US ARMY AIR DEFENSE SCHOOL
FORT BLISS, TEXAS 79916
MAY 1970

# AIR DEFENSE TRENDS

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Fort Bliss, Texas 79916

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*Air Defense Trends is an instructional aid of the United States Army Air Defense School; it is published when sufficient material of an instructional nature can be gathered.*

*Lift the cover of some history books and you will find accounts of an assortment of actors performing in some particular play of human affairs.*

*Lift the cover of other history books and you will find accounts of a great assortment of actors performing in many plays of human affairs.*

*Lift the cover of almost ANY history book and you will find one actor who is always there—the soldier. His is the supporting role, without which the play would collapse. The enlightened monarch, the dictator, the popular national leader—all these make military demands. But it befalls the soldier to plan, prepare, and execute.*

*Cherished in war and damned when no enemy threatens, he must show poise and dignity as he stoically paces the stage between these extremes of public attitude.*

*Those who have viewed the play of American history have seen these inevitable supporting actors change repeatedly from roles of solicitude to the pinnacle of dare-and-do, and every time capturing the admiration—yea, the adoration—of their people. So raise a toast to the American soldier—for what he has been, for what he is, for what he must be.*

—The Editor

# West German Chancellor Visits US Army Air Defense Center and Fort Bliss

*Major General Richard T. Cassidy, US Army Air Defense Center and Fort Bliss Commanding General, greets German Chancellor Willy Brandt upon his arrival at Biggs Army Airfield. Chancellor Brandt was a guest at Fort Bliss for 3 days prior to traveling to Washington, D.C., to confer with President Richard M. Nixon.*

*Chancellor Willy Brandt presents General Cassidy with a memento from Germany during an exchange in which General Cassidy presented the Chancellor with a framed color portrait of the Fort Bliss Replica Museum.*

*Chancellor Brandt with a group of staff officers assigned to the German Air Defense School at Fort Bliss, Texas, prior to addressing troops. Brigadier General Hans H. Heise (second from left) is the School Commander.*

COVER In the January 1969 issue of Air Defense Trends we introduced SAM-D, which is being developed by the US Army Missile Command as the coming air defense system for the field army. At that time we were limited to artists' concepts in providing illustrations. Now we are able to give a status report, using some photographs of equipment in the state of advanced development. Raytheon Co., Bedford, Massachusetts, is the prime contractor. Our cover depicts the multifunction, phased-array radar antenna which has been completely fabricated and the interconnection and electronic checkout completed. The antenna, which is optically fed and employs some 5,000 three-bit, ferrite phase-shifters, has recently been installed in the eyeball (fig 1) for antenna pattern checks. The radar transmitter is a frequency-diversity, low-noise, two-stage, chain (traveling wave tube/cross-field amplifier) type, boasting an overall efficiency of 30 percent. The design and fabrication are complete, and the finished product is being installed and checked out in the van.

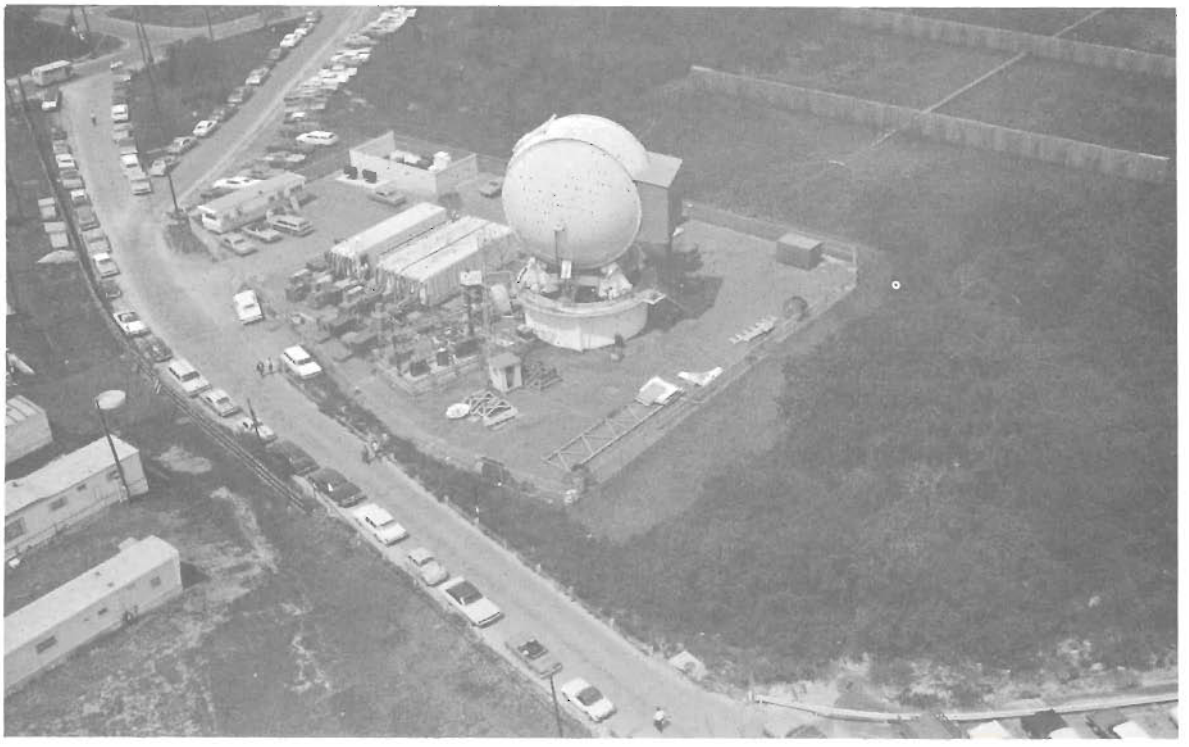

Figure 1. Fire control group test facility showing the missile site radar eyeball, vans, environmental control equipment, prime power, and other facilities.

The beam steering programer is a special-purpose computer that accepts basic steering angles from the weapons control computer and calculates commands for antenna elements so as to steer the antenna beam in the commanded direction. This programer has passed acceptance tests and is ready for integration into the radar system.

The radar control unit has also passed acceptance tests, and integration into the radar system has begun. This is a digital unit that accepts mode command words from the weapons control computer and generates triggers for timing the operation of the SAM-D radar.

Design has been completed and subunits are being fabricated and checked out for the radar receiver. The power distribution rack and receiver input/output control units are complete. The receiver is a monopulse, dual-conversion, low-noise, front-end, analog-pulse compression system.

Also fabricated and in the process of electrical checkout is the radar signal processor. A special-purpose digital unit, it converts receiver output to digital data and performs the radar moving target indication function digitally.

The weapons control computer is a 24-bit, 1-microsecond, 131,000-word memory, binary machine. Its instruction repertoire is tailored to SAM-D application, including instructions for multiprocessor operation. The several elements of the complete machine are in various stages of completion which range from subsystem tests to fully operational.

The display console has been built and is undergoing a final test. It is a computer-driven, synthetic-situation, display type that displays a set of 64 symbols along with an alphanumeric tabular display that presents computer data.

A target-via-missile antenna, whose function is to receive missile guidance downlink signals, has been checked out and is now ready for pattern tests scheduled for September 1970. The antenna is an optically fed, receive-only phased array. It has an added capability of performing certain electronic counter-countermeasures.

An experimental model seeker is being prepared for a captive flight test program after having been successfully operated in ground-to-air target tracking. The seeker encodes the illumination energy reflected from the target and transmits the encoded signal to the ground (downlink). It also accepts missile steering commands and other data from the ground via 80-bit digital uplink.

Also undergoing preparation for captive flight test programs is the guidance ground processor. It has already been successful in ground-to-air target tracking. The processor receives target-via-missile signals; acquires and tracks targets in range, velocity, elevation, and azimuth; extracts boresight error in conjunction with the weapons control computer; and transmits the resulting steering commands via uplink to close the homing loop.

An advanced development seeker (fig 2) has been released by engineering personnel and is at the subunit test cycle stage. This instrument is a seeker for advanced development guided missile flights (guided test vehicle). It vitalizes microelectronic circuit techniques to obtain the required form factor.

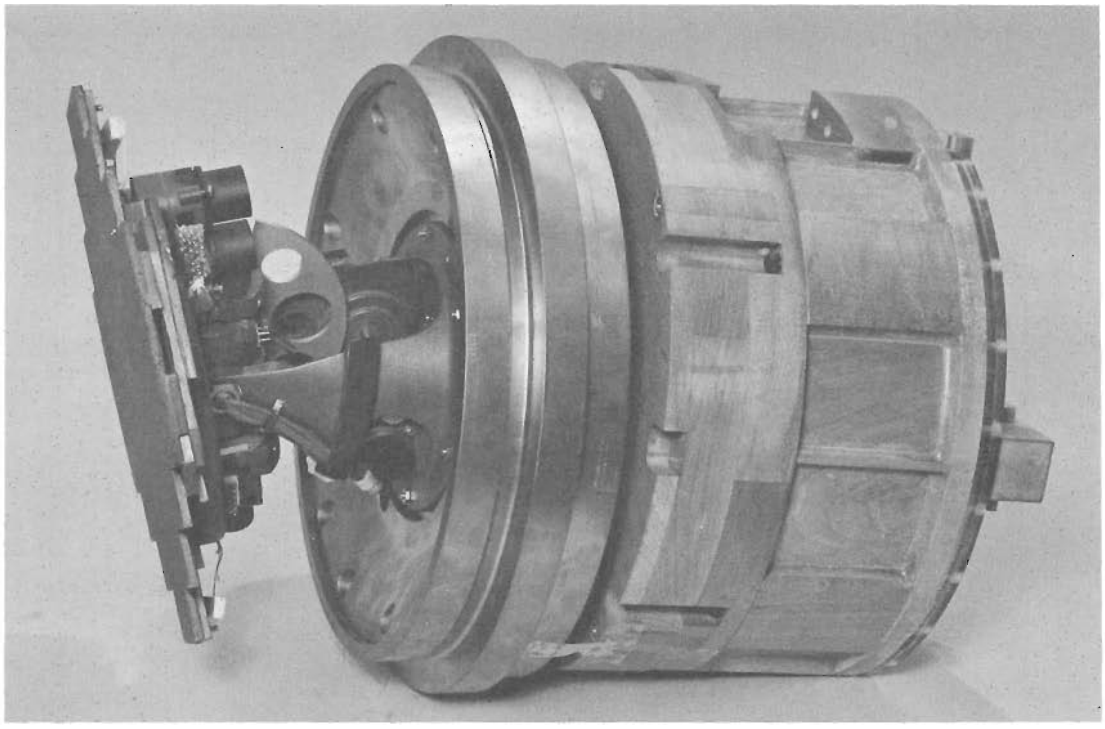

Figure 2. Advanced development seeker.

A guidance correlator which, by correlating returns in target-via-missile and radar paths, and permitting resolving in range on one of several formation targets, has been validated as to technique in laboratory tests. It has also been checked out and is awaiting flights for conducting field trials against two jamming aircraft flying in formation.

Wind tunnel tests have verified engineering calculations of missile performance and stability characteristics. Eleven rocket motors (fig 3) have been successfully fired, completing this development phase. The rocket motor is an all-boost, solid-propellant type, using a carboxyl-terminated polybutadiene binder with free aluminum augmentation; the motor case is made of 300-grade maraging steel.

An engineering model of the band-switched, missile autopilot satisfactorily passed breadboard tests and has been integrated with the engineering mode of the guidance system. The autopilot provides the required transfer functions for proportional navigation guidance as a function of the missile altitude and mach number.

The missile control system (fig 4) is a battery-powered, hydraulic actuation system for the missile control surfaces. Breadboard tests were successful, and a prototype unit is being assembled.

Essentially, all remaining major fabrication and testing will have been completed by September 1970. Because interest in SAM-D is mounting throughout the air defense family, Air Defense Trends will publish all information as it is released by the program manager.

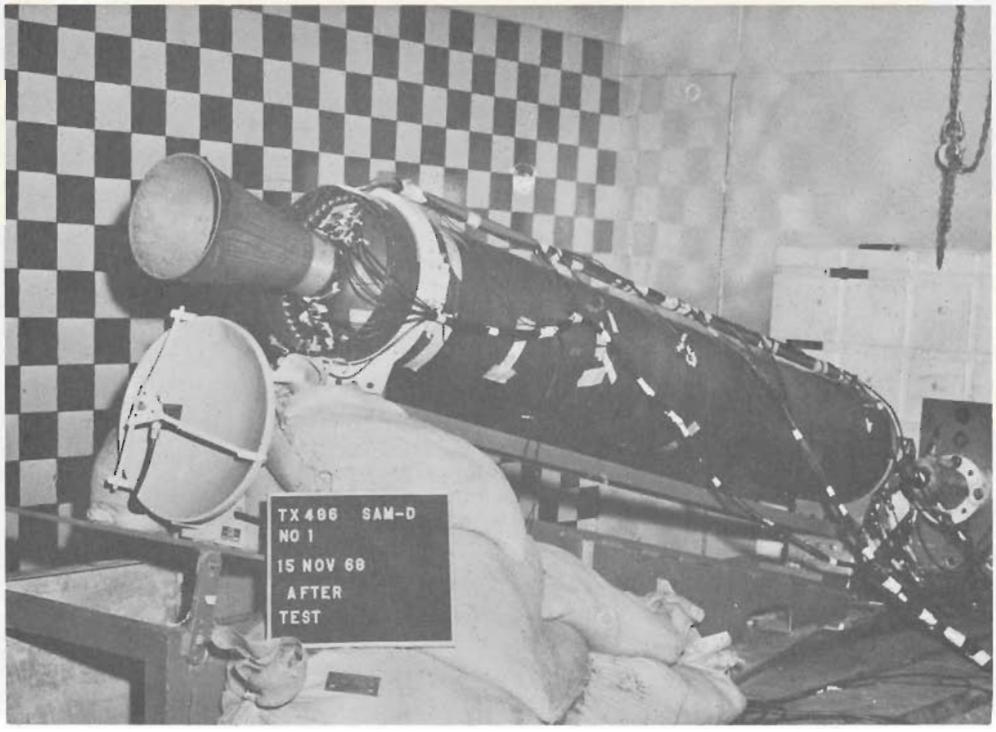


Figure 3. SAM-D rocket motor.

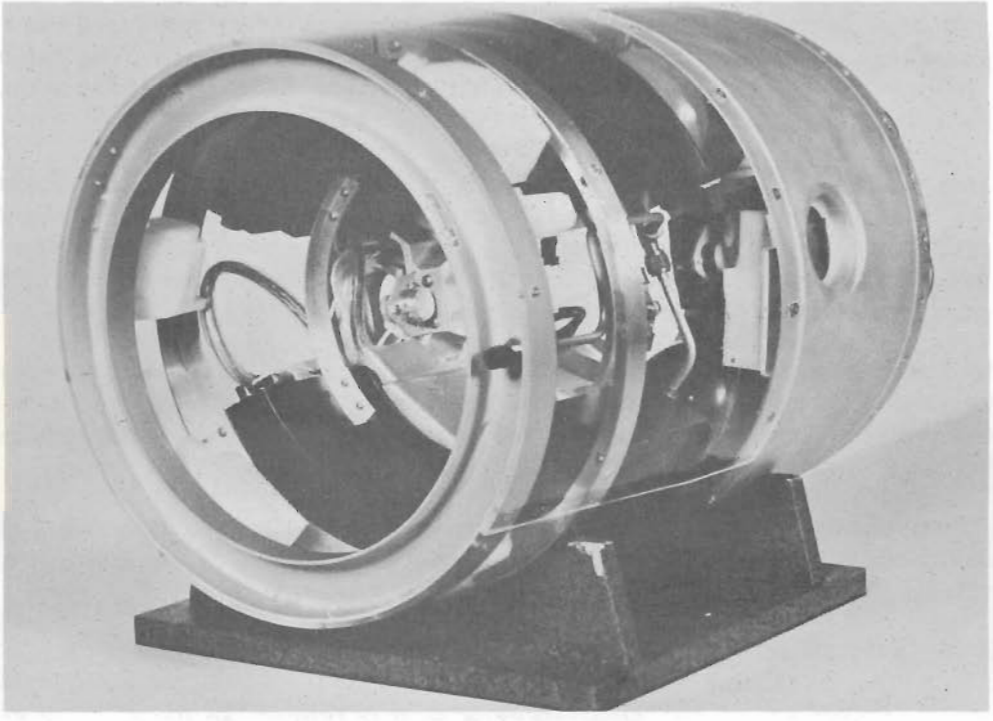

Figure 4. Missile control system.

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## AIR DEFENSE TRENDS

An instructional aid of the United States Army Air Defense School, Air Defense Trends is published when sufficient material of an instructional nature can be accumulated. It is designed to keep air defense artillerymen informed of unclassified tactical, technical, and doctrinal developments because it is essential to national defense that all levels of air defense command be kept aware of these developments and their effect on the air defense posture.

Distribution of this publication will be made only within the School, except for distribution on a gratuitous basis to Army National Guard and USAR schools, Reserve component training and ROTC facilities, and as requested by other service schools, ZI armies, US Army Air Defense Command, Active Army units, major oversea commands, and military assistance advisory groups and missions.

Qualified individuals may purchase copies of Air Defense Trends by writing to The Book Store, US Army Air Defense School, Fort Bliss, Texas 79916.

When appropriate, names and organizations of authors are furnished to enable readers to contact authors directly when they have questions concerning an article.

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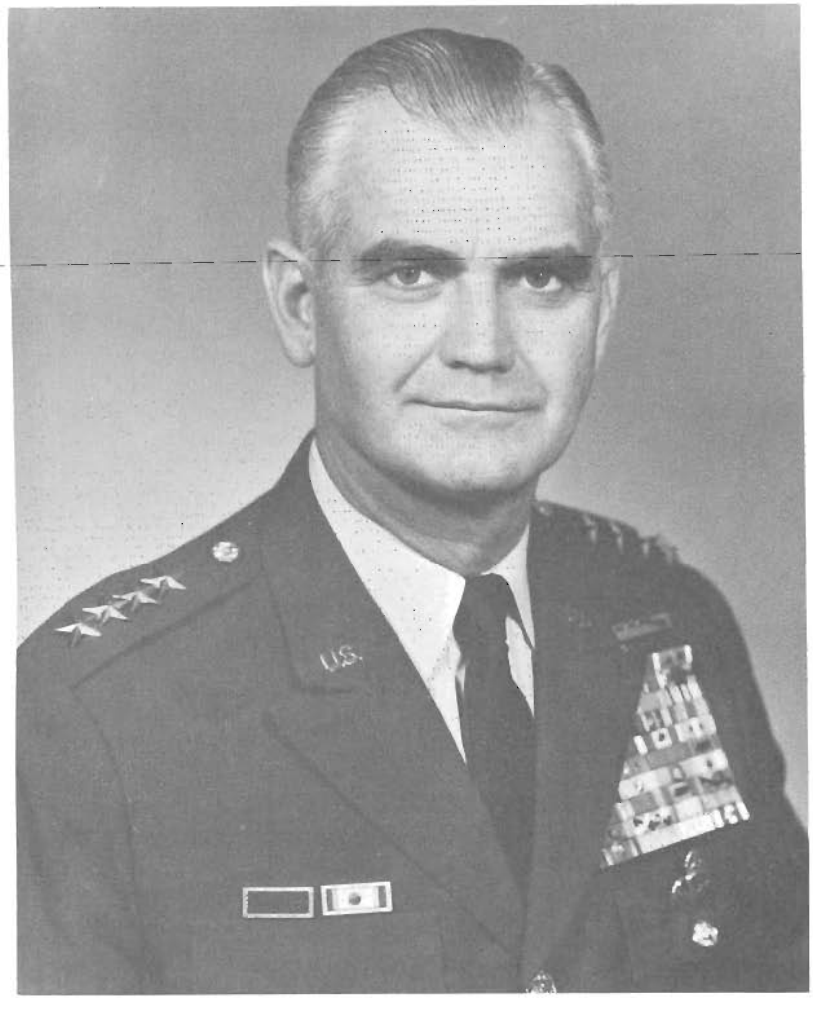
# General Westmoreland Visits US Army Air Defense Center and Fort Bliss




*General William C. Westmoreland*
*US Army Chief of Staff*

A tour of US Army Air Defense Center and Fort Bliss facilities, an address to US Army Air Defense School personnel and students, a speech before the El Paso Chapter of the Association of the United States Army, and a press conference were included in General Westmoreland's recent visit.

Displaying the vision that is typical of him, General Westmoreland spoke mainly of developments that he foresees for the Army. The Air Defense Artillery has a bright future as a separate branch. Providing continental air defense and overdue support for the field army are the main areas for action. The US Army Air Defense Center and Fort Bliss will play a vital role in developing forward area weapon units and in training technicians for the Safeguard system. Many of our potential enemies are bristling with airpower which makes defensive preparation urgent.

