pregnant to extend for the duration of the pregnancy plus 6 weeks for postnatal care have been eliminated. Requests approved prior to July 15, however, will not be affected by these changes.

All request for extensions should be submitted to HQDA through commanders exercising general court-martial authority. Additional details of the changes may be found in the DASG-HCP message 021200Z July 1976.

CGSC NONRESIDENT PROGRAM

Officers who have graduated from their branch advanced course are encouraged to apply for enrollment in the Command and General Staff College nonresident program. The course closely parallels the resident program and is designed to prepare officers for duty as commanders and general staff officers. Numerous options are open for completing this course using any combination of correspondence courses, USAR school courses, and extended residence program.

Successful completion of the course enhances the officer's professional knowledge, upgrades his military education level, and insures equal consideration with resident course graduates for assignments. Officers approaching their last years of eligibility for the resident course are particularly urged to consider this program.

Upon receipt of an eligibility certificate for the resident phase, officers in the program are requested to forward the certificate and their application to DA MILPERCEN (DAPC-OPD- and their branch symbol); i.e., Air Defense Artillery-ADA, 200 Stovall Street, Alexandria, VA 22332.

A course description is available in DA Pam 350-10 or can be obtained by writing:

Commandant, USACGSC
ATTN: DNRI
Fort Leavenworth, Kansas 66027

GREEN TAB RULES TIGHTENING

Fewer Army troop leaders will be wearing green tabs in the near future. A recently approved revision to Army Regulation 670-5 states that after October 1 distinctive green tabs that identify combat leaders may be worn only by specified leaders of Category I units — those with a mission of direct combat. Specified leaders of Category II units that have a majority of Category I subelements also may wear green tabs. Category II units are those that provide nontactical support or assistance to Category I units.

Specific leaders in qualifying units who may wear the green cloth loops include all commanders, deputy corps and assistant division commanders, tank commanders, and leaders of platoons, sections, squads, and fire teams. Also included are command sergeants major, first sergeants, and platoon sergeants.

These leaders cannot wear green tabs when reassigned from these specified positions in a qualifying organization. The new green tab wear policies will also apply to Reserves and National Guard.

Basing the authority to wear green tabs on the standard Army definitions of unit categories will make it easier to determine which units and leaders qualify and will insure that the challenges of leadership in a combat unit will be properly and uniquely recognized.

Senior Air Defense Artillery Commanders

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

BG William E. Cooper, Jr.
31st Air Defense Artillery Brigade

COL Cyrus Q. Shelton, Jr.
38th Air Defense Artillery Brigade

COL Russell M. McGraw
The School Brigade

COL Gary C. Mahan
1st Air Defense Artillery Training Brigade

COL John T. Weathers
11th ADA Group

COL J. Hollis V. McCrea, Jr.
108th ADA Group (C/V)

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 Peter Hixson
2d Battalion, 2d ADA (Hawk)

LTC Alvie Ashley
1st Battalion, 1st ADA (Hawk)

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

LTC Robert Winefurter
2d Battalion, 57th ADA (Hawk)

LTC David Roberts
6th Battalion, 52d ADA (Hawk)

LTC Terrence Shaw
3d Battalion, 60th ADA (Hawk)

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

LTC James Leach
3d Battalion, 71st ADA (Herc)

LTC Kurt Keene
2d Battalion, 1st ADA (Herc)

LTC John Birrane
5th Battalion, 6th ADA (Herc)

LTC Laurence Kenney
2d Battalion, 59th ADA (C/V)

LTC Robert Horn
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 Raymond E. Starsman
1st Battalion, 44th ADA (Hawk)

LTC George O. Evans
2d Battalion, 44th ADA (Herc)

LTC Harold B. Dennis
2d Battalion, 71st ADA (Hawk)

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

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

LTC Donald J. Beebe
5th Battalion, 52d ADA (C/V)

LTC John D. Crandall
1st Battalion, 51st ADA (V)

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

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

LTC William Solomon
3d Battalion, 4th ADA (C/V)

LTC Richard Dean
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 Richard Baldwin
2d Battalion, 52d ADA (Herc)

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

LTC John W. Moore
1st Battalion, 55th ADA (C/V)

LTC Leslie L. Custer
2d Battalion, 55th ADA (Hawk)

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 Gustave Villaret III
Allied Student Battalion

LTC John P. Wilson
5th Battalion, 576th ADA (Hawk)

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

The Editor Comments

The Annual Readership Survey questionnaires circulated with our last issue are continuing to arrive from the field in a steady stream. Therefore, we will wait until the October-December issue to publish the final results. If you have not sent your survey form to us yet, please forward it soon. We are reading and reacting to them!

A preliminary check of the survey shows that many of our readers are interested in writing articles for ***AIR DEFENSE*** but are uncertain about the "proper format" to use. Here are some guidelines for you:

- If possible, submit your article typed and double spaced.
- Generally, a 1,000 to 2,000 word article is sufficient to concisely cover a subject.
- Inclose photographs, sketches, charts, or drawings to illustrate your article. Photos can be either black and white or color—send what you have. The charts or sketches do not have to be in final form, since we can have them redone for publication.
- In your cover letter, be sure to include your name, mailing address, and phone number; a brief biographical sketch; and a "head and shoulders" photograph of yourself.

A second comment that many readers are making is that they want to read more articles and features written by people "in the field." The ***AIR DEFENSE*** staff agrees with this wholeheartedly! However, the problem is one of input. We publish over 95 percent of the material we receive from the field; but, we are hindered by the small volume that arrives from ADA units. Remember, you and all air defenders in the field are our only "reporters." We depend on ***you*** for the news about innovations and actions happening in your units and agencies. As a matter of fact, the primary reason for the existence of ***AIR DEFENSE*** is to be a viable forum for the presentation of ***your*** ideas, comments, reports, features, and articles.

So, we are kicking the ball back to your end of the field. Send us your input and we'll get it printed. If you see or read something in ***AIR DEFENSE*** that you disagree with or have a better idea about—write a "letter to the editor" and we'll show the world your viewpoint. If you have the "meat" for an article—send it to us. We'll correct the punctuation, sentence structure, or whatever—that's our job.

AIR DEFENSE is ***your*** branch journal. Contribute to it and watch it grow!

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