*Impromptu discussion with Major General Richard T. Cassidy, Commanding General, US Army Air Defense Center and Fort Bliss, and Colonel (Ret) Ray A. Murray, President, El Paso Chapter, Association of the United States Army.*

*At a Redeye demonstration.*

The next decade will produce unique techniques for engaging aggressive forces. The battlefield will be continuously covered by sensors, radar, and aerial surveillance systems to aid the commander in his decisions.

The Army of the 70's will be smaller but more cohesive. It will be built around an integrated control system that exploits advanced technology. The individual soldier will bear greater responsibility. He will have to be highly disciplined and well-motivated. The hallmarks of such an Army are discipline, training, teamwork, and pride of unit.

*At Hueco Range for a Chaparral/Vulcan demonstration.*

*Addressing the El Paso Chapter of the Association of the United States Army.*

*George W. Dunaway, Sergeant Major of the US Army, accompanied General Westmoreland on his visit.*

Concerning Vietnam, the enemy appears to be weaker while the South Vietnamese are stronger. Basically, the economy of South Vietnam is good, and indications are that the Vietnamization program is successful. Regional and popular forces continue to improve. The South Vietnamese are increasingly demonstrating their resistance to armed attack, and the Republic of Vietnam has increased its central control to more than 90 percent of the population. Because of these accomplishments, the number of American troops is being reduced. However, we will be there for a long time. We will be needed to help South Vietnam in establishing methods to prevent being overrun by the Communists.

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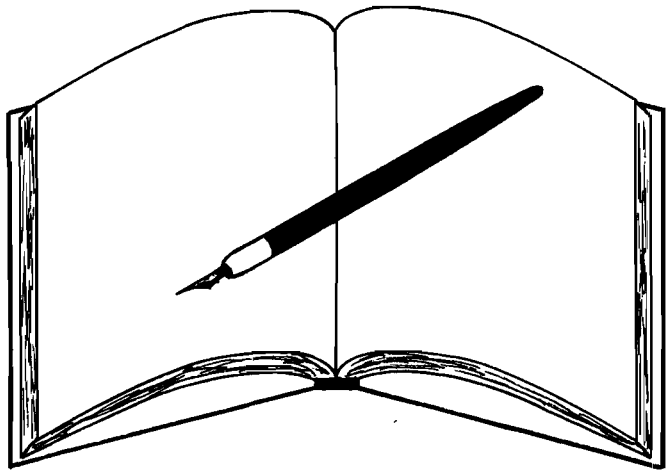


# LETTERS

# *to the Editor*

• Very recently I read a copy of Air Defense Trends dated October 1969. I was particularly interested in pages 48 to 55. [*Ed Note: These pages pertain to "History of Air Defense."*]

During my career, first National Guard, then active duty, starting with the Coast Artillery Corps, I had worked with the R.A. Corrector, the 60-inch Searchlight, and the Brocq equipment, "truly an invention of the Devil."

The October 1969 issue stated that this was the second of a series of articles on early antiaircraft (now you call it air defense).

If there is available a copy of the first in the series on early antiaircraft, please send me a copy; it would be greatly appreciated if future copies could be mailed to me.

LEROY S. MANN
Colonel (Ret)
*5447 30th Place N.W.*
*Washington, D.C. 20015*

• First I'd like to compliment you on a fine publication. The other guys here at the J-Box and I get to read Trends on either Saturday or Sunday afternoon while we are on manning—but not on hot-status.

My question is, when is the Army going to get some better generators? Our guys break their backs and really have a tough job of keeping ours going, and I'd like to find out if there is going to be some relief.

32d Air Defense Command Vet.

*The problem is well-known, and things are being done. Technical Bulletin 5-6100-201-15 authorizes units to requisition replacement generators at 5,000 hours' use and turn them in at 6,000 hours. In the foreseeable future, new 30- and 60-kilowatt generators will replace the 15- and 45-kilowatt generators. Requirements have been set by Combat Developments Command Engineer Agency to develop an entirely new family of generators.*

*Ed.*

•The recognition of the capabilities of automatic air defense weapons in the ground support role was long forgotten during the period between the Korean and the Vietnam Wars. Now, at last, the potency of these weapons is once again being praised on all sides.

One wrong impression is, however, being continually made in the press; that is that the M42 "Duster" was used in combat in Korea. An example of this idea appears on page 71 of the October issue of Air Defense Trends.

We certainly could have used the "Duster" in Korea, but that weapon was procured in quantity only after the end of the war. In early 1953, for example, I had the one and only "Duster" at Fort Bliss in the Enlisted Specialist Section of the Gunnery Department.

The 40-mm automatic weapon that was employed in Korea was the multiple gun motor carriage M19A1 which was based on the M24 light tank chassis of World War II. This was an excellent weapon which had only one major drawback: the electric fuel pumps for the twin Cadillac engines. Toward the end of the war, many of these weapons were stockpiled and not usable because of the lack of replacement fuel pumps. The end result was that the M19A1's were used almost exclusively by the nondivisional automatic weapon self-propelled battalions in fixed positions.

The AW battalions organic to the divisions were mostly equipped with the M16 quad fifties mounted on a halftrack. As I recall, the only exception to this was the 3d Antiaircraft Automatic Weapons Battalion (SP) assigned to the 3d Infantry Division which had a few M19A1's still operational at the end of the war.

The 40-mm Bofors gun is a grand weapon and one which probably never will become obsolete. Advanced, improved versions are standard air defense weapons in virtually all European armies. The powers-that-be should never allow these, or similar more modern weapons such as the Vulcan, to ever disappear from the inventory again.

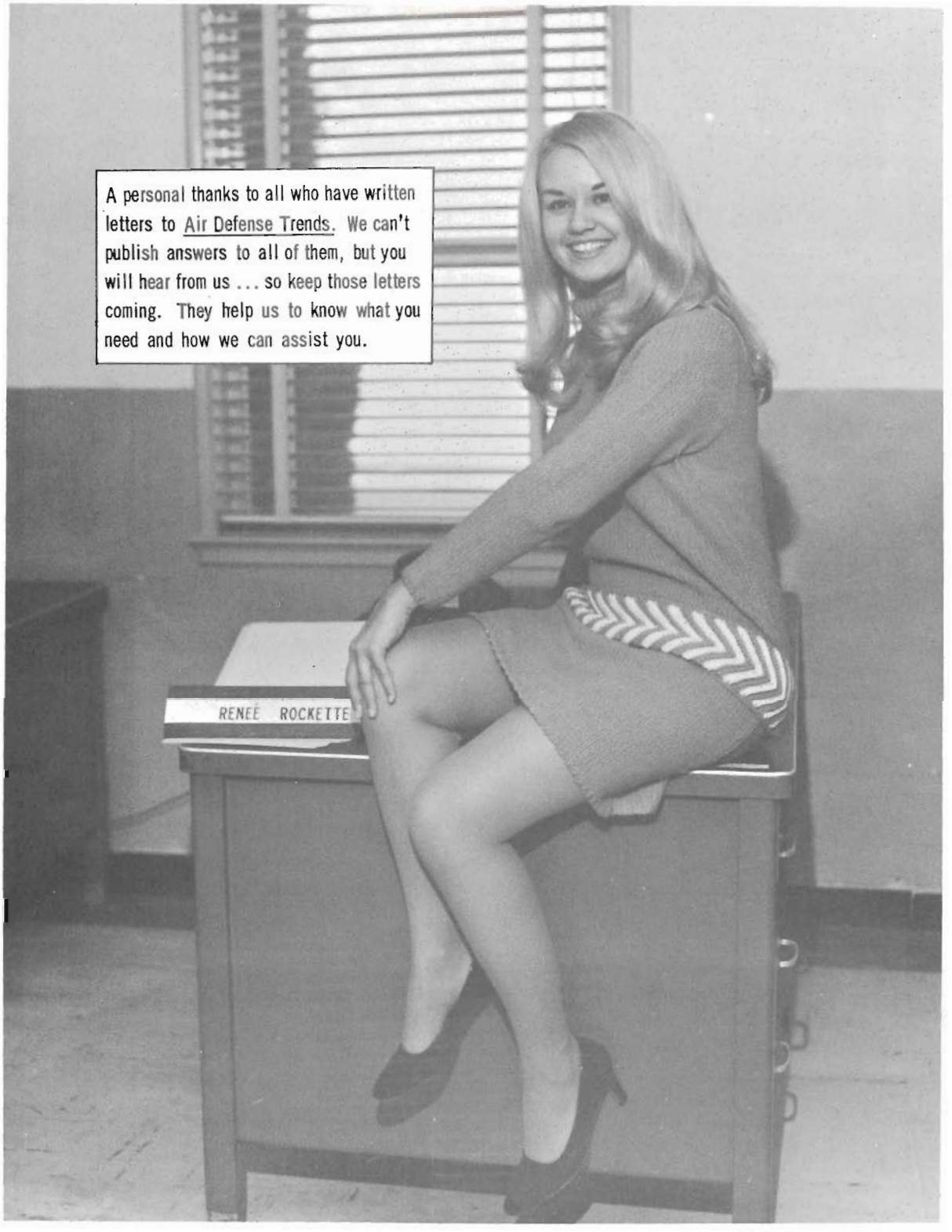
JAMES D. ANDERSON
Major, ADA
*Army Advisor*
*1st Battalion, 201st Artillery*
*Fairmont, West Virginia 26554*

•Recently, when I was in Vietnam, the battalion commander stated that the men could keep their unit crests. If this is authorized action, can you tell me the proper supply procedure to allow me to drop these crests from the books and acquire additional crests for issue? Your answer in Trends would be appreciated.

Name Withheld

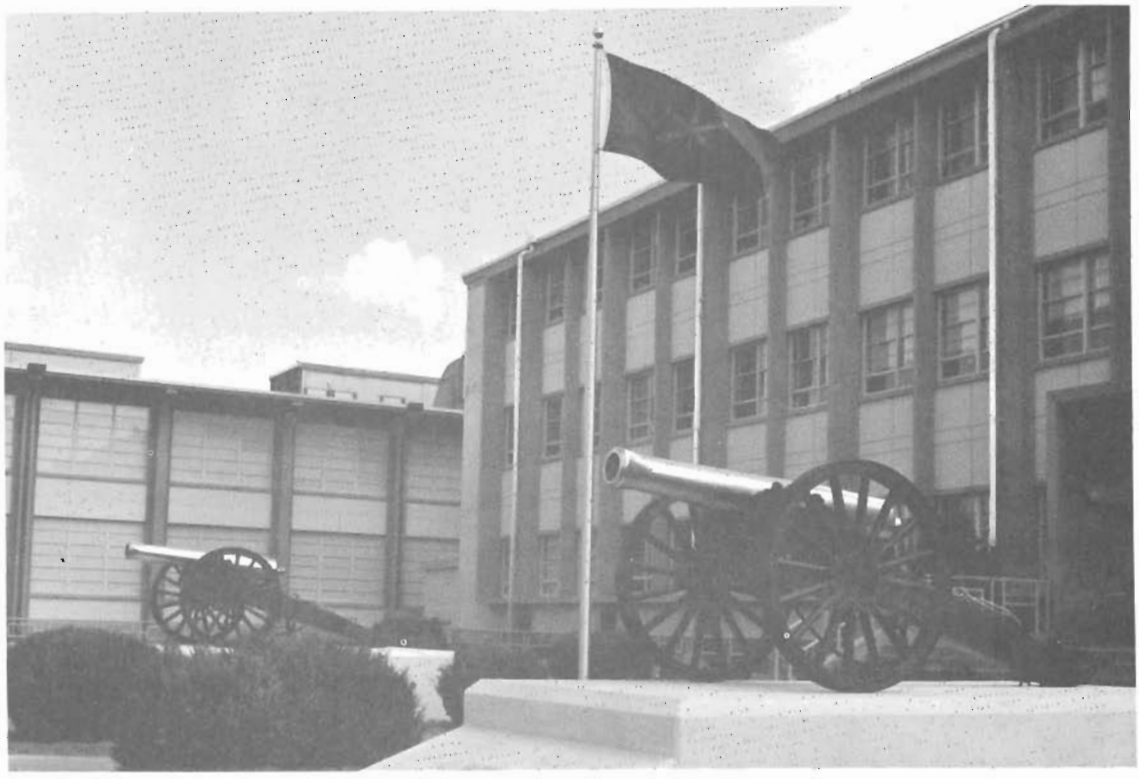
*Because unit crests are purchased by the unit fund, they may be kept by unit personnel if so voted by the unit fund council and approved by the next higher headquarters. The battery/company commander is accountable for unit fund property, and the crests, even though expendable, should be accounted for on DA Form 1991. It is also advisable to keep a running inventory on a control sheet. As crests are issued, they can be signed for on the control sheet and dropped from DA Form 1991. As new crests are purchased, they should be picked up on DA Form 1991. This recordkeeping, as required by paragraph 3f, AR 230-21, is in addition to maintaining DA Form 3259-3.*

*Ed.*




A personal thanks to all who have written letters to Air Defense Trends. We can't publish answers to all of them, but you will hear from us ... so keep those letters coming. They help us to know what you need and how we can assist you.

# USAADS Instructional Notes



*Hinman Hall*

## OFFICE OF DOCTRINE DEVELOPMENT, LITERATURE, AND PLANS

### RESERVE OFFICER TRAINING

Summer training for air defense artillery Reserve officers enrolled in either the USAR School or USAADS correspondence Branch Officer Basic Course (BOBC) and Branch Officer Advanced Course (BOAC) has been tentatively scheduled as follows:

1. 4-18 July 1970.

   a. BOBC: Phase II (M42/M55).

   b. BOAC: Phase II (Nike Hercules).

2. 18 July-1 August 1970.

   a. BOBC: Phase III (Chaparral/Vulcan).

   b. BOAC: Phase IV (Hawk/FAW).

3. 1-15 August 1970.

a. BOBC: Phase IV (ADA Tactics).

b. BOAC: Phase VI (Operations and Communications).

4. 15-29 August 1970. BOAC: Phase IA (ADA Tactics).

All instruction will be conducted in the academic departments of USAADS. The 4160th El Paso USAR School will serve as host school during the period 4 July-1 August, and the 4162d Austin USAR School will serve as host school during the period 1-29 August.

As in the past, both host schools will require limited instructor augmentation and will consider applications from qualified Reserve officers to serve as instructors for periods of 2 or more weeks. Besides having instructor experience, applicants must be graduates of the course in which they desire to instruct. Inquiries should be made to the Commandant, 4160th El Paso USAR School, P.O. Box 9591, El Paso, Texas 79986.

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## RESPONSIVE AIR DEFENSE CAPABILITY AT CORPS LEVEL

A definite need exists for a responsive air defense capability at corps level. The best way to provide the corps commander with this capability is to maintain the present doctrine of assigning one air defense artillery group, consisting of four Hawk battalions (three self-propelled and one towed) and one Chaparral/Vulcan battalion to each corps in the field army.

Some believe that all nondivisional air defense, exclusive of theater air defense, should be assigned to the air defense artillery brigade in the field army. The US Army Air Defense School is convinced that the doctrine for allocation of air defense assets contained in FM 44-1 (Jul 67) (contrary to the doctrine set forth in the revised FM 44-1) is more responsive and more suitable to field army operations. The air defense group is under the command and operational control of the corps commander and is specifically tailored to be immediately responsive to his needs and desires. This retention of air defense assets at corps level is structurally consistent with the organization of other branches within the field army. Also, the present allocation of air defense assets enhances tactical training effectiveness for both air defense personnel and the corps commander and his staff. The provision for centralized direction is established for the corps commander and his ADA group by the ADA brigade SOP. Also, the present allocation of air defense assets helps assert the fact that ADA, in addition to its air defense role, has a ground support role and a deterrent role.

The allocation of air defense assets whereby all nondivisional air defense, exclusive of theater air defense, is assigned to the air defense artillery brigade in the field army would habitually take the form of an air defense artillery group being assigned a standard tactical mission of direct support of the corps. In this situation, the group assigned the direct support mission would remain under the operational control of its immediate ADA headquarters and theoretically would insure a maximum amount of centralized control. Actually this form of allocation of assets would result in denying the corps commander the responsive air defense he needs in a fluid combat situation. The ADA brigade commander is not necessarily familiar with the tactical situation in the corps area and probably could not anticipate

the needs of the corps commander. In addition, the ADA brigade commander would have the responsibility for operational control of several direct support groups (one per corps) as well as those groups supporting the field army. The ADA brigade commander probably could not keep adequately abreast of a rapidly changing tactical situation because of this broad extension of his span of control. It is probable that responsiveness by the air defense group to the needs of the corps as a whole would be severely degraded.

Here are some major advantages in retaining air defense assets at corps level:

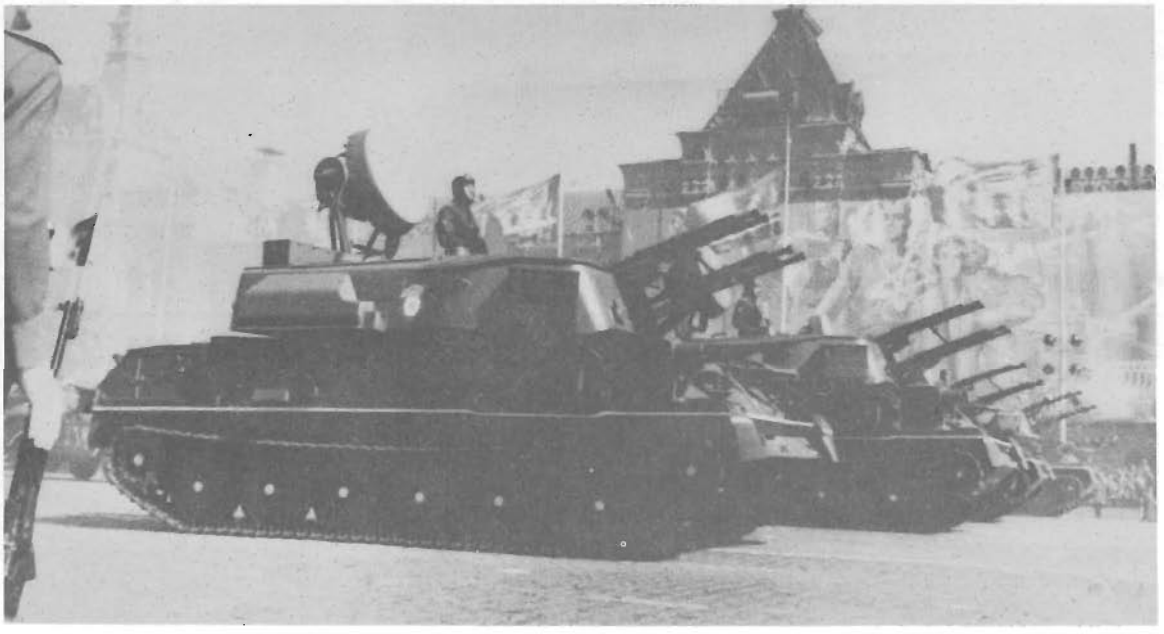
•Responsiveness to changes in corps priorities. The corps commander is most knowledgeable concerning the tactical situation in his own corps area. As part of his inherent responsibility as corps commander, he must establish priorities consistent with his assigned mission. Fluidity on the battlefield would necessarily dictate periodic changes in his priorities. With his own ADA assets, the corps commander could more easily keep himself well defended against hostile air attack. He could also maneuver his forces without having to sustain overall air defense integrity as envisioned by the field army ADA brigade commander other than what was outlined in an ADA brigade SOP.

•Tactical training effectiveness and flexibility to respond to changes in operational control authority. By attaching or assigning the air defense group to the corps, training would be greatly enhanced and could be conducted concurrently with those units with which air defense personnel would be working in a hostile environment. If nondivisional air defense assets were assigned at field army, almost all training would probably be done autonomously from the corps, and each time an ADA group was assigned a support mission for a corps it would be a new experience. Training in a hostile environment, when it could be accomplished more simply in a nonhostile environment, is not desirable.

In recent years, by having the ADA group assigned at corps, headway has been gained toward educating field commanders of other service branches concerning the true capabilities of ADA weapon systems. The imminent adaption of standard tactical missions to air defense will greatly increase their understanding of the full capabilities of ADA weaponry. The provision for centralized direction and adherence to common doctrine would be established for the corps commander, his staff, and corps ADA organizations through an ADA brigade SOP along with rules of engagement that would apply to the entire field army. On the other hand, by denying the ADA capability to the corps, the impression could be created that ADA has a place as a combat support arm only when the aggressor has air superiority. This impression is completely erroneous and in many cases extremely dangerous. Currently in Vietnam the M42 and M55 systems are being used in the ground support role. For those systems without this additional capability; i.e., Hawk and Chaparral, the deterrent effect must be considered. By reducing the probability of enemy air attack by the mere presence of an effective air defense capability, the air defense mission is, in fact, accomplished.

RUSSIA'S ZSU-23-4

Through the courtesy of the Editor of British Joint Service Recognition Journal we are able to give you a glimpse of one of today's most modern self-propelled antiaircraft weapons (see the four photographs below). It is a product of evolution, since Russia has consistently included self-propelled antiaircraft weapons in her inventory. The armament consists of four turret-mounted 23-mm guns, thus the name ZSU-23-4. The guns are automatic and deliver a high rate of radar-directed fire. The weapon is obviously designed primarily for defense against low-flying aircraft.



## TRAINING LITERATURE REPORT

Here is the status of Department of the Army training literature produced by the US Army Air Defense School during fiscal year 1970.

FM 44-1-1, US Army Air Defense Artillery Operations (Oct 69) (new).

FM 44-4, Procedures and Drills for Chaparral Self-Propelled Weapon System, Jan 69 (revision). Final draft complete Jun 70.

(C) FM 44-4A, Procedures and Drills for Chaparral Self-Propelled Weapon System (U), Aug 69 (revision). Final draft complete May 70.

FM 44-5, Procedures and Drills for Vulcan Self-Propelled Weapon System, Aug 68 (revision). Final draft complete Jun 70.

FM 44-19, Qualification Program, Air Defense Artillery Weapon Systems, Dec 68 (revision). To TAGO Mar 70.

FM 44-20, Service Practice for Air Defense Artillery Missile Units, Jun 66; C 1, Oct 66 (revision). Final draft completed Mar 70.

FM 44-62, Air Defense Artillery Automatic Weapon Gunnery (Aug 69) (revision).

(C) FM 44-82A, Procedures and Drills for Nike Hercules Missile Battery (U), Nov 66 (revision). Final draft complete May 70.

(C) FM 44-97, Air Defense Artillery Engagement Simulator; Guided Missile System Radar-Signal Simulator Station AN/MPQ-T1 (Nike Hercules) (U), May 67 (revision). Final draft complete May 70.

FM 44-99, Procedures and Drills for Hawk Missile Battery (Towed and Self-Propelled), May 69 (revision). Final draft complete May 70.

FM 44-100, Procedures and Drills for Vulcan Towed Weapon System (new). Final draft completed Jan 70.

TM 44-210, Digital Computers, Jun 67 (revision). Submitted to TAGO Nov 69.

TC 44-8, Air Defense Element, Tactical Operations Center, Nov 63 (revision). Final draft completed Mar 70.

ATP 44-2, Headquarters and Headquarters Battery, Air Defense Artillery Brigade (Group), Dec 67 (revision). Final draft complete May 70.

ATP 44-8, Air Defense Artillery Target Detachment (Jul 69) (revision).

ATP 44-85, Air Defense Artillery Automatic Weapon Units (Jul 69) (revision).

ATP 44-235, Air Defense Artillery Battalion, Hawk, Dec 67 (revision). Final draft complete Apr 70.

ATP 44-325, Air Defense Artillery Battalion, Chaparral/Vulcan, Self-Propelled, Aug 68 (revision). Final draft complete Apr 70.

ATP 44-725, Air Defense Artillery Battalion, Chaparral/Vulcan, Nondivisional (new). To CONARC Feb 70.

ASubjScd 44-5, Reconnaissance, Selection, and Occupation of Position for Air Defense Artillery Units (Sep 69) (revision).

ASubjScd 44-7, Air Defense Artillery Chaparral/Vulcan Squad, Aug 68 (revision). To CONARC Feb 70.

ASubjScd 44-10, Air Defense Section, Airspace Control Element, Tactical Operations Center (Nov 69) (revision).

ASubjScd 44-12, Air Defense Artillery Service Practice Procedures, Jul 67 (revision). To TAGO Dec 69.

ASubjScd 44-14, Automatic Weapon Section (M42) (Sep 69) (revision).

ASubjScd 44-34, Hawk Self-Propelled Platoon (Oct 69) (new).

ASubjScd 44-39, Launching Platoon Headquarters and Launching Section (Nike Hercules), Jun 67 (revision). Final draft complete Jun 70.

ASubjScd 44-42, Air Defense Artillery Communications (Jul 69) (revision).

ASubjScd 44-00G20, Advanced Individual Training and Refresher Training of Target Aircraft Crewman, MOS 00G20 (revision). To TAGO Jan 70.

ASubjScd 44-16D10, Advanced Individual Training of Hawk Missile Crewman, MOS 16D10, Jun 67 (revision). To TAGO Jan 70.

ASubjScd 44-16E10, Advanced Individual Training and Refresher Training of Hawk Missile Fire Control Crewman, MOS 16E10, May 67 (revision). To TAGO Jan 70.

ASubjScd 44-16F10, Advanced Individual Training and Refresher Training of Light Air Defense Artillery Crewman, MOS 16F10 (Jul 69) (revision).

ASubjScd 44-16R10, Advanced Individual Training and Refresher Training of Vulcan/ Chaparral Crewman, MOS 16R10, Feb 68 (revision). To CONARC Dec 69.

ATT 44-2, Air Defense Artillery Brigade (Group), May 66 (change). Final draft completed Jan 70.

ATT 44-85, Air Defense Artillery Automatic Weapon Units (Jul 69) (revision).

ATT 44-235, Air Defense Artillery Missile Units (Hawk), May 66; C 1, Jul 67; C 2, Nov 68 (revision). To CONARC Feb 70.

ATT 44-325, Air Defense Artillery Battalion, Chaparral/Vulcan, Self-Propelled, Feb 69 (revision). Final draft completed Feb 70.

ATT 44-725, Air Defense Artillery Battalion, Chaparral (Self-Propelled)/Vulcan (Towed) (new). To CONARC Feb 70.

## MAKING SOLDIERS INTO MISSILEMEN

*Colonel John E. Connor, Jr*
*Director of Instruction*
*US Army Air Defense School*

The US Army Air Defense School, charged with the responsibility of turning soldiers into missilemen, is one of the most advanced service schools. Because of the complexity of the subjects we teach at this school, our teachers have to be the best possible. This means the Air Defense School instructors must be better than satisfactory. Those who receive a rating of satisfactory no longer instruct. They must receive a rating of excellent or higher to remain as instructors (fig 1).

Figure 1. Sergeant First Class Jay L. Wilkerson, recently named an outstanding instructor of the High Altitude Missile Department's Officer Instruction and EW Division.

One of the most impressive facts to civilian educators who visit School facilities is that every instructor in the School is a graduate of the School.

We have what might be called a "charm" course which every instructor must pass. We instill in them confidence in their knowledge of the subject and equipment and in their ability

to communicate. They practice in front of television cameras, and fellow instructors critique them. The competition between them to excel is quite high. The "charm" course is taught entirely by the Educational Services Division under the Director of Instruction. All of the teachers—civilians who are qualified as educators—teach and then evaluate new instructors after they have graduated and are in the classroom. The teachers even evaluate the tests and work on better teaching methods. They are highly qualified as teachers, not as technicians. The "charm" course includes instruction in speech, use of training aids, and teaching methods, but not the actual material which will be taught in the classroom.

Future instructors learn the technical material they will be teaching when they go through basic School courses in the missile field in which they will be instructing.

One of the most fascinating things about our "charm" course is that other agencies and departments (for example, the Department of Agriculture downtown and the Judge Advocate General's Office here on post) ask for quotas for their personnel. We are pleased that the Center Chaplain's Office has even asked for quotas so some chaplains can take the course.

All instructors must face and survive a "murder board" before they give a lesson in the classroom. These boards, in all departments of the School, are composed of qualified instructors. The instructor who goes before one of these boards presents his polished lesson plan. The board critiques the lesson plan, and the instructor goes back and works to make it better. He does this over and over again until the board is satisfied with the presentation.

Most air defense artillery officers and enlisted men are selected for the Air Defense Artillery branch as a result of exhibited skills in mathematics, science, or other technical fields. Upon selection, they are assigned to one of the 65 courses offered at the School. Not all of the students the instructors must teach are qualified. Some haven't even a basic knowledge of electricity. And, naturally, not all of them volunteered for the Army or the field in which they find themselves.

Recognized as the free world's foremost authority on guided missile sciences and training, the School teaches not only officers and enlisted men from the Air Defense Artillery branch of the US Army, but officers and enlisted men from some 56 other nations as well. Consequently, we need interpreters in some of our classes, but these students learn amazingly well considering the language barrier for some of them.

The rapidly growing School will give instruction to more than 7,500 students this fiscal year with 6 percent of them being allied military students. Largest classes of allied students in the past years have come from Belgium, Denmark, Germany, Greece, Italy, Japan, Korea, and the Netherlands. We have more allied students than all of the other Army schools added together and are teaching more courses (65) than any other service school.

Because of the large number of students, the first class starts at 0445 and the last class ends at 2255. We have to meet stringent requirements to send these soldiers back to their units as missilemen. This means the faculty spends many, many extra hours getting them ready. We present our material so that the student not only understands it but also so he cannot misunderstand it. We keep him continually involved (fig 2).

Figure 2. Captain Vaughn, student in the Air Defense Artillery Officer Advanced Course, demonstrates the use of communication test equipment to officer classmates.

To handle this large student load the School runs three separate shifts in the hardware departments with a total of 1,236 instructors—885 of whom are enlisted men. Instructors are selected who are highly motivated and have confidence in their ability to communicate. While the instructors spend much of their time keeping up with the latest trends, changes, and improvements in the systems which they teach, the School is also keeping up with the latest changes in teaching methods. We are now in embryonic stages of educational television. However, we do not and will not permit the television camera to be a substitute for the instructor. All air defense courses are taught "live" with an instructor on stage. We use the educational television only as a teaching aid.

Another innovation being used in the classroom is a student response machine. After the instructor has taught his lesson, he will show a question slide and each student will answer by pushing one of four buttons in front of him. The instructor's board shows which students did not answer correctly, and he can call on those who answered wrong to explain their answers. This leads to the student learning why he was wrong and the correct answer as well.

Still another method is being studied at the School. Programed instruction is now in the exploitation stage and may be adopted. The experiment is being conducted in advanced officer courses. The officers are given a test, for instance on basic electricity, and those

who fail are given a textbook with questions and correct answers—sort of an open book test—to fill out. They then are given another test without the open book. All this is done on their own time so we can go into other things in our instruction time. It allows us to teach them more in the time we are allotted.

Not all of our students—officer and enlisted—graduate. Those who do not qualify do not pass. We are teaching men how to handle the equipment responsible for the defense of our country, and the equipment they will be handling is quite complex. They must be highly qualified and motivated. These are the men who are manning the missiles which are ready to defend our country from air attack at a moment's notice.

# NONRESIDENT INSTRUCTION DEPARTMENT

## HOW THE NONRESIDENT INSTRUCTION DEPARTMENT CAN HELP THE ADA UNIT COMMANDER

*Lieutenant Colonel Wilmer O. Gray, Jr*
*Nonresident Instruction Department*
*US Army Air Defense School*

The 1st Advanced Individual Training Brigade (Air Defense) at Fort Bliss graduates soldiers trained in air defense materiel every 2 weeks. These new soldiers, having just completed an 8-week advanced individual training program, are awarded a 10 entry skill level in an air defense military occupational specialty (MOS) as crewmen for the Nike Hercules or Hawk missile systems, or for the light air defense artillery (M42/M55) or Chaparral/Vulcan weapon systems. After graduation the soldiers are assigned to air defense artillery units around the world. As the gaining battery commander of these new soldiers, you realize that they have merely scratched the surface of the training and skills necessary to become proficient in their duties for your unit. The completion of their training now becomes one of your major responsibilities.

The needs of the service often require assignment of personnel to jobs in their additional MOS or in their secondary MOS. These personnel may not have worked in either of these MOS's for some time and may need refresher training or, in some cases, complete training.

How can you, the gaining commander, solve the training problems posed by the situations above? The obvious thought that may come to mind is on-the-job training (OJT). This method of training is usually effective and provides the advantage of hands-on-equipment training. However, because much of air defense artillery equipment is electronic, technical, and complex, OJT alone may not provide the theory and background necessary to insure well-trained soldiers.

Your training problem does not end with your enlisted personnel. The new lieutenant just reporting in is likely to be a graduate of the basic course. The training and skills he acquired will need refinement and must be tuned to your unit needs. Correspondence courses are an excellent means of refresher training and are available for every air defense artillery weapon system in the field. Specialized courses are also available which can assist your new officer in those extra duties that will be his responsibility.

As a commander, have you been away from this type of air defense system for some time? Do you need a refresher in unit readiness, supply, maintenance, or battery control officer/tactical control officer (BCO/TCO) procedures? Whatever the need, there is likely to be a correspondence course that you can pursue to meet your requirement. The material also provides a ready reference for everyday use.

The following training methods—group study and individual enrollment—available through the Nonresident Instruction Department, US Army Air Defense School, are ideally suited to assist you, the commander, with this type of training problems. They are effective adjuncts to an OJT situation and provide the media to make a complete and effective training program

at battery level. These methods are adaptable to a formal training program at battery, platoon, or section level, or to an informal training program through individual enrollment in correspondence courses coupled with the unit OJT.

GROUP STUDY

The procedures for group study are outlined in USAADS Pamphlet 350-8, Correspondence Courses Catalog, 1969-1970. The objectives of group study are:

- To provide an opportunity for two or more individuals with common educational or occupational interests and needs to study together and participate in joint discussions and critiques for their mutual benefit.
- To provide commanders at all echelons with an additional instructional medium which may be tailored to meet requirements for training individuals.

All required study references and materials are provided. The responsibilities of the commander under the group study plan are outlined in DA Pamphlet 350-60, section VI, or commanders may obtain information for establishing group study by writing to the address shown at the end of this article.

INDIVIDUAL ENROLLMENT

Any member of any component of the Armed Forces may enroll in the Correspondence Course Program. Commanders may desire to use this medium of training without a corresponding OJT training program or it may be coupled with OJT. Enrollment procedures and subcourse and course completions are processed through the commander and provide an excellent means to monitor training progress.

The Nonresident Instruction Department, US Army Air Defense School, offers subcourses for enlisted personnel in every nontechnical air defense MOS. Air defense subcourses are also available for officer personnel. The subcourses are complete with all materials and study references provided. The student is provided adequate time to progress at a reasonable pace. Subcourses in automotive maintenance, personnel records and procedures, supply, communications, electronics, mess management, unit administration, and many others are also available for both officer and enlisted personnel. Through individual enrollment each soldier can improve his knowledge and skills in his MOS, prepare for his annual evaluation test, and earn promotion points. This method can assist you, the commander, in insuring that you have a well-trained and proficient unit. It is particularly useful where minimum impact on an existing training program is desired. For more details and information on either of the two training methods outlined above or for a current copy of USAADS Pamphlet 350-8, write to:

Commandant
US Army Air Defense School
ATTN: Nonresident Instruction Department
P.O. Box 5330
Fort Bliss, Texas 79916

*Editor's Note:*

*Check this space in the next issue of Air Defense Trends for information on how the Nonresident Instruction Department can help the ADA ROTC instructor.*

# Notes From
# US Army Air Defense Center and Fort Bliss

## THE AIR DEFENSE CENTER TEAM

The Air Defense Center Team, which meets monthly at Fort Bliss, is a forum for discussion of major significant problems of broad application and interest to air defense. It is organized in accordance with the Center Team concept introduced by General Harold K. Johnson when he was the Army Chief of Staff. The objective of the Air Defense Center Team is to make full use of the knowledge, experience, and capabilities available at Fort Bliss to solve air defense problems and resolve common issues when resolution cannot be effected at lower command levels.

*Air Defense Center Team in action.*

Members of the Team include commanders of the US Army Air Defense Center and Fort Bliss; US Army Combat Developments Command Air Defense Agency; the Assistant Commandant, US Army Air Defense School; the President, US Army Air Defense Board; and the Chief, US Army Air Defense Human Research Unit. The Team is administered by the USAADS Office of Doctrine Development, Literature, and Plans. Member organizations and agencies outside the Air Defense Center that are concered with air defense activities are invited to present topics relative to doctrine, materiel, and training to the Team for

information, discussion, problem resolution, or identification as specific problems to be referred to other agencies. The reservoir of knowledge and research facilities available at Fort Bliss makes the Center Team an ideal vehicle for proposing, testing, and finalizing air defense problem solutions. Each problem is carefully analyzed by a task group in searching for a practical solution.

Team positions and recommendations are forwarded to major commands concerned. Problems that cannot be satisfactorily resolved are referred to an appropriate agency for further research. Matters of significant magnitude or those that are of joint service concern may also be forwarded to the Army Chief of Staff for resolution.

Following are some of the more significant problem areas which the Team has acted upon recently.

- Joint Chiefs of Staff Publication 8, Doctrine for Air Defense From Oversea Land Areas. For some years JCS Pub. 8 has been less than suitable for the battlefield use of air defense artillery. It does not provide such Army fire units as Redeye and Chaparral/Vulcan the freedom to fire that these rapid-reaction systems warrant. Recommended changes that would alleviate this deficiency were forwarded through USACDC channels to ACSFOR-DA for consideration pending development of FM 44-11/AFM ( ), Joint Air Defense Operations From Oversea Land Areas.

- Joint Chiefs of Staff Publication 12, Tactical Command and Control Procedures for Joint Operations. Required information between the Army and Air Force is inadequate for fully effective coordination between the services. Information for coordination of forward area weapons is not mentioned. The Center Team approved a recommended change describing the minimum coordination requirements for medium/high and low-altitude weapon systems. The request for joint negotiation was forwarded through USACDC channels to ACSFOR-DA for consideration pending development of FM 44-11/AFM ( ), Joint Air Defense Operations From Oversea Land Areas.

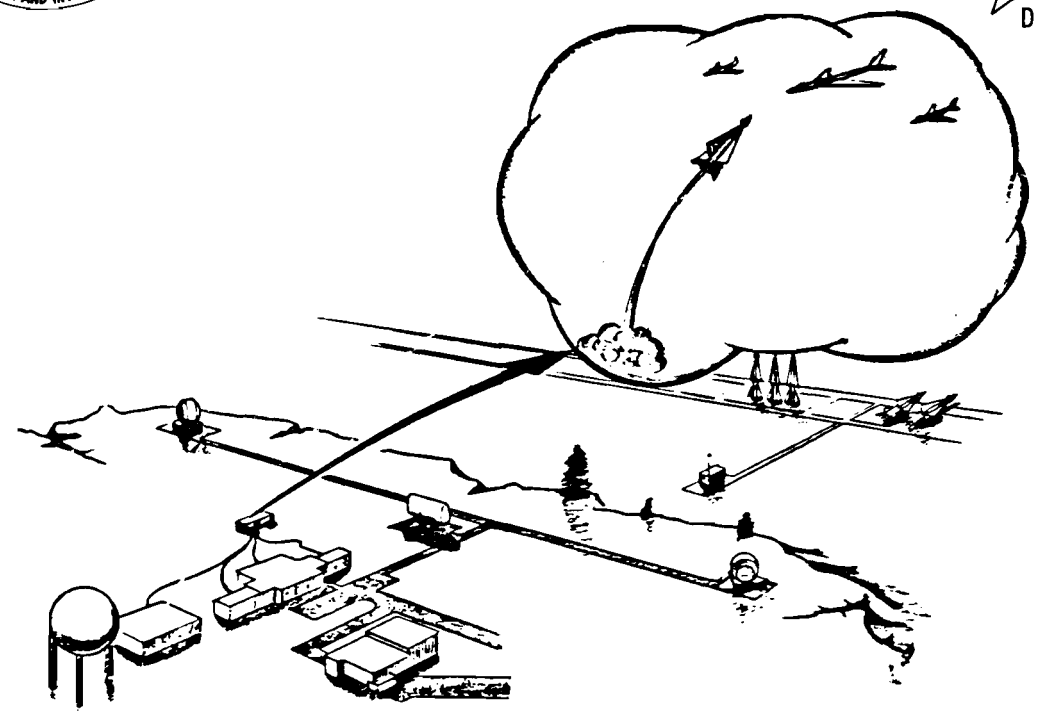
- Maintenance Concept. Maintenance concepts proposed by US Army Missile Command (USAMICOM) and US Army Electronics Command (USAECOM) are not compatible with the presently developed Chaparral, Improved Hawk, and forward area alerting radar (FAAR) systems. The Center Team developed a fact sheet recommending that CONARC emphasize opposing the implementation of USAMICOM's maintenance concept involving the level of piece-part repair for Chaparral, Improved Hawk, and FAAR. This action was submitted to the Army Chief of Staff.

- Attempt to Limit Antiradiation Missile Damage (ALARMD) Study. This is a study concerning the limiting of damage by an antiradiation missile strike. A fact sheet on the study was forwarded to CONARC and then to the Army Chief of Staff. Firing doctrine and hardening techniques are being developed and included in appropriate field manuals. A feasibility study for hardening (armoring) air defense equipment is being conducted by US Army Materiel Command.

*The Center Team encourages all commanders to submit significant air defense problems for discussion. Problems should be of general application rather than to some specific local condition. Problems or suggestions submitted will be carefully considered, and all concerned will be informed of the results.*

# Notes From US Army Air Defense Command

FIGHTING THE ELECTRONIC COUNTERMEASURES WAR



The United States is engaged in electronic warfare wherever it confronts potential enemies. There is constant probing on both sides to detect weakness in each other's electronic capability. For each electronic countermeasure (offensive), there must be developed

an electronic counter-countermeasure (defensive). Recognizing the ever-changing complexity of electronic warfare, ARADCOM Improved Nike Hercules air defense units constantly train against anticipated electronic countermeasures that a potential enemy may use.

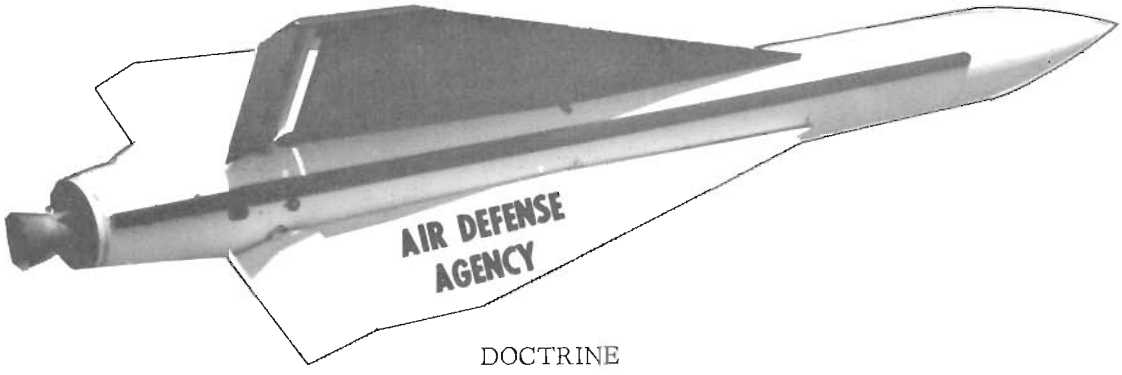
One of the most important instruments in the ARADCOM inventory of training devices is the AN/MPQ-T1 simulator. The AN/MPQ-T1 was developed for the Nike Hercules missile system by Aircraft Armaments, Inc., Cockeysville, Maryland. Recently, ARADCOM deployed the last of 40 simulators it was scheduled to receive. These 40 simulators are distributed throughout the United States and are constantly rotated between ARADCOM air defense sites. This training device, connected to the weapon system by cables, has distinct training advantages that even live aircraft exercises cannot furnish because of air safety and other restrictions. The simulator is capable of simulating from one to six independent aircraft targets and of simulating electronic jamming, by a presumed enemy, which radar operators are trained to counter.

The simulator "video" is seen on the Nike Hercules system radar scopes independently or, if desired, simultaneously with live video, including actual existing terrain features. The simulator operators fly their target aircraft against the system and "probe" for weakness in the radar operator's capability. The "battle" rages in a two-way, give-and-take affair as the simulator's electronic countermeasure is countered by the radar's electronic counter-countermeasure. As the radar operator's proficiency is increased, the simulator operators "pour it on," anticipating the worst situation that the weapon system crew may face against a real enemy.

If a real air attack occurs when the simulator is being used, the battery commander can push an eject button which immediately disconnects the simulator from the Nike Hercules radars, putting them into combat condition.

ARADCOM weapon system personnel are on continuous training status with these simulators and live exercises. This continuous training develops the radar operators to a high degree of proficiency that poses a formidable threat for any enemy that would dare attack the United States. The US Army Air Defense Command, as a component element of the North American Air Defense Command, insures that the air defense of the United States is always the best.

# Notes From the US Army Combat Developments Command




## DOCTRINE

A new version of FM 44-1, US Army Air Defense Artillery Employment, has been approved and is now at Department of the Army for printing. Field distribution is estimated as May 1970. Approval of this manual makes official the air defense artillery adoption of standard tactical missions (direct support, general support, general support-reinforcing, and reinforcing) similar to those first suggested in the January 1969 issue of Air Defense Trends.

The Agency is conducting a division air defense study (DIVAD). This study integrates the Redeye, Vulcan, Chaparral, self-propelled Hawk, Army aviation, and Air Force doctrine and operational concepts into a single package for division air defense and airspace control. Subjects covered are threat, tactics, command and control, communications, early warning, identification, firepower, logistics, and troop test needs. The study was released for field review in March 1970. Major study recommendations will be presented in the next issue of Air Defense Trends.

The US Army Combat Developments Command and the Air Force's Tactical Air Command have been working together for the last 3 years to produce a joint air defense manual, with the objective of bridging the doctrinal gaps between Army, Air Force, and joint doctrine. A draft of this manual, designated FM 44-11/AFM ( ), Joint Air Defense Operations From Oversea Land Areas, was recently prepared by the Air Defense Agency and forwarded through channels for Army and Air Force review and eventual joint publication.

## ORGANIZATION

The only currently approved divisional Chaparral/Vulcan organizations are those for the armored, infantry, and mechanized infantry divisions. Based on Department of the Army guidance, the Air Defense Agency recently developed a Chaparral/Vulcan table of organization and equipment (TOE) for the airborne division. The battalion-size organization (TOE 44-425T) initially consists of a headquarters and headquarters battery (TOE 44-426T) and two towed Vulcan batteries (TOE 44-427T) and is tailored to permit later incorporation of two Chaparral batteries. The airspace control element section and the liaison section were inadvertently omitted from the draft TOE, but will be added in a subsequent change.

All TOE's, except those tentative TOE's identified by a "T" suffix, are published and distributed at Department of the Army level and may be obtained from the Commanding Officer, US Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, Maryland 21220. "T" series tentative TOE's are distributed by Headquarters, US Army Combat Developments Command, and may be obtained by writing Commanding General, US Army Combat Developments Command, ATTN: CDCPA-PO, Fort Belvoir, Virginia 22060.

# Notes From the US Army Air Defense Board

## NEW COMPUTER SYSTEM FOR AIR DEFENSE BOARD

The US Army Air Defense Board has received a new IBM 360 system, Model 30. The new computer system, a marked improvement over the currently installed IBM 1620 system, will become an integral part of Air Defense Board facilities.

The US Army Air Defense Board, a part of the US Army Test and Evaluation Command (USATECOM), is responsible for service testing all new Army air defense systems and system components. To keep abreast of the increasingly complex problems presented in the testing of modern weapons, USATECOM has established the Test, Evaluation, Analysis, and Management Uniformity Plan (TEAM-UP). The new IBM system was originated in recognition of the unique requirements of US Army Materiel Command (USAMC) associated with the mission of USATECOM. This effort has resulted in the expansion and standardization of testing and data analysis techniques which require computers capable of meeting growth, day-to-day changes, and various scientific, engineering, and management systems associated with the testing mission. The Air Defense Board's new IBM 360 system is a part of this TEAM-UP program.

The new computer is composed of 13 interconnected units. The central processing unit, responsible for the management and execution of programs; a high-speed printer; a card reader; a card punch; magnetic tape drives; and disk storage devices with their associated control units comprise the total system. Also included is a teleprocessing capability through which the computer at the Air Defense Board will communicate with a 360 system, Model 50, at White Sands Missile Range, also a part of the USATECOM complex. The advent of the new system marks a great increase in capability and degree of sophistication.

# Notes From the Human Resources Research Organization

FY 70 WORK PROGRAM FOR THE ARMY

The HUMRRO research program for the Army in fiscal year 1970 consists of 35 separate projects—10 of them new this year and 24 continuing from fiscal year 1969.

Five of the new projects are work units—full-scale efforts designed to produce information or products that can help solve an Army problem. They are:

ACCOUNT—Analysis of Army Experience in Implementing a Mechanized Stock Accounting System, sponsored by the Deputy Chief of Staff for Logistics. In this effort, scientists are analyzing the Army's experience in implementing the NCR 500 logistics computer system at the direct support unit/general support unit level and will determine the nature of techniques and devices which could be developed to aid operator and manager performance and on-the-job training for this system. The results of this effort will provide the Army with guidelines for training personnel for the NCR 500 system and for training and implementing oncoming computer systems—such as the CS3.

JOBGOAL—Improved On-the-Job Training for Logistics Personnel, sponsored jointly by the Deputy Chief of Staff for Logistics and the US Army Materiel Command. Scientists will determine and develop means for improving on-the-job training of enlisted logistics personnel. At present, men in over 60 percent of all Army enlisted occupational specialties receive on-the-job training in lieu of, or in addition to, Army school training. Consequently, any improvement in on-the-job training would have a significant positive effect on the total Army training system.

MARKSMAN—Combat Marksmanship, sponsored by the US Continental Army Command. In this effort, research scientists will help the US Army Infantry School review marksmanship training throughout basic combat training and advanced individual training. While collaborating with School personnel in "systems engineering" marksmanship training, HUMRRO scientists are devoting emphasis to three subareas: (1) identifying conditions under which rapid-pointing fire can best be used, (2) establishing definitive guidance for proper employment of semiautomatic and automatic fire, and (3) developing higher levels of marksmanship skill under conditions of limited visibility.

OC LEADER—Systems Engineering of Leadership Training for Officer Candidate Programs, sponsored by the US Continental Army Command. Although effective, leadership training in current officer candidate programs has evolved more or less unsystematically over a period of many years. Further significant improvements will require a more systematic approach, both to leadership concepts and to leadership training. Scientists will develop and examine potentially productive approaches in the Infantry OCS program in terms of identifiable objectives and methods for attaining them. Validated objectives and training packages would have wide application in leadership training for officers and noncommissioned officers in all the arms and services.

TYPETRAIN—Development of Improved Army Typing Training Program and Materials, sponsored by the US Continental Army Command. Training in typewriting is presently being given to approximately 35,000 Army enlisted men and women each year in courses at seven Army training centers. Additional thousands learn typing in Army education centers and in enlisted supply courses. The US Army Adjutant General School, which is the proponent agency for Army typing training, wants to improve this training. HUMRRO scientists will conduct laboratory studies to determine the skills essential to effective typing, the training variables that affect these skills, and the most effective methods for training. They will also develop a typing training program and accompanying materials which will enable the Army to produce more proficient typists or to reduce the training time required to reach current standards.

Five of the new HUMRRO projects are exploratory research—efforts to evaluate the feasibility of undertaking major research activity on a particular Army problem. They are:

ER-74—Soldier Esprit, sponsored jointly by the Deputy Chief of Staff for Personnel, and by the US Continental Army Command. Scientists will evaluate the feasibility of developing a set of attitude and personality scales to measure soldiers' basic motivational needs, identification with the Army, and perceptions of the extent to which membership in the Army satisfies their individual needs. They will also determine the feasibility of developing training methods to use in modifying needs and achieving closer correspondence between satisfaction of needs and accomplishment of Army goals.

ER-75—Methodology for Training Systems Engineering, sponsored by the US Continental Army Command. At present, military personnel schooled in training analysis—a key element in the systems engineering of training—are not available in the Army. Army personnel required to develop training programs have to rely on guidance provided by training engineering documents. Available regulations, manuals, and reports are not organized in the "cookbook," how-to-do-it fashion which would be most helpful. HUMRRO scientists are collecting and collating available procedural information pertaining to the three major steps in training systems engineering: establishing training objectives, developing the training program, and evaluating the program graduate. They will prepare preliminary manuals containing the available procedures for accomplishing each of these three steps. They will also determine the requirement for additional training technology development, specifying and clearly defining the areas to be attacked by further training research.

ER-76—Army Personnel Management Technicians, sponsored by the Deputy Chief of Staff for Personnel. A serious shortage exists throughout the Army in both quality and quantity of personnel management technicians. Current methods of training and using these technicians, their supervisors, and personnel management officers are not considered adequate to meet the new demands on the Army. HUMRRO scientists are exploring the feasibility of conducting a research program, the results of which could be used to improve the training and utilization of personnel management technicians at various levels within the Army.

ER-77—AD Officer Career Course, sponsored by the US Continental Army Command. The recent separation of the artillery into two career branches—air defense artillery and field artillery—has created a need for a new program of instruction at the US Army Air

Defense School for the Air Defense Artillery Officer Advanced Course. Working in conjunction with the School, HUMRRO research scientists will design a program of research and exploratory development to permit gradual revision of the course in administratively feasible stages.

ER-79—Reducing Errors in Logistics ADP, sponsored by the US Army Logistics Doctrine, Systems, and Readiness Agency. There is a high error rate in automatic data processing operations within the Army logistic systems. These high error rates are costly, they lower logistics responsiveness, and they ultimately have an adverse effect on materiel readiness. In this study, HUMRRO scientists will assess the feasibility of research aimed at determining the factors in the working environment that are associated with high error rates in ADP operations in logistics systems.

# Quality Assurance / Quality Control of Maintenance

*Jack L. Matthews and James H. Ams*

Jack L. Matthews is a training specialist in the Office of Doctrine and New Materiel, US Army Missile and Munitions Center and School, Redstone Arsenal, Alabama. He has years of radar, computer, logistics, and training experience in Army weapon systems. He attended Pennsylvania State University and is presently working for a master's degree in administrative science at the University of Alabama.

James H. Ams is a supervisory general engineer in the Quality Assurance and Test Division of the Hawk Project Office, US Army Missile Command, Redstone Arsenal. He has management responsibility for several increments of the basic, self-propelled, and Improved Hawk programs. Having attended the University of Tennessee and University of Illinois, he holds bachelor of science and master's degrees in electrical engineering.

Let's be candid. Really, how good is your maintenance? How much trust do you place in the present condition of your stocks? Are you sure that your equipment will perform satisfactorily under the cold objective light of battle conditions? Do you have a comprehensive maintenance system that will guarantee, with a high order of confidence, the built-in reliability your weapon system is supposed to have? In other words, do you now have an effective, responsive, and reliable quality assurance program?

If these questions cause a healthy self-examination and critical evaluation of the status quo, the odds are in favor of your uncovering some shortcomings and doing something about it before it is too late. If, on the other hand, you feel secure: beware, so have other commanders with rather sudden and startling results! Let us examine one such case in point and try to glean what lessons were learned.

During a recent annual service practice (ASP), a missile battalion achieved a very poor showing initially. The commander halted the ASP at the halfway point and initiated a concerted and highly detailed scrutiny of equipment and procedures to determine causes and correct conditions. The exercise was resumed with a corresponding sharp improvement in system performance. The contrast between the "before" and "after" results was so great that an extensive effort was made to pinpoint the culprit or culprits. This evaluation of missile status was made on a very large scale with extraordinary pains taken to insure objectivity.

Well, what did the results show? The facts reveal three things: (1) Significant deficiencies were observed in all levels of maintenance, (2) these conditions were universally prevalent, and (3) a major contributor was the lack of adequate control measures in the supervision of maintenance. The deficiencies were mainly qualitative, not quantitative. The personnel in these units worked long and hard, and their attitudes were remarkably conscientious. Maintenance had been performed regularly and periodic management checks and reports had been faithfully rendered; yet, for some reason, these were not good enough! Probably the most significant finding was not the cumulative deficiencies themselves but rather that these problems were not recognized during the normal course of maintenance management. One might say that many were led down that broad, rosy path of "a false sense of security" until that day when the buttons were pressed.

What should be done? One approach is to carefully "peak and tweak" all the missiles and ground equipment just prior to the annual service practice or other readiness exercise.

We do not endorse this "cramming for the final exams" for two very good reasons: (1) It defeats the purpose of the test (viz., to ascertain actual posture), and (2) the enemy, unfortunately, does not usually give his opponent an advance notice of attack. Now that it has been established what not to do, let us examine some of the positive aspects.

Certain common denominators of management exist in any successful maintenance operation, particularly in support of complex equipment. These factors were employed at the midpoint of the ASP firing just described. They are certainly used in industry where keen competition will reward substandard performance with ruin. Reduced to simplest form, these factors may be termed "quality assurance/quality control." Like love and marriage, they are inseparable functions; so let's define them:

- Quality assurance (QA) - A management discipline consisting of a planned and systematic program covering all functions and actions necessary to provide adequate confidence that the end item or service will perform satisfactorily in actual operation.
- Quality control (QC) - The management, methods, techniques, and physical acts employed to insure that the quality of worksmanship, materiel, or maintenance operations conform to established standards, criteria, or specifications established by the quality assurance program.

In other words, QA prescribes the ends that must be achieved, and QC is the means of attaining those ends. The main job of QA/QC is to bring to the surface conditions of substandard quality and prescribe corrective actions, or preventive measures, before the situation gets out of hand. Let's be specific. What are some of the factors which tend to lie beneath the surface and, like icebergs, are totally deceiving in appearance until detected and identified?

One factor is a lack of emphasis on long-range maintenance. A coat of paint may cover a multitude of sins, but true system reliability is only evolved by an integrated program of careful preventive and corrective maintenance. Thus, a reorientation of thinking and priorities must be made. Actions must be taken to expend less energy on "stamping out fires" and more upon detecting the sparks that ignite those fires. Such actions include close attention to the actual manpower and materiel requirements of maintenance elements and command action on the little problems that may be precursors to big problems.

Another factor is the overdependence on paperwork. The famous Maginot line looked great on paper. So does the readiness posture of many military units. Personnel in responsible positions need to be aware of the unadulterated facts, not carefully edited reports. How does one extract the truth? By creating an atmosphere that is conducive to honesty and candidness; by recognizing and rewarding those who "tell it like it is" and then follow through on corrective actions; and by providing a check-and-balance system to guarantee factual, frequent, and accurate reporting.

A third factor relates to the conduct of inspections. It is axiomatic that a unit will naturally pay closest attention to those items that they know will be inspected most closely. Emphasis on cleanliness and recordkeeping will always yield clean shop floors and neat files. Important as these things are, it is more important to have a feel for such items as support test equipment condition, calibration status, logbook posting, personnel proficiency, and

product quality. Often deficiencies in these and other areas are acute but tend to be submerged under comparatively irrelevant details. Particularly during command visits to maintenance areas, the commander has a golden opportunity to evaluate these essential things.

Finally, it must be recognized that there is a vast degree of difference between the world of environmental testing of missile systems in CONUS under relatively optimum (or at least controllable) conditions and the average field circumstances. Equipment or components of equipment that is bounced across rough terrain, exposed to excessive moisture and dust, or subject to extremes of weather does not perform like laboratory or fresh-from-the-production-line items. Unusual circumstances should be met with extraordinary procedures when necessary, and these techniques should be made an integral part of unit policy. Don't pin your future on a particularly competent individual who may be here today and gone tomorrow. Conversely, establish a system by which continuity of control and standardization of operations are maintained regardless of personnel turnover or change of command.

Indeed, the preceding paragraphs may sound a bit like paeans in praise of motherhood, but maybe they should. We need to have the broad objectives in sight before we take a bead on the specific solutions. A review of the preceding factors (i.e., long-range maintenance, meaningful paperwork, realistic inspections, and compensatory procedures) should suggest that the requirement exists for fashioning a more readily identifiable quality assurance program and implementing a more effective quality control system. There are two ways of doing this: (1) evolving an Army-wide system complete with all the necessary training, personnel, doctrine, organization, and equipment; and (2) taking more limited but immediate corrective action in the field.

Let us examine the former area first. What things are currently being worked on by CONUS commands to effect the longer range solution? Briefly, they are as follows:

1. Integration of enhanced instruction on quality assurance/quality control into service school training programs (i.e., resident and nonresident courses).

2. Development of procedural doctrine (i.e., DA pamphlets, field manuals, technical manuals, and special texts) on quality assurance/quality control.

3. Authorization of sufficient TOE personnel and equipment assets to provide appropriate and adequate resources for repair and quality control operations.

4. Development and publication of pertinent quality assurance and quality control standards and criteria for maintenance.

5. Improvement of system maintainability and reliability through design innovations and equipment modifications.

6. Elimination of the electronic repair apprentice MOS and substitution of the journeyman-level repairman MOS to missile support TOE's.

7. Requirement for service school training prior to award of MOS in <u>all</u> critical and highly technical specialties (i.e., warrant officer and enlisted).

8. Development of a total on-the-job training (OJT) program (e.g., commander's guide, qualification standards, correspondence courses, and supporting materials) which is designed to continue the training of service school graduates.

9. Provision of second-level advanced technical training for career-committed enlisted personnel.

10. Continuous emphasis on command support of quality assurance program development.

Now comes the obvious question: "When do we get such things and how will they be provided?" Unfortunately, there is no simple answer to this question. The details will differ with each type of weapon system, and some items will require more extensive analysis and staffing than others. Suffice to say that all of these areas are being explored actively, and probably some of the results of this increased emphasis on quality in maintenance will become evident in the near future.

So much for the future—the problems are here right now, and some of them cannot wait for total program implementation. What then can field commanders and maintenance activities do in the interim period with the existing personnel, doctrine, organization, and resources? Obviously, the situation differs from unit to unit and is dependent upon numerous variables. It is because of this that each responsible individual must exercise originality in tailoring the system employed to conform to his unit needs and available assets. It is believed, however, that certain common denominators can be applied in the development of any quality assurance/quality control program. The following seven-point program is designed to significantly improve most maintenance operations; in addition, it will prepare for forthcoming developments:

1. Establish a quality assurance program. Any effective management system must have a basis or charter which identifies pertinent information in general terms, such as objectives, responsibilities, priorities, and procedures. A brief but definitive quality assurance program document is essential as guidance upon which to base an effective quality control system. Ideally, such a program should be established at all command levels and closely interfaced. However, we shall concentrate on the quality assurance program at the battalion, battery, or company levels. To have maximum utility and validity, the program should be jointly developed by key command, staff, and technical personnel who are involved in unit maintenance operations. The format employed can be that of an SOP or command policy letter. It must be recognized that the purpose of this document is to establish broad command guidance for the accomplishment of quality control and to cite responsible activities/individuals. Therefore, simplicity, brevity, and practicality are essentials of a good program. Minimum recommended coverage should include:

a. Purpose.

b. Application.

c. References.

d. Rescissions.

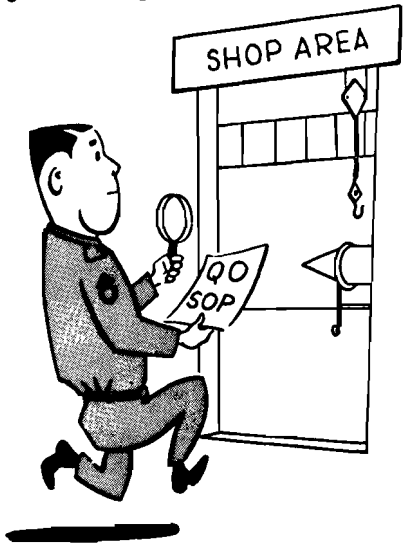
e. Definitions.

f. General objectives and goals.

g. Responsibilities and functions.

h. Procedures. (Cite the actions and interactions between the quality control activity and command and staff elements, tactical elements, and service support elements, and portray the general methodology to be used in accomplishing quality control.)

2. Formalize the quality assurance program. After development of a brief but definitive written quality assurance program, these goals and objectives must be translated into specific procedures and actions. Generally speaking, this means giving the necessary identity and authority to the individuals designated as responsible for quality control and providing them with the means of accomplishing this mission. Great care must be exercised in determining the positioning of the quality control element in the organization and in designating the types of personnel to be used. This can best be illustrated by reviewing a quality control structure proposed for direct support of the Hawk missile system. The Hawk missile system is offered as an example primarily because the quality control structure has been rather thoroughly explored as a result of a recent study on Hawk maintenance support. It is believed that the fundamental principles developed for Hawk will have, to a large degree, direct application on the maintenance of all air defense missile systems and other complex materiel. Currently, Hawk maintenance inspectors are authorized at grade E-6, "20" skill level, and located within the repair sections of the direct support platoon. Based upon an analysis of workload densities, job skill and knowledge requirements, and unit organization, the organization shown in figure 1 is recommended. Note that the quality control function is segregated from production and administered by a separate and dedicated element of the support platoon. To maintain a dynamic continuity of the quality program to battalion headquarters level, the missile maintenance staff officer (MOS 4516) is designated to exercise operational



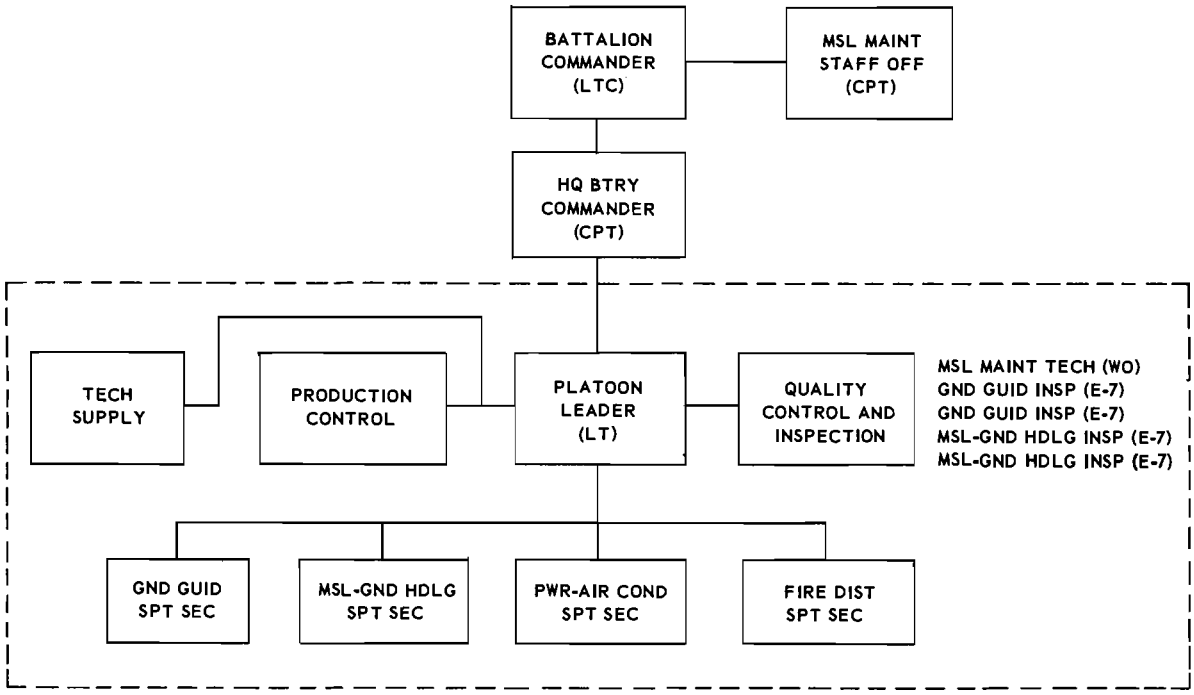



Figure 1. Hawk direct support platoon.

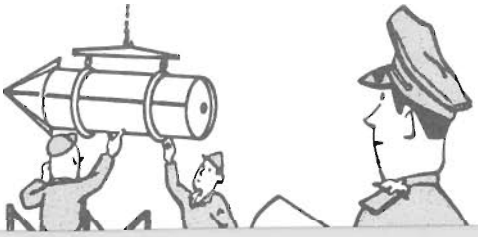
control of the direct support platoon. In this capacity, he would have a direct responsibility and vested interest in the conduct of the quality assurance program. The personnel composition of this element is equally important. Inspectors at grade E-7 with a "50" skill level authorized for each functional maintenance area (i.e., radar repair, computer repair, missile repair, etc.) will provide the type of individuals who are both technically competent and management oriented. This group should be supervised by a warrant officer, missile system repair technician, who will coordinate maintenance quality control activities and perform vital liaison services both within the support shop and between the support shop and supported batteries. It may be necessary to augment present equipment authorizations with additional items that may be required to conduct quality control inspections or to perform critical or sensitive repair operations. Examples of such specialized equipment that may not be presently available are illuminated magnification devices for inspectors, flashlights with flexible extension devices, antiwicking tools, and improved soldering equipment for repairmen. The basis for maintenance quality control must be approved standards and criteria. These are normally available in equipment technical manuals and bulletins. However, these must be supplemented with other specialized publications, such as MIL-S-45743C for soldering standards and TM 750-245-4 for missile quality control inspection criteria. It is often advantageous to fabricate models for acceptable versus unacceptable workmanship to settle interpretative disputes. The foregoing description briefly portrays some of the constituent elements of an effective quality assurance program. The process of formalizing this program is necessarily an evolutionary one. Optimum results are only achieved through periods of trials and refinements and by attitudes which are progressive and flexible. The terminal results of an effective program are more efficient utilization of resources and higher readiness condition of equipment. Until these goals are fully realized, it must be recognized that "the journey of a thousand miles begins with the first step."

3. Fully indoctrinate personnel. Not only must the inspectors be trained in quality control techniques and procedures, but likewise the repairmen must be apprised of the system of which they are a vital part. It is particularly important to stress the need for quality control in the maintenance of complex equipment, the individual responsibilities for everday application, and the specific techniques used for quality workmanship. Examples of common and typical unacceptable conditions or practices should be cited, and the practical remedy and proper technique clearly demonstrated. Training sessions of this type should always be constructive in nature and administered as often as required to insure that quality control becomes an instinctive habit of each man. As much as time and circumstances permit, a free and frequent exchange of ideas between operator personnel and maintenance personnel should be encouraged to reach better understanding and resolve mutual problems.

4. Keep records of vital data. It is never popular to suggest the creation of new records, charts, or reports—especially for maintenance and tactical units that are often already overburdened. However, the whole concept of quality control is that "an ounce of prevention is worth a pound of cure." Therefore, it is only logical that some method be devised to keep records of vital data for effective quality control and to portray this information graphically. Specific formats are determined by individual unit requirements; however, the important thing is to show trends and developing problems. Such records must be kept simple, meaningful, useful, and accurate. Whenever they fail to meet this fourfold test, it is time to abolish or modify the formats used or change the methods of data collection.

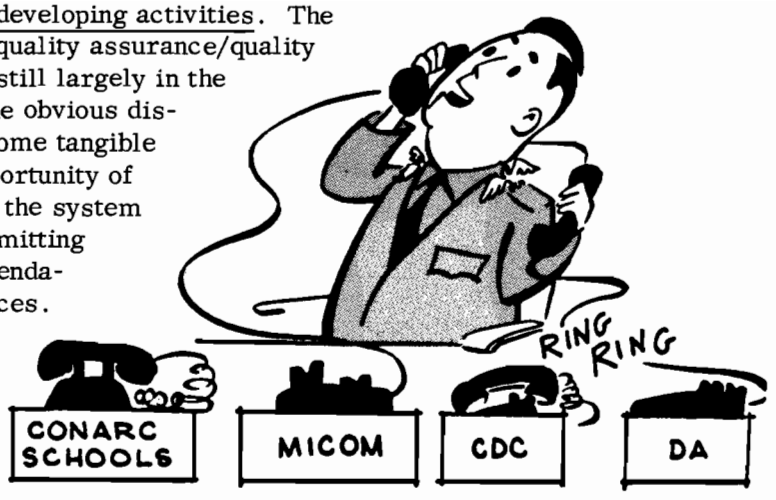
5. Make the program dynamic. Few things are more depressing to observe than a well-intentioned program that falls into disuse

or impotence through neglect or failure to keep pace with the times. Like a muscle, the quality control program draws strength through continuous exercise and close attention. Procedures and methods should be under constant surveillance, and periodic reviews should be made of their effectiveness and responsiveness. When it can be shown that new or revised techniques are preferable to established ones, corrective action should be taken immediately. Commanders and supervisory personnel should be receptive and responsive to proposed innovations or changes when such are constructive. The entire quality assurance program and quality control system must be a "living" thing which is flexible, adaptable, and responsive to changing circumstances.



6. Provide consistent command emphasis. In the final analysis, the lifeblood of the unit quality program is the command emphasis given it. To be effective instruments, the designated quality control personnel must have consistent command-level backing on their decisions, actions, and recommendations on those matters which affect quality control. But this backing is more than an indorsement; it also involves the provision of command-level technical assistance and guidance. The commander and his key staff personnel should have an open door and a willing ear for all matters affecting quality, and thereby encourage a two-way exchange of ideas and problems with quality control personnel. The quality control inspectors will need command support to effectively discharge their duties, many of which may involve judgment and arbitration. Correspondingly, these men, and the systems, procedures, evaluated during all command inspections, and hen required to make the program more workable. just as much as it does inspection check sheets, consistent command emphasis and support, the s at the subordinate levels and correspondingly d at the command level, it will quickly

7. Maintain contact with developing activities. The Army-wide establishment of a quality assurance/quality control system for the field is still largely in the genesis stages. Aside from the obvious disadvantages of this, there are some tangible benefits. You can have the opportunity of influencing and helping develop the system ultimately to be adopted by submitting written comments and recommendations based upon your experiences. Of particular value to personnel involved in the planning, training, and doctrine and literature development are reports of your progress, successes, problems, or failures in implementing a program such as that portrayed. Correspondence should be addressed to any or all of the following activities:

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Commandant
US Army Missile and Munitions Center and School
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Redstone Arsenal, Alabama 35809

Commanding General
US Army Missile Command
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# Transportable Maintenance Calibration Facility AN/TSM-55(V)5 Supports Chaparral/Vulcan Air Defense Artillery Units*

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*Program Manager*
*Calibration Programs*
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US Army calibration policy, as set forth in AR 750-25, Army Metrology and Calibration System, prescribes that all Army test and measuring equipment requiring calibration be calibrated at regularly prescribed intervals and that such requirements be identified and analyzed in the equipment development stage to insure that the necessary support will be available on a timely basis. Calibration requirements for test and measuring equipment developed or adopted for maintenance of the Chaparral/Vulcan systems were analyzed and the transportable maintenance calibration facility AN/TSM-55(V)5 (TMCF) was chosen to provide total support including diagnosis, repair, and calibration of Chaparral/Vulcan test equipment. Produced for the US Army by Hughes Aircraft Company, this facility will also be used to support maintenance calibration requirements for the forward area alerting radar (FAAR) system to be deployed with the Chaparral/Vulcan fire units.

Army test and measuring equipment utilized by maintenance activities requires periodic calibration servicing through the Army calibration system as prescribed by AR 750-25. Support provided by Army secondary reference or secondary transfer calibration facilities is identified as A level calibration while support provided by designated maintenance activities is identified as C level (maintenance calibration). The assignment of a specific type of Army test equipment to either A or C level is a function of several factors. C level support is normally employed when the personnel and equipment resources required to perform maintenance calibration are available for this purpose to the supporting maintenance organization. Test equipment which is beyond the capability of the maintenance activity due to more stringent accuracy requirements or unique characteristics is normally assigned to A level and is periodically calibrated by mobile secondary transfer calibration facilities which serve maintenance activities on a scheduled basis.

The AN/TSM-55(V)5 serves as a transportable facility capable of performing maintenance and C level calibration of electronic test equipment in the field. The basic facility is designed to house, transport, and provide an enclosed working space for operation of the various items of installed calibration standards used to perform the calibration mission. The complement of calibration standards installed in the facility was selected to support Chaparral and Vulcan test equipment within the context of the Army calibration system. The facility consists of a modified S-208( )/G electronic equipment shelter (fig 1) equipped with desk-height workbenches, vibration-isolated storage shelves for major calibration standards items, storage drawers for small items, a combination air conditioner-heater, an electrical power and lighting system, and various accessories, including power cable and reel, ground rod, and field telephone. The facility interior is illustrated in figures 2 and 3.

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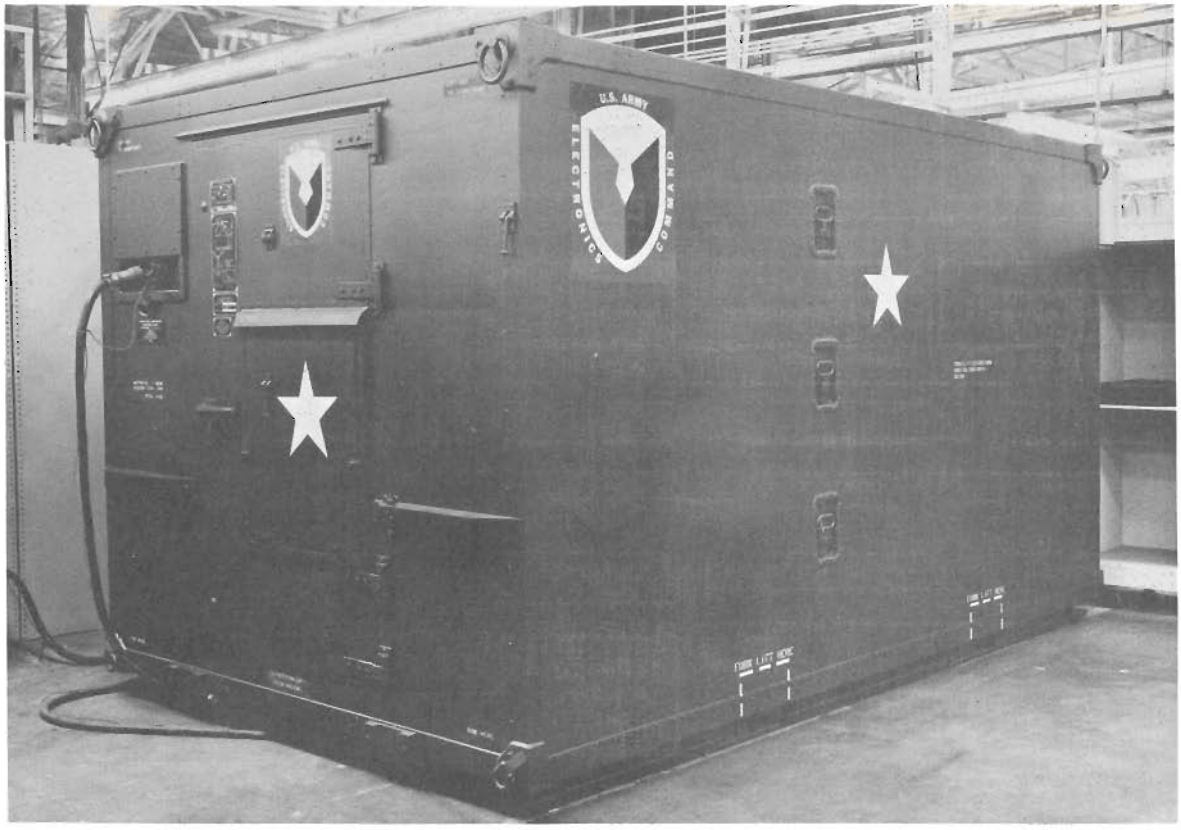



Figure 1. Transportable maintenance calibration facility AN/TSM-55(V)5.

PHYSICAL CHARACTERISTICS

1. Transport. Each facility is transportable by truck, rail, or towing (when used with mobilizer, gichner P/N 4000C3-2A, Army designation M707), helicopter, or similar transportation.

2. Weight. The gross weight of the facility is approximately 4,000 pounds including calibration standards, accessory equipment, support spares, and documentation.

3. Workspace. Maximum workspace is provided at a convenient height and of sufficient size to accommodate workload items, tools, and special equipment setups required in processing workload items. Sufficient sitting and standing room is provided for two people at the workspace areas.

4. Storage space. Facility accessory items have designated storage positions. Storage space is provided for the user's equipment and data as follows:

a. Calibration standards: 53.5 linear feet of shelving; 30-square-foot convolute foam storage drawers.

Figure 2. Basic calibration facility interior (roadside).

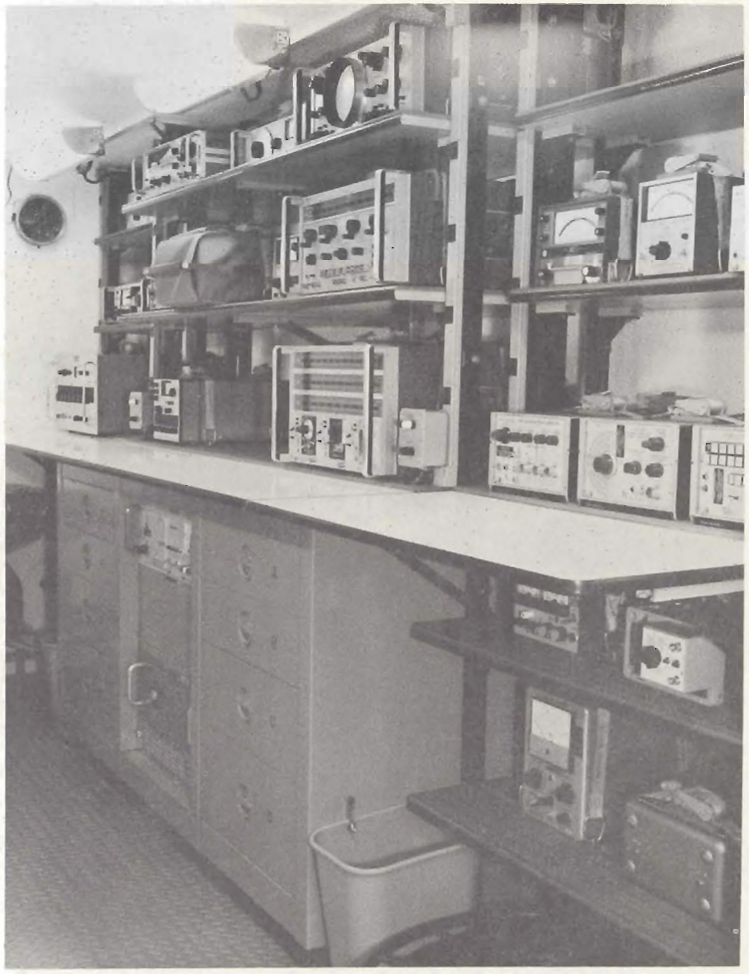


Figure 3. Basic calibration facility interior (curbside).

b. Repair parts: 17 cubic feet of drawers.

c. Documentation: 12 linear feet of 8-1/2- by 11-inch drawers.

5. Tiedown. Provision is made to tie down the major items, and placement is such that the equipment can be used while tied down. Drawers with convoluted foam padding are provided to store and contain miscellaneous smaller items of equipment when not in use and during mobilization.

6. Environment control. A combination air conditioning and heating system and two ventilating fans are provided as part of each facility for environmental control.

ELECTRICAL CHARACTERISTICS

1. Power source. Each facility is designed to operate with a primary power source of 10-kilovolt-ampere, 208-volt alternating current, 60-Herz, 3-phase, 4-wire. A reel of cable approximately 100 feet long is provided for connection of the facility to the prime power source through a power panel.

2. Power distribution. An auxiliary power connector which parallels the prime connector is provided for interconnection to another facility. Power distribution is through a circuit breaker panel located on the roadside of the door in the upper portion of the wall. Regulated 115v ac external and internal convenience power outlets are provided for equipment power as needed to perform the mission.

3. Lighting. Fluorescent lighting is provided for optimum human consideration of sufficiency, minimum shadow, distribution, and physical interference with normal operation of the facility.

4. Telephone. A field telephone (TA-312/PT) is provided in each facility on the roadside wall near the entrance. Connection is made to the telephone connectors on the power input panel.

MEASUREMENT AND SOURCE CAPABILITY

Measurement and source capability of the facility is specially tailored, by standards selection, to support the Chaparral/Vulcan/FAAR test equipment within the Army.

The AN/TSM-55(V)5 maintenance support for Chaparral/Vulcan units provides for the traceability of system measurements through the Army calibration system to the national standards. Commercial-type test equipment will be maintenance-calibrated through the measurement systems contained in the AN/TSM-55(V)5 at the DS/GS level. This calibrated equipment, in turn, is used for system testing and/or maintenance calibration of special-purpose test sets by system maintenance personnel. Thus, the maintenance calibration workload is divided between the AN/TSM-55(V)5 and shop sets provided for the Chaparral/Vulcan systems. These combined resources afford the equipment capability within the Chaparral/Vulcan support maintenance organization to fully maintain all Chaparral/Vulcan

electrical-electronic test equipment, including repair, since the maintenance calibration equipment provides the means to diagnose random failures and performance test of equipment following repair.

Similar facilities configured in the AN/TSM-55(V)1 and AN/TSM-55(V)2 versions have been fielded for more than 2 years in Southeast Asia to support US Army general electronic and communications test equipment, respectively, within the same general support concept.

# The USSTRICOM ADA Battalion

*A detailed look at a new air defense artillery organization—Joseph B. Fries, USACDCADA*

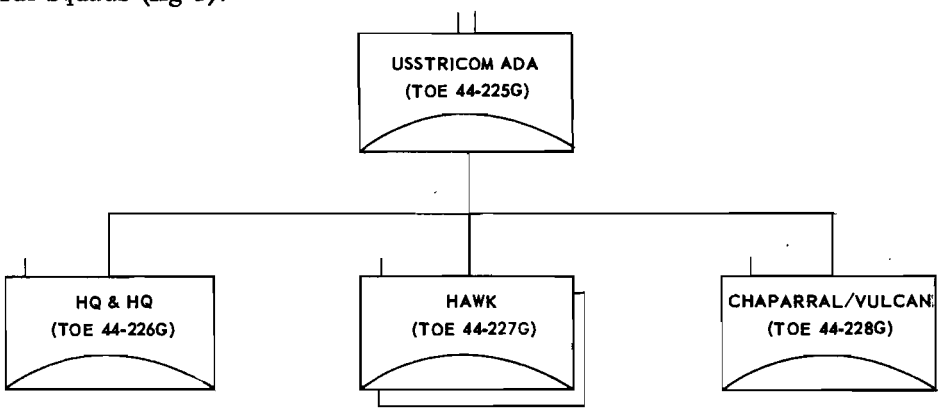
## WHAT AND WHY

Would you believe that a new air defense artillery battalion includes some of almost everything? The new USSTRICOM air defense artillery (ADA) battalions will include Chaparral, Vulcan, Hawk, and FAAR (forward area alerting radar). The full unit designation is "USSTRICOM Air Defense Artillery Battalion (Chaparral/Vulcan/Hawk) (Provisional)." These units will defend US Strike Command (USSTRICOM) airbases during emergency operations in, for example, Africa or the Middle East. If required, they will also support USSTRICOM ground forces. The USSTRICOM ADA battalion organization was just recently approved; this article provides unofficial advance information based partly on combat development studies, draft tables of organization and equipment (TOE), field manuals, and recent Army decisions.

## ORGANIZATION

Key points are:

•Firepower. Four towed Hawk firing sections, six towed Vulcan squads, and six self-propelled Chaparral squads (fig 1).




| | HQ & HQ | HAWK | CHAPARRAL/VULCAN |
|---|---|---|---|
| PERSONNEL | 191 | 282 | 118 |
| FAAR | 3 | | |
| HAWK FIRE UNITS | | 4 | |
| VULCAN FIRE UNITS | | | 6 |
| CHAPARRAL FIRE UNITS | | | 6 |
| VEHICLES, ALL TYPES | 62 | 84 | 35 |

Figure 1. USSTRICOM ADA battalion organization.

•Detection and identification capability. Four Hawk acquisition radars (two equipped with electronic IFF), three FAAR's (equipped with electronic IFF), 54 Chaparral and Vulcan crewmen, and airbase radars and aircraft. A theater air defense system made up of integrated

Nike Hercules, Hawk, and interceptor defenses may also help or may even exercise control; however, it can be expected that many USSTRICOM operations will be far removed from existing theater air defense systems. This article considers the latter case—the "isolated" airbase.

•Mobility. 100 percent ground mobile; air-transportable.

•Standardization. Uses standard towed Hawk batteries, FAAR sections, Chaparral squads, and Vulcan squads.

•Adaptability. Tailored for the tactical airbase air defense mission; capable of supporting mobile ground force operations, if required, with modification to the headquarters and headquarters battery and the Chaparral/Vulcan battery.

•Self-sufficiency. Tactically and logistically self-sufficient, except for personnel and finance services.

## DEPLOYMENT

The USSTRICOM ADA battalion commander positions (deploys) his units to best defend the airbase complex, following the airbase commander's guidance. A typical deployment is depicted in figure 2.

The two towed Hawk batteries (four firing sections total) are deployed to give all-round, low-to-medium altitude coverage, with emphasis on covering any low-altitude avenue of attack. Deploying the batteries "on-base," as shown in figure 2, provides reasonable coverage while lessening ground security problems. However, the batteries may be deployed "off-base" if necessary for defense effectiveness.

The six towed Vulcan squads are on-base in positions providing clear fields of fire and mutual support. Because there aren't enough Vulcans to cover all of the base, only the especially critical parts of the base receive full Vulcan coverage. The possibility of providing close-in Vulcan defense for Hawk is not overlooked. The Vulcans may move out of their air defense positions to help the ground defenses at night if the nighttime air threat isn't too serious.

The six self-propelled Chaparral squads are usually placed off-base to best use the Chaparral coverage pattern. The Chaparral defense is strongest along the low-altitude avenue of attack. However, reasonable all-round coverage is maintained by insuring some overlap of Chaparral fires against attacks from other directions. The Chaparral squads may be moved in at night to reduce ground security problems.

The three FAAR systems are deployed, often off-base, to serve better the Chaparral and Vulcan fire units, while gap-filling the Hawk radar coverage. Collocation of FAAR and Chaparral positions may be common.

The battalion AADCP is located close to the airbase operations center or other facility responsible for coordination of operations so that all detection, identification, and coordination means are exploited.

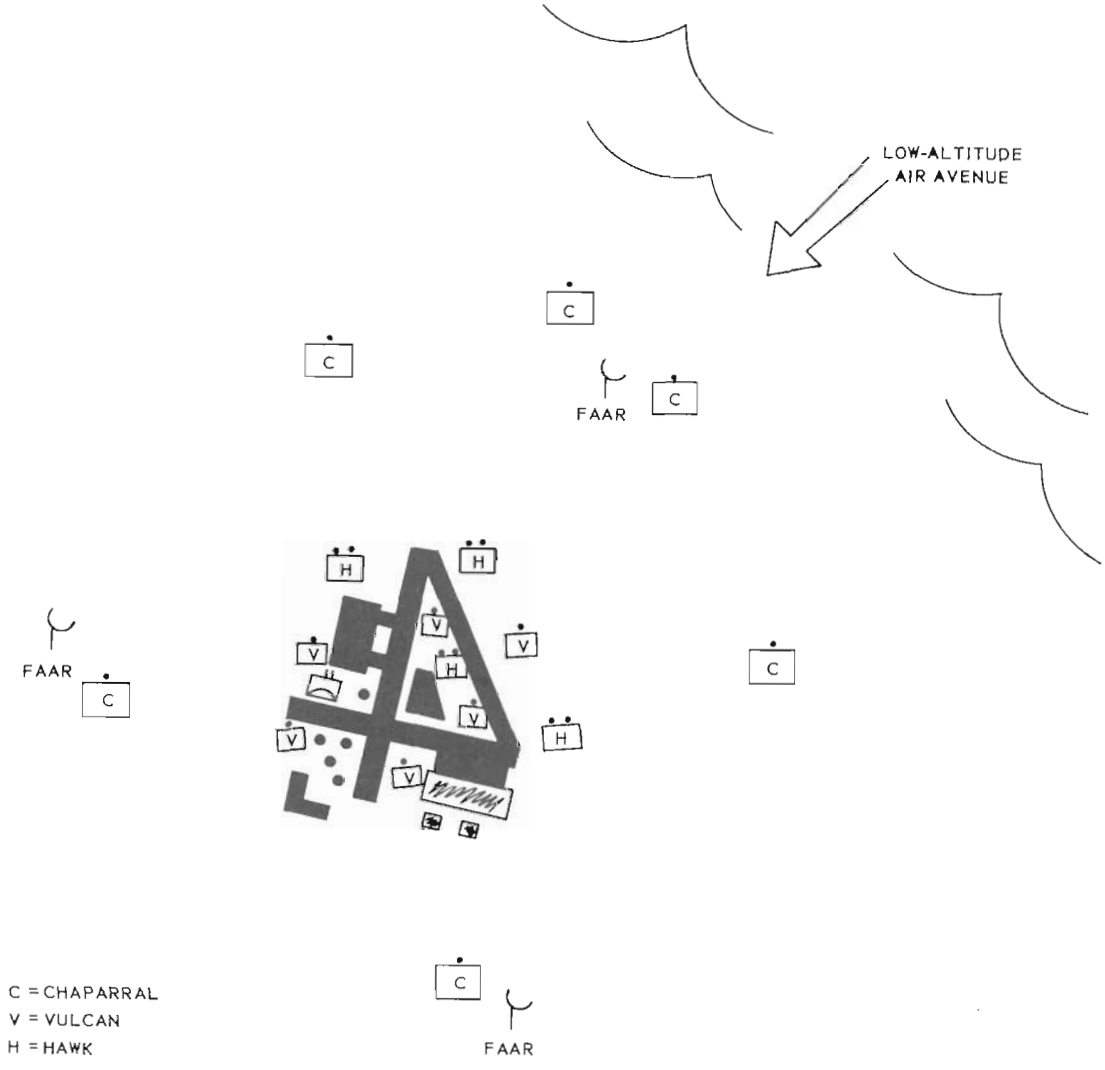



Figure 2. USSTRICOM ADA battalion deployment.

## COMMAND

Figure 3 shows typical command relationships, assuming the airbase is isolated from any theater air defense system.

The airbase commander would usually exercise operational control of the USSTRICOM ADA battalion. This gives the base commander authority over all battalion tactical activities, although he would usually delegate execution authority to the ADA battalion commander.

Support (e.g., air defense ammunition, personnel services, and higher level maintenance) of the battalion comes by way of Army channels. Common supplies, such as food and fuel, should logically be provided by the airbase commander.

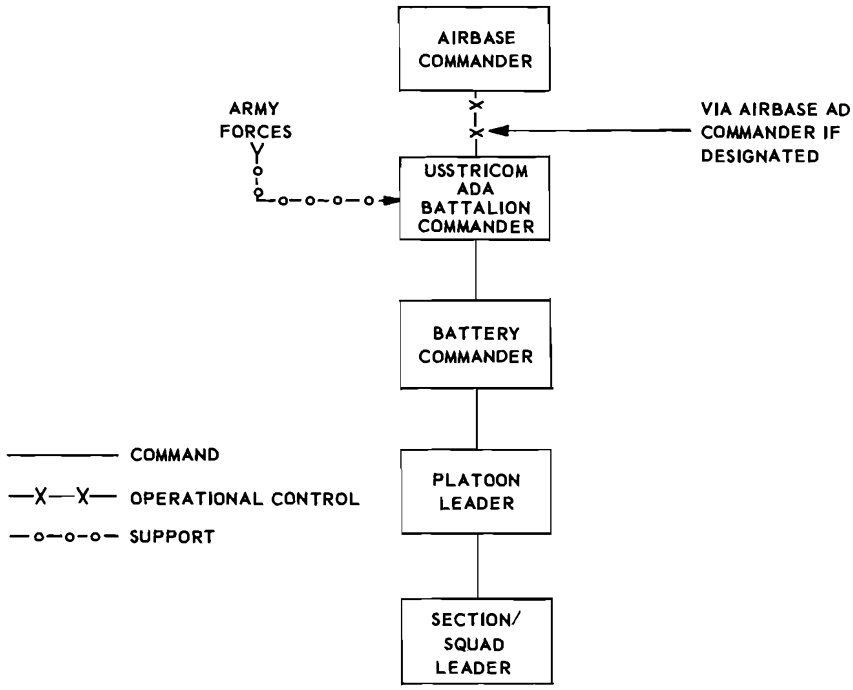



Figure 3. Command relationships.

## CONTROL

Control of Army air defense firepower in the strategic airbase air defense environment is worthy of special attention.

The critical need to defend the airbase—the focal point for tactical and logistical support of typical US Strike Command combat operations—justifies maximum freedom of ADA fires. But the large amount and critical nature of the friendly air traffic near the base argues for maximum restriction of ADA fires. A fire control concept that can resolve this conflict may be one that exploits these considerations:

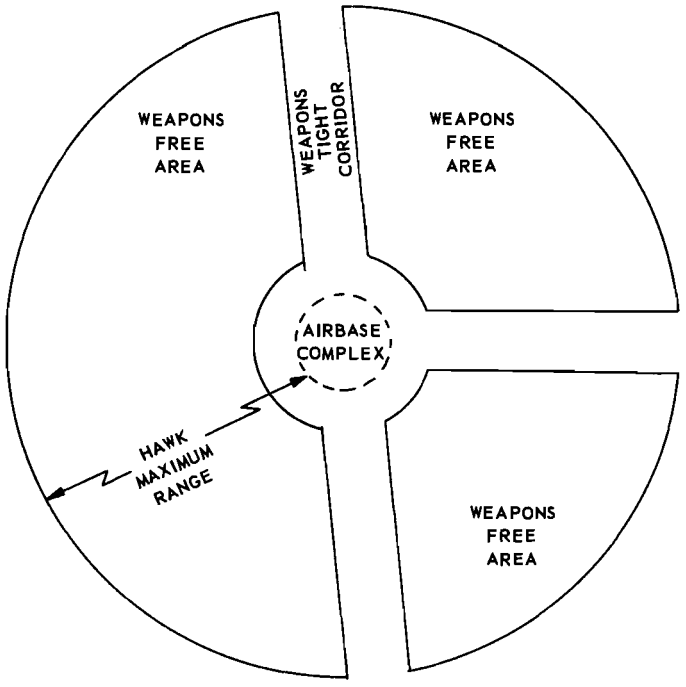
- Friendly air traffic in and around the base will be under close control; therefore, "unknown" aircraft are probably hostile.

- The air defense artillery is deployed within a small area, is semistatic, and can establish a well-developed communications system.

- Special identification procedures, not usable in other situations, may be put to use with little difficulty. For example, a friendly aircraft has no business approaching his airbase at high speed and low altitude—that could be called "hostile act." There are other possibilities, such as use of special flight corridors. Special pilot procedures; e.g., "wheels down 10 kilometers from airbase," are also practical.

A concept based on these possibilities is shown in figure 4. Under the concept shown, friendly aircraft would be restricted to designated entry, holding, and exit corridors. These

corridors could then be designated as air defense artillery "weapons tight" corridors. The usual rules for positive hostile identification could apply in the weapons tight corridors, with additional hostile acts specified; the example, "wheels up, incoming" (recognizable by Chaparral/Vulcan gunners) and "over 300 knots, low altitude, incoming" (useful to Hawk units). The corridors could be changed as often as necessary and eliminated when not actually needed. In the "weapons free" areas, the air defense artillery is free to engage any aircraft not positively identified as friendly—providing maximum air defense effectiveness in these areas.




WEAPONS FREE - ENGAGE HOSTILES AND UNKNOWNS
WEAPONS TIGHT - ENGAGE HOSTILES

Figure 4. Concept for control of ADA battalion fires.

## COMMUNICATIONS

Figure 5 presents suggested ADA battalion tactical radio nets, assuming an "isolated" airbase situation. Wire nets will also be used extensively and, in fact, may be the primary means of on-base communications with the radio nets serving as backup. Notice that figure 5 shows no electronic control and coordination system links, such as those associated with the Missile Monitor fire distribution system. No such links are anticipated. The radio nets are briefly described as follows:

•Command. Up to seven separate nets: battalion, FAAR platoon, Hawk battery (2), Chaparral/Vulcan battery, Chaparral platoon, and Vulcan platoon. Selected staff officers also operate in these nets for exchange of command, administrative, and logistical information not pertaining directly to the air battle. FM voice.

| STATION \ NET | CMD | WPN CONT, HAWK | WPN CONT, C/V | RADAR RPTG | FAAR DATA | THEATER AD WNG | THEATER AD O&I | USAF COORD |
|---|---|---|---|---|---|---|---|---|
| AIRBASE OPERATIONS | | | | | | | | X |
| BATTALION | X | X | X | X | X 1/ | X 1/ 2/ | X 2/ | X |
| FAAR PLATOON | X | | | | X 1/ | | | |
| FAAR SECTION | X | | | X | X | | | |
| HAWK BATTERY | X | X | | X | | X 1/ 2/ | | |
| CHAPARRAL/VULCAN BATTERY | X | | X | | | X 1/ 2/ | | |
| CHAPARRAL PLATOON | X | | | | X 1/ | | | |
| VULCAN PLATOON | X | | | | X 1/ | | | |
| CHAPARRAL SQUAD | X | | X | | X 1/ | | | |
| VULCAN SQUAD | X | | X | | X 1/ | | | |
| THEATER AD SYSTEM | | | | | | X 2/ | X 2/ | |

1/ Receiver only
2/ If applicable

Figure 5. Tactical radio communications.

•Weapons control. Direct battalion-to-fire-unit links, monitored by battery. For exchange of tactical information, such as states of alert, weapons control status, special control instructions, and current status information. AM SSB voice (Hawk) and FM voice (Chaparral/Vulcan).

•Radar reporting. For transmission of radar plot and warning information from the Hawk radars and the FAAR's to battalion. AM SSB voice.

•FAAR data. Three nets: one for each FAAR and the fire units it serves. Alerting/identification data displayed at each fire unit on a target alert data display set (TADDS) (formerly known as rapid alerting and identification display (RAID) unit). FM digital data broadcast.

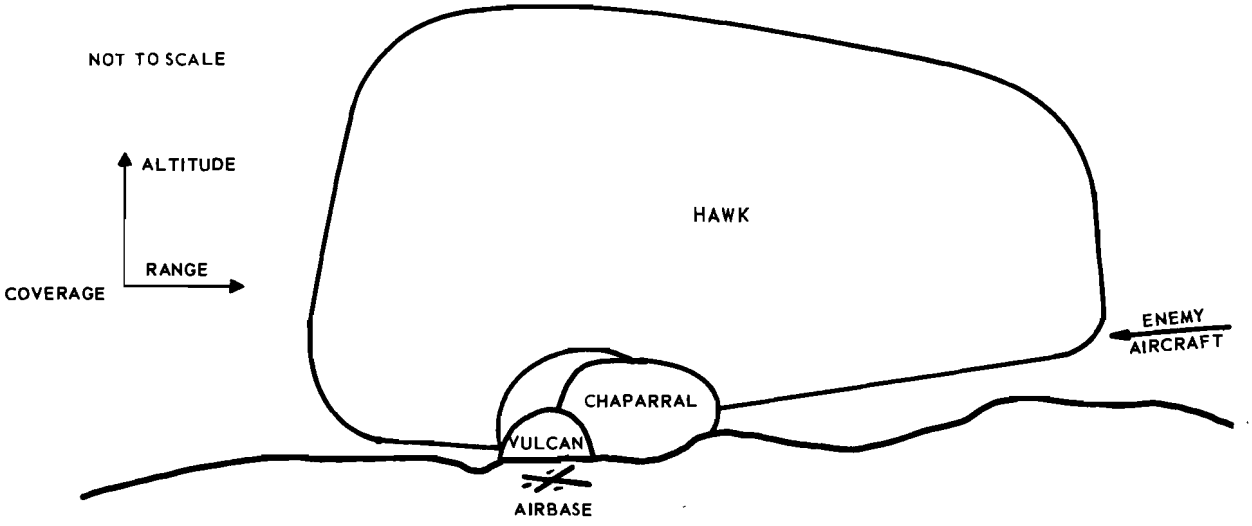
•Theater AD. Selected elements operate in warning and operations/intelligence (O&I) nets associated with a theater air defense system, if applicable, or as directed. AM SSB voice.

•Other. An AM SSB voice net may link the battalion and its liaison officer when use of a liaison officer is required. Also, FAAR sections may tie into the FM voice nets of nearby units if required for purposes of coordinating security and logistical arrangements.

## EFFECTIVENESS

US Army Combat Developments Command and US Air Force computer simulations suggest a high degree of effectiveness for the USSTRICOM ADA weapon combination. This is because the coverage and characteristics of the members of this family of weapons are complementary as shown in figure 6. A bonus is provided by Vulcan's ground fire support capabilities.

The USSTRICOM ADA battalions fill a definite need. USSTRICOM strategic airbases should never get the same treatment that Egyptian airbases received in June 1967.




| FIRE UNITS | ALL-WEATHER CAPABILITY | GUIDANCE SYSTEM | IDENTIFICATION MEANS |
|---|---|---|---|
| HAWK (4) | YES | RADAR HOMING | ELECTRONIC IFF PROCEDURES 1/ |
| CHAPARRAL (6) | NO | INFRARED (IR) HOMING | EYEBALL PROCEDURES 1/ |
| VULCAN (6) | NO | NO IN-FLIGHT GUIDANCE | EYEBALL PROCEDURES |

1/ CORRIDORS, DIRECTION OF FLIGHT, ETC.

Figure 6. Hawk/Chaparral/Vulcan complementary effects.

# Integrated Circuits

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Whether it be gun, cannon, or missile, the name of the game in the Army air defense role is coordination with a resulting successful engagement. Such engagements have become more dependent with each passing year on electronic technology. In the last 10 years fire distribution systems have gone from electron tubes (Missile Master) to transistors (Missile Monitor) and finally to the integrated circuits (IC) or micromodules (Missile Mentor and data converter AN/GSA-77).

All electronic circuits used in air defense can be classified as either discrete or integrated. The discrete component circuits are made up of tubes, transistors, inductors, resistors, and capacitors packaged as separate items. The integrated circuit contains all required elements or components in a self-contained package. Recent developments have been aimed at assembly, packaging, and interconnection of circuit components as an integral part of manufacture and fabrication. With air defense emphasis on size reduction and maintenance ease, the integrated circuit has come into use. These integrated circuits are made of glass or ceramic wafers on which diodes, resistors, transistors, interconnecting conductors, and insulating materials are formed. Integrated circuits use the same electronic principles of operation as the older discrete circuits. Most integrated circuits are produced by a batch-fabrication method. The difference in manufacture and physical size result in characteristic differences between discrete and integrated circuits.

The integrated circuit uses very few capacitors and almost no inductors, the reason being that the cost of manufacture goes up when these components are required. All voltages used with integrated circuits are much lower than with discrete circuits. Most integrated circuits use the NPN transistor because of the manufacturing process. The physical construction varies slightly with each manufacturer. The common integrated circuit is of multilayer construction using silicon with an impurity (fig 1). The integrated circuit cannot be repaired when one component fails, a characteristic which leads to the throwaway maintenance concept. Troubleshooting or isolating procedures for integrated circuits and discrete circuits are the same.

Most integrated circuits are classified according to the types of components used in the circuits. The following five classifications are generally used: diode-logic (DL), resistor-transistor logic (RTL), diode-transistor logic (DTL), transistor-transistor logic (TTL), and direct-coupled transistor logic (DCTL).

One of the acute problems in all types of discrete circuit operation, a problem which is even more acute in integrated circuit operation, is in faulty connections between components and circuits. This problem can be overcome by eliminating or improving all wire and manual connections. The newer connection methods will be found in modern air defense electronics because of the high reliability required of all military systems. Manufacturers of military equipment use connecting processes known as beam leads, laser weld, flip chips, spider bonding, and reflow or batch soldering. These processes show great promise in integrated circuits. The Safeguard ballistic missile defense system equipment uses the beam-lead method. At this time, the beam-lead method gives promise of highest reliability.

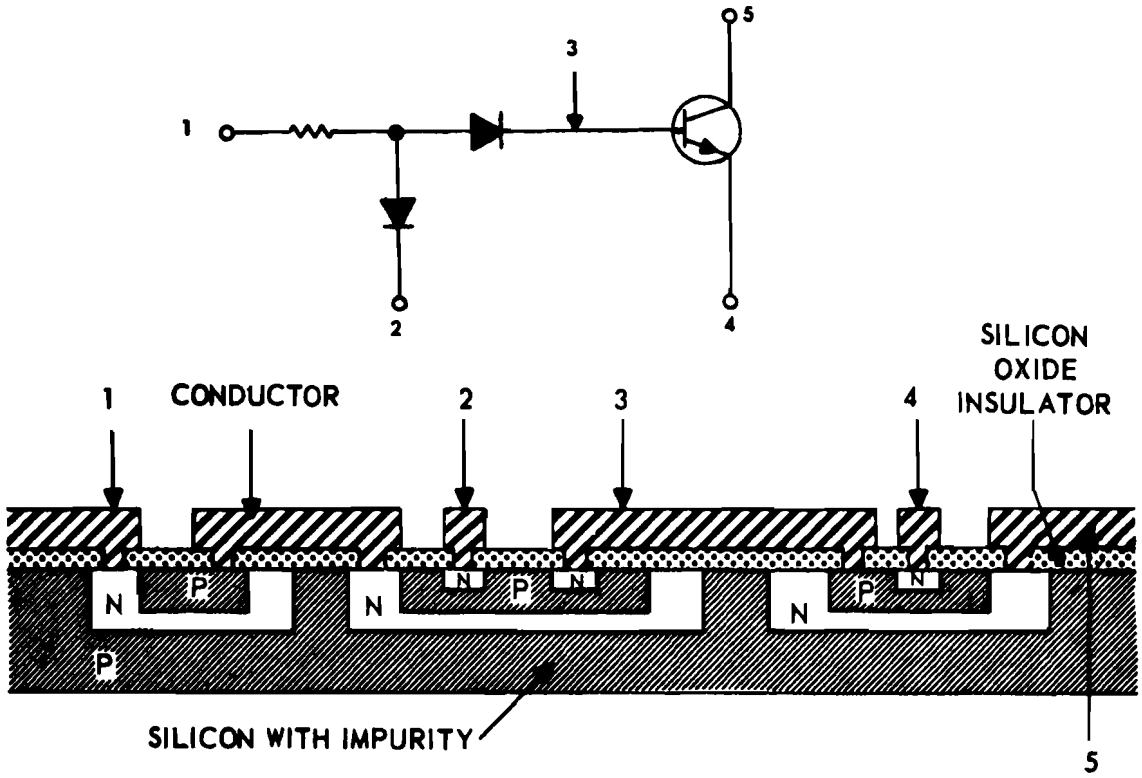
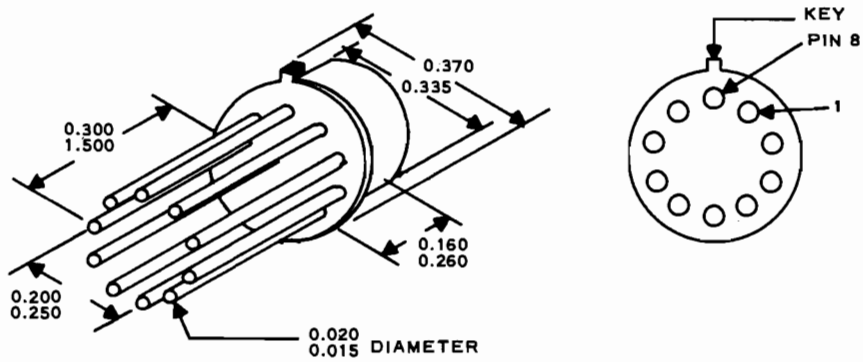


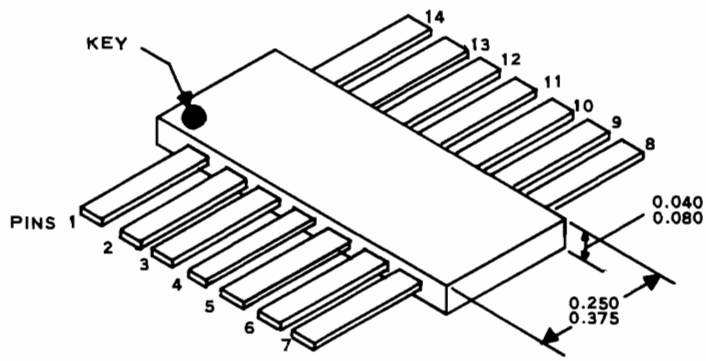

Figure 1. Physical construction of an integrated circuit.

To insure the very highest reliability in the manufacture of integrated circuits, most companies use a multistage inprocess testing procedure. This procedure is to insure stabilization within defined parameters of operation. All integrated circuits are produced under extra clean and controlled ambient conditions. To insure that the integrated circuit maintains its initial design performance, it is continually tested. All wire bonds are made, and the integrated circuit is then tested by a centrifuge device which checks the bonds at 10,000 to 40,000 times normal gravity, varying from -75° C. to as high as +240° C. Each integrated circuit is then hermetically sealed by use of any one of several different package materials. The normal military package is metal, but ceramic and plastic may be used by the Army in the future. The physical package may be broken down into three basic types: can, flat pack, and dual in-line (fig 2).

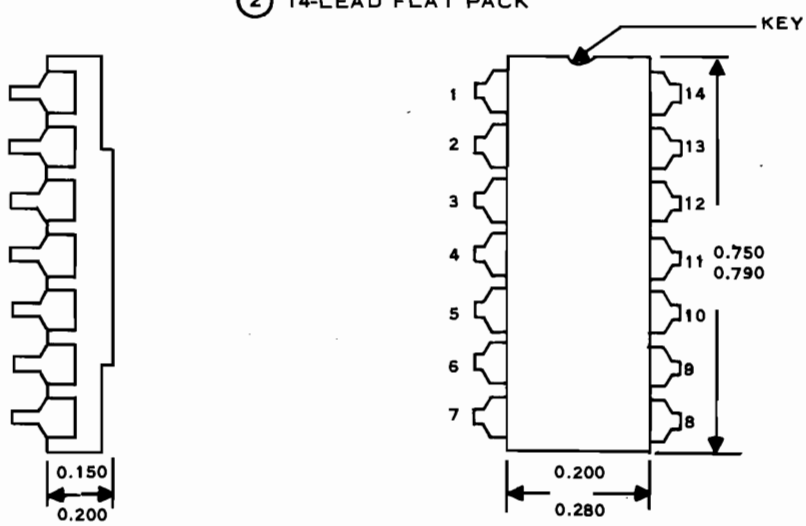
Integrated circuits are expected to replace nearly all discrete circuits because of their greater reliability, reduced size, and extremely small power requirements. They are already replacing discrete circuits in television, radio receivers and transmitters (AM and FM), and radar. The future of Army air defense will rely heavily on the integrated circuit of today and even more so on the large-scale integrated circuit of tomorrow.




1 8-LEAD METAL CAN



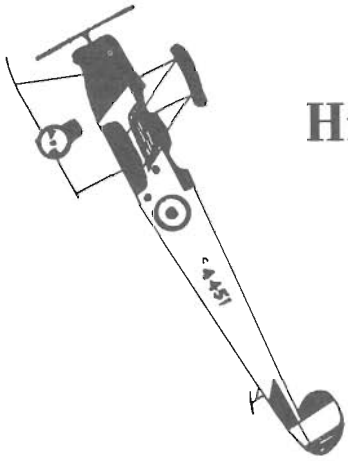

2 14-LEAD FLAT PACK



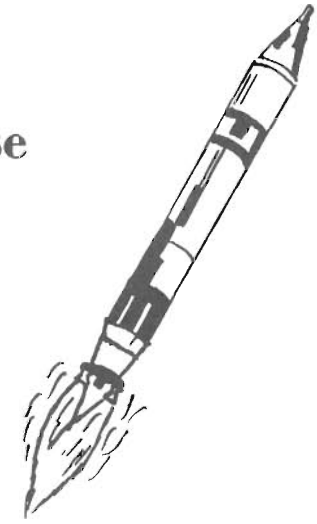

3 14-LEAD DUAL IN-LINE

NOTE: ALL MEASUREMENTS ARE IN INCHES.

Figure 2. Integrated circuit packages.



# History of Air Defense



*Editor's Note:*

*In this fourth installment we see the development of our air defense artillery weapons between World War I and the time of our involvement in World War II.*

At the close of World War I the bulk of the United States antiaircraft materiel was primarily French or wartime-produced. An M1917 3-inch AA gun (fixed mount) and the M1918 3-inch gun (mobile) had been in production since the latter part of the war. A prototype of the new (M1918 4.7-inch gun (fig 1) had been produced and tested; after the Armistice, this weapon was quietly shelved until the 120-mm (4.7-inch) AA gun appeared in 1943. In addition, there were a few of the M1916 75-mm guns (truck mount) on hand. These were used to some extent for training but quickly were relegated to obsolescence.

The M1917 AA data computer (French R.A. corrector) was on hand, and with minor improvements, it was retained and used with M1918 3-inch AA gun for about 10 years. In fact, this fire control system was the sole AA computer until a new director was adopted in 1927. The M1917 altimeter, used with the M1917 computer, was quickly superseded by the M1920 altimeter, an improved version. Central fire control of a kind was established by usage of the M1917 wind and parallax computer. This instrument was primarily a tripod-mounted, high-powered telescope by which the battery commander could observe the target. It also was a means of providing ballistic wind and parallax corrections for application to firing data. It was replaced by the M1920 model which was a slight improvement.

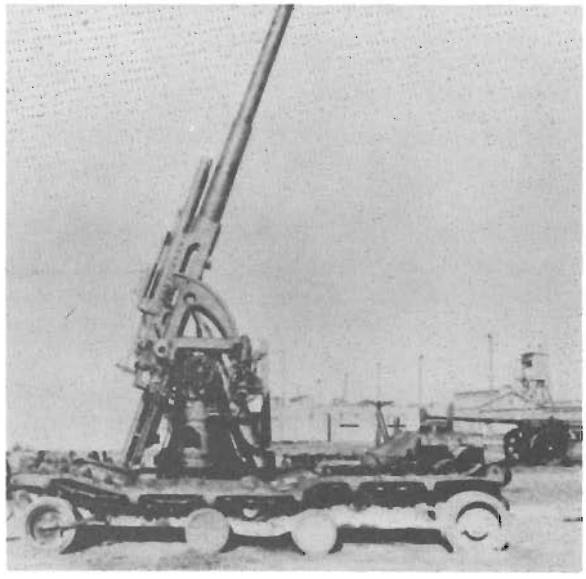


Figure 1. M1918 4.7-inch experimental AA gun.

During World War I, a school in antiaircraft gunnery had been established at the Coast Artillery School, Fortress Monroe, Virginia. (The major part of US antiaircraft units in France had been primarily Coast Artillery units.) Following World War I, the Chief of Coast Artillery, who early had recognized the impact of aerial warfare upon seacoast defenses, continued a major interest in antiaircraft operations and development.

In 1922 under his guidance an antiaircraft target practice was conducted using a sleeve target towed by an airplane. By 1924 all antiaircraft units were conducting annual target practices, and that same year these antiaircraft regiments were organized:

60th Coast Artillery (Antiaircraft), Fort McKinley, Philippine Islands

61st Coast Artillery (Antiaircraft), Fortress Monroe, Virginia

62d Coast Artillery (Antiaircraft), Fort Totten, New York

63d Coast Artillery (Antiaircraft), Fort Winfield Scott, California

64th Coast Artillery (Antiaircraft), Fort Shafter, Hawaii

65th Coast Artillery (Antiaircraft), Fort Randolph and Fort Sherman, Canal Zone

At the instigation of the Chief of Coast Artillery, beginning in 1926 and continuing through 1929, a series of antiaircraft artillery tests was conducted at Aberdeen Proving Ground. At this time all antiaircraft materiel in use was of World War I design and manufacture, although several new designs had been developed. The tests, conducted largely around new methods of fire control, proposed new directors and better methods of determining the altitude of the target. These test firings were conducted both by day and by night. A new gun and mount had been proposed and a prototype developed, and there were two new proposed systems for controlling searchlights. As a result of these tests, much valuable information was gained, new equipment was tested, and the art of antiaircraft gunnery advanced tremendously.

Following World War I, Major William P. Wilson proceeded to develop a prototype corrector to eliminate the many inaccuracies of the R.A. corrector and to incorporate his thoughts on antiaircraft data computations. This director, the T1 (fig 2), was tested at Aberdeen in 1926, as well as the T2, which was a Vickers-Armstrong director. Also tested was an improved model of the Vickers T2, known as the T3. Primarily as a result of these tests, the Vickers T3 was adopted in 1927 and became the M1 director. This director computed data based upon the angular travel principle. It could be changed from use with one type of gun to another having different ballistics, simply by changing a few cams and data drums. Data production was based on the asumption of straight-line flight at constant speed and constant altitude. It was a semiballistic computer. Although primarily used to provide the guns with firing azimuth, elevation, and fuze range, it could be used to provide firing deflections to gun sights. Data were transmitted electrically to the guns by the M1 data transmission system which was a step-by-step system. In 1928 a further improved version of this director M1 was adopted as the M1A1. The major improvement was the use of the M2 (Vickers) data transmission system which was an ac self-synchronous system.

During the 1926 tests at Aberdeen the superiority of the Wilson T1 director had been established; but it needed further refinements, and Major Wilson wanted to make certain additional changes and improvements. He died suddenly in 1927, and the Sperry Company took over his project, resulting in the adoption of the M2 director (fig 3) in 1930. This first director of American manufacture was computed on the linear-speed method and was fully ballistic. The computations within the director were very simple, but it was a large, heavy, complex instrument containing eight ballistic cams. The director cams were designed for use with the 3-inch AA guns only, and there were two sets of interchangeable cams—one for use with shrapnel and one for HE shell. Data were sent to the guns via the M2A1 data transmission system. The difference between the M2 and M2A1 data transmission systems was two additional data transmitters in the director for sending present azimuth and present elevation to a stereoscopic heightfinder. The director could track a target with a maximum speed of 185 miles per hour (mph), and it contained a parallax mechanism by means of which the director could be moved away from the guns 1,000 yards in any direction.

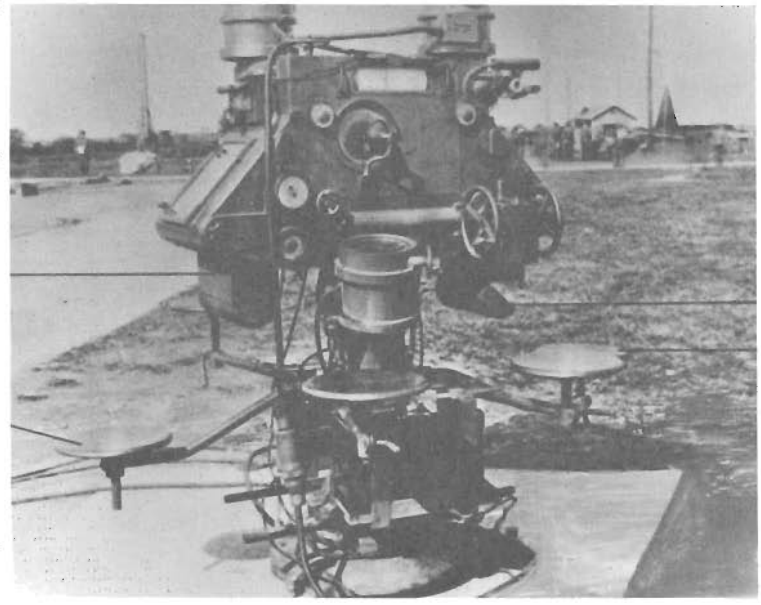


Figure 2. Wilson T1 director.

In 1935, a new director, the M3, was adopted. This director also was a linear-speed predictor and was essentially the same as the M2 except for major simplification, a large reduction in weight, and changes which reduced it to a semiballistic-type computer. It could track targets which had a speed of 250 mph. Two sets of cams were provided—one for the Mark I 3-inch AA shrapnel, 2,550 feet per second (f/s) muzzle velocity; the other for Mark IX 3-inch AA shell, 2,700 f/s muzzle velocity,

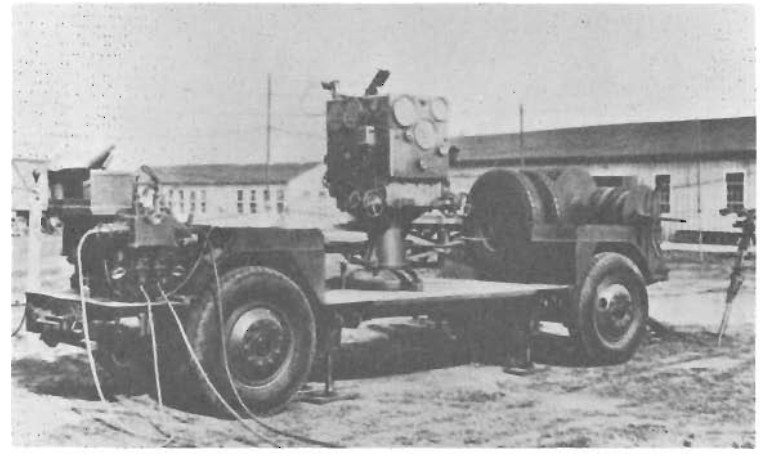


Figure 3. The first American-designed director, the Sperry M2.

using the Mark III Seovil powder-train fuze. Like the M2, the M3 could be offset from the guns. It contained provision for adding 0-10 seconds' time to the prediction mechanism to cover the dead time lost during loading and firing. The version calibrated for the 105-mm AA gun was designated the M3A1.

The M4 director was essentially an M3 director with some improvements in the methods of prediction. It did, however, incorporate some major changes. The M4 could predict future position for a target which was climbing or diving at a uniform rate. It contained a simple mechanism to allow it to predict for targets under 10° in elevation. It contained interchangeable parts so that it could be adapted readily to fire several different types of ammunition, including 105-mm. Its maximum target speed capability was advanced to about 400 mph. It contained a provision for inserting parallax corrections, and it used the M4 data transmission system, a fully synchronous ac system. It also could use the M3 data transmission system.

The M1917 3-inch AA gun (fixed) had been developed, and production started in 1916. Eventually a total of 159 of these guns and mounts were produced, with most of them emplaced at seacoast defenses during the interim period. The M1918 3-inch AA gun (mobile) had been developed, and production started during World War I; by March 1919, a total of 167 guns had been produced. This gun was the mainstay of antiaircraft gun defense until the next AA gun, the 3-inch M3, was adopted in 1928. The 1918 guns were used as auxiliary weapons as late as 1932 by regular antiaircraft units.

In 1927, a new mobile 3-inch AA gun was tested and, with improvements, was adopted in 1928 as the M3 3-inch AA gun on the M2 mount (fig 4). The gun used M1918 fixed

Figure 4. M3 3-inch AA gun.

ammunition having muzzle velocities with shrapnel of 2,600 f/s and with shell of 2,800 f/s. The gun had an automatic breechblock; i.e., when the gun was fired, the block opened and and ejected the empty cartridge case. When loaded, it closed automatically, thus increasing the rate of fire. The gun had 360° of traverse and could be fired from -1° to +80° elevation. Its rate of fire, with good crews, could be as high as 30 rounds per minute. This gun became the standard mobile AA gun and was used in the early part of World War II. The M4 3-inch AA gun, on the M3 mount, was essentially the same weapon as the M3 gun except that it used a fixed mount and replaced the M1917 3-inch AA gun.

During the 1927 Aberdeen Proving Ground antiaircraft exercises, four M1917 3-inch AA guns, equipped with the Sperry self-synchronous system and torque amplifiers, were tested. In addition to continuous electrical data transmission, the data were applied to the guns automatically through the torque amplifier. The gun now had fully automatic pointing. This was a quantum improvement, providing increased accuracy for the system, and was one of the most significant improvements to antiaircraft gunnery until the advent of electronic directors and proximity fuzes.

In the Aberdeen tests, a new gun, a 105-mm gun on a fixed mount, had been tested, and it was decided to produce four of these guns and conduct further tests. As a result, the 105-mm AA gun on a fixed mount (fig 5) was adopted in 1928. Eventually 15 of these guns were produced and installed in the Canal Zone. The gun used power loading, and it was possible to attain firing speeds of 15-20 rounds per minute. The gun developed a muzzle velocity of 2,800 f/s.

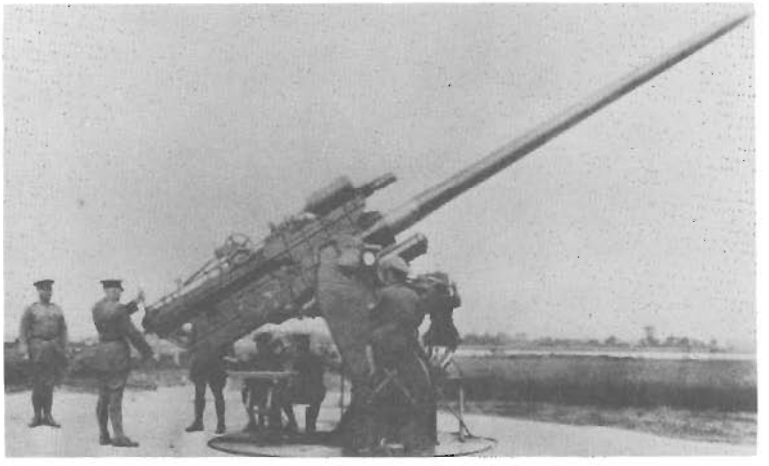


Figure 5. 105-mm AA gun.

The observation and correction of AA fire was very important, and in 1928 the M1 AA battery commander observation instrument was adopted. It required one man to track the target continuously. The battery commander had another eyepiece through which he could observe the target and adjust the fire of the battery. It was a start toward the centralized control station, later known as the integrated fire control system.

With the advent of the electrical data transmission systems, it became necessary only for the operator to match the mechanical pointer with the electrical pointer and then cut the fuze. Eventually, even this operation was to become entirely automatic—another major improvement.

During the Aberdeen tests, searchlights were given continual attention and development; thus, through a series of minor changes, we had several different models of searchlights, acoustic correctors, and methods of searchlight control. In the case of the searchlight, this consisted of improvements to the arc feed and thermostatic load control, increased intensity of the light source, and a 60-inch metal searchlight mirror (fig 6).

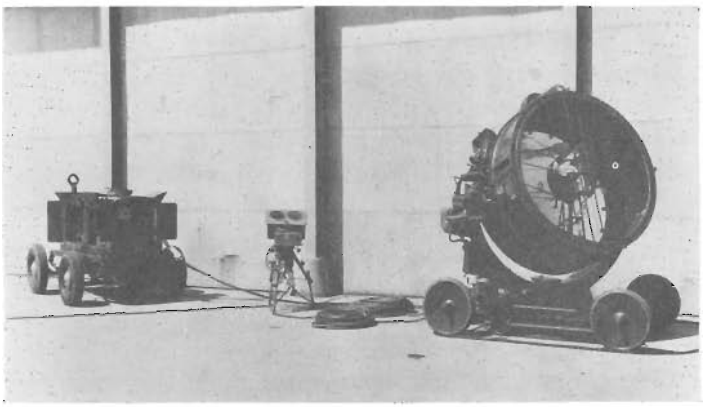


Figure 6. 60-inch AA searchlight, showing also the generator and distant electric control station.

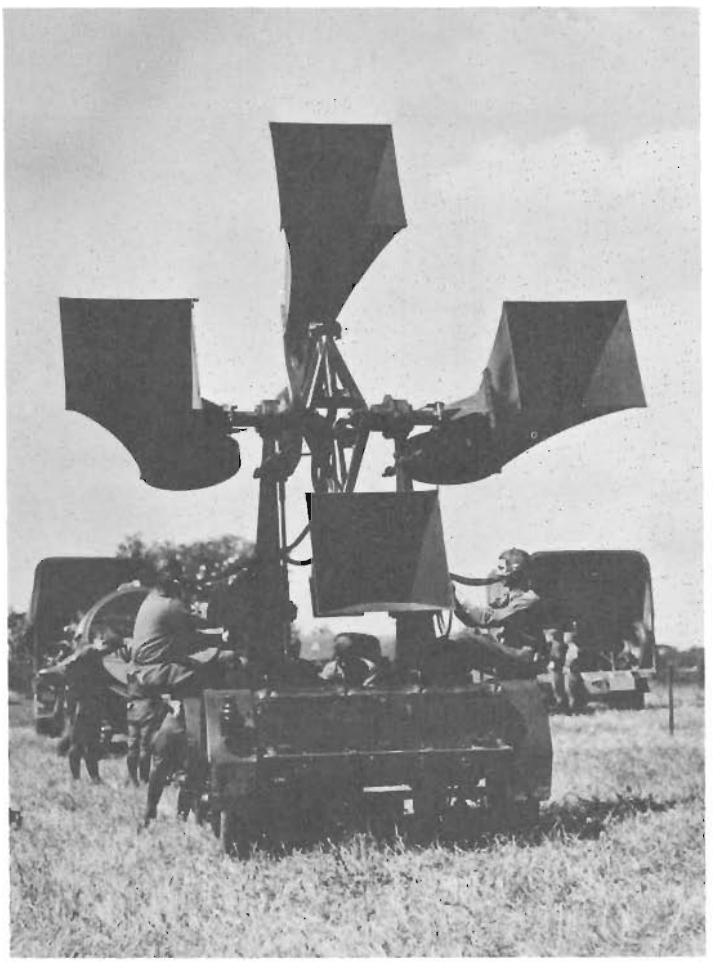


Figure 7. M1A1 sound locator and acoustic corrector.

The control system underwent various changes, including stages of step-by-step control which eventually became an ac self-synchronous type of control. The acoustic corrector (fig 7) passed through several stages; however, by 1940 it had largely reached its zenith in that aircraft speeds had so far outstripped sound-lag correction methods that it was becoming ineffective. However, its place was to be taken very shortly by a new development—radar control.

The United States finished World War I with the M1920 altimeter which determined the altitude of the target. This system was continued in use as long as the R.A. corrector was used. Its inadequacies were well-known, and development of the self-contained optical coincidence rangefinder resulted, in 1925, in the adoption of the stereoscopic heightfinder. This, in turn, was replaced in 1939 by an improved model, the M1 (fig 8). It had a base some 13 feet long, used either 12x or 24x magnification, and was capable of a maximum range determination of 50,000 yards. The slant-range-to-height converter was graduated from 0 to 10,000 yards in altitude. It contained tracking scopes and controls for the azimuth and elevation trackers; the stereoscopic reader was concerned only with making stereoscopic range readings. Data were transmitted electrically to the director. This unit was used until superseded by radar ranging in World War II.

For some time following the the war, the caliber .30 machine-gun was continued in use as an AA weapon. In 1921 the first M1

Figure 8. M1 (Keuffel and Esser, and Eastman) and M2 (Bausch and Lomb) stereoscopic heightfinder (SCR-584 radar antenna in background).

Figure 9. Caliber .50 water-cooled AA machinegun.

caliber .50 machinegun was adopted as a major contribution to the low-altitude field of air defense. Quickly, the M2 machinegun, an improved model, followed. For a number of years, both the M1 and M2 models were found in antiaircraft units. As late as 1939, machinegun batteries of the antiaircraft units were equipped with both caliber .30 and caliber .50 machineguns on the M1 mount. In the early stages of World War II, they provided a major contribution, particularly the caliber .50 guns, to low-altitude antiaircraft defense (fig 9).

However, the caliber .50 machinegun was very light for use against high-speed aircraft, and development proceeded to a heavier automatic weapon for use in the low-altitude field. A 37-mm automatic cannon (fig 10) was developed, and by 1940 many had been issued to antiaircraft troops in the field.

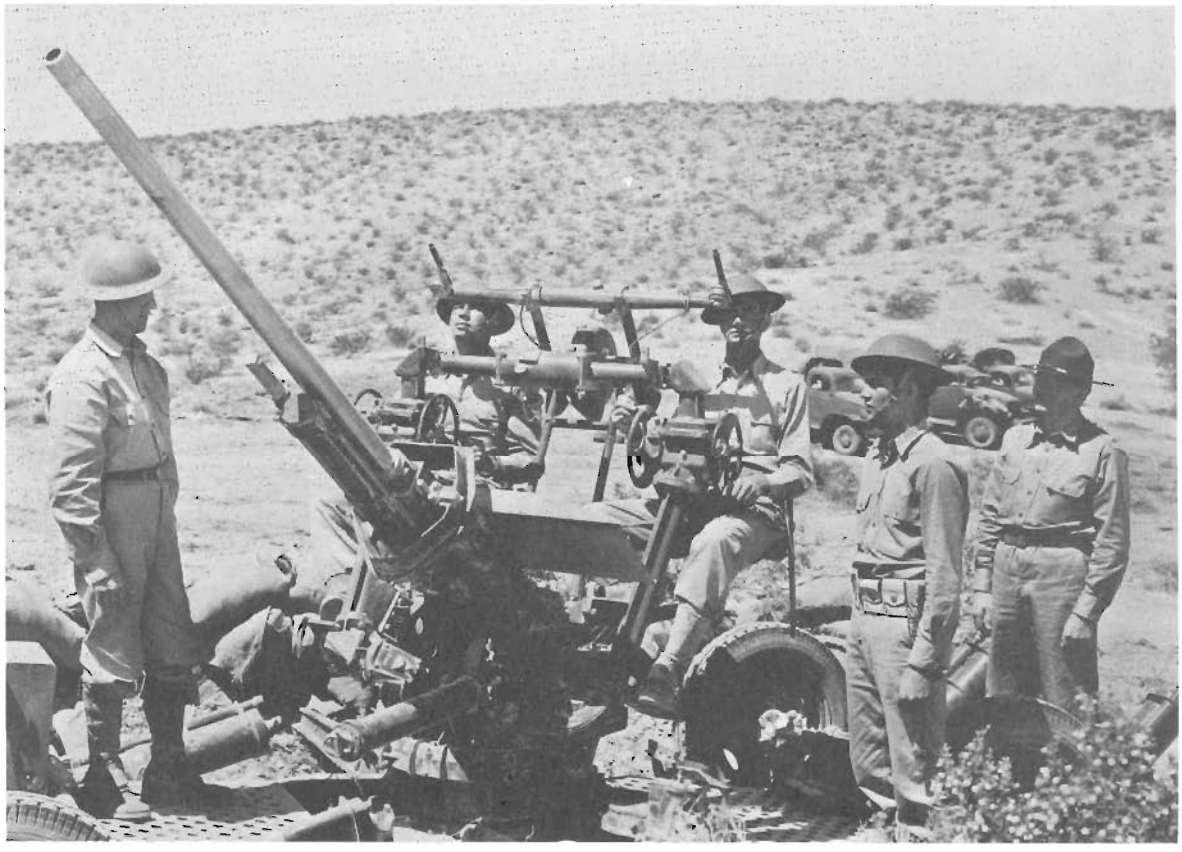


Figure 10. 37-mm AA automatic weapon.

This weapon was capable of firing 120 rounds per minute, using a high-explosive shell weighing 1.25 pounds and containing a tracer element. A mobile mount was developed for this weapon. Its muzzle velocity was 2,800 f/s, and it had an effective range of about 2,500 yards. This gun saw considerable service in World War II where it gave a good account of itself. In the years subsequent to its adoption, considerable interest arose and a number of tests were made involving a new Swedish gun, the Bofors 40-mm (fig 11) which had been adopted in the meantime by the British.

Figure 11. Bofors 40-mm gun.

We inherited from World War I a system of machinegun fire control which was "shoot at the target, observe the tracers, and adjust pointing accordingly." These deficiencies, as elaborated on by 2LT Halstead C. Fowler, CAC, in 1923 and quoted below, led to further developments:

> The training of gunners (AA machinegun) is of primary importance. The accuracy of antiaircraft machinegun fire depends primarily upon the eye and hand of the man pulling the trigger.

To this delineation of tracer control, he should have added, "and those mental processes by which the trapshooter is able to evaluate his target, take the proper lead, and fire." During the succeeding years, this method, known as individual tracer control, was subjected to much investigation and evaluation by many people. Numerous procedures were proposed. These fell into two classes: (1) observation of the tracers for determination of leads and (2) computers which mechanically determined deflection leads to be inserted into the sights of the machinegun. Starting with the French forward area sight (US model 1917) and the British "Peycru" sight, various modifications were proposed. A tremendous amount of work was done on computing sights, but the extreme rates of target angular travel, coupled with the extremely short time that the new higher speed target was within range of the weapon, vitiated success.

A method was developed and equipment produced to provide centralized control. Under this method, the gunners of four guns were concerned only with keeping their gunsights on the target. The observers to their rear observed the fire and made the necessary sight corrections to bring the cone of fire of all four guns on the target. This was known as central tracer control. This same system also was applied to the 37-mm AA gun.

If time did not permit centralized control, the gunners utilized individual tracer control, which still remains today as the sole method of adjustment of AA machinegun fire.

# Saigon People's Self-Defense Forces

*Major Charles A. Green*

To discuss the evolution of the Saigon People's Self-Defense Forces (PSDF), it is first necessary to explain certain background information about Saigon and its indigenous population. Saigon is a city of more than 2.5 million people contained within an area so small that the population density is the greatest in the world. Many of the city dwellers are migrants from North Vietnam and, more recently, from adjacent rural areas. The religion of the majority of the population is Buddhism. Their religious belief that suffering is inherent in life and that one can escape it into nirvana by mental and moral self-purification has a great effect upon the actions and, in some cases, the inactions of the government and the people. Additionally, it is inherent to the nature of the Vietnamese individual to be vitally concerned with those things that affect him and his immediate family.

Prior to the Tet (Lunar New Year) and the May 1968 Viet Cong (VC) offensives, the city of Saigon and its people felt a relative degree of security from enemy atrocities. Other than a few scattered terrorist activities and occasional abduction or assassination, the city remained unscarred by the war. The people and the government carried on day-to-day activities in the same bureauratic manner as did the former French regime. The concern of the average citizen for the war was one of relative indifference since it had no immediate effect upon him or his family.

The destructive attacks by the Viet Cong during Tet and May of 1968 within Saigon rudely awakened the populace and the government of the city. The destruction of more than 30,000 homes during the two offensives left more than 300,000 people homeless. With the idea thus imbedded in the minds of the people and the government that the war was now at their doorsteps, PSDF was conceived.

Between the Tet and May offensives, a hastily, sporadically organized people's force was commissioned in some segments of Saigon to defend against future attacks (fig 1). The national program decreed by the president of the Republic of Vietnam during this period was placed under the auspices of Vice President Ky. In Saigon, little, if any, training was given to this civilian body charged with the responsibility of defending its local area against Viet Cong attacks. Only a few weapons and some ammunition were made available to this home guard. It is significant that in those areas of Saigon where the people displayed enough initiative to organize themselves and prepare for another attack, there was little, if any, action during the May offensive. It appears that the VC did not want to fight in a strange area where the populace had organized itself against them. Instead, they chose to attack those areas of least preparation where the people seemingly had an attitude of indifference.

At the termination of the May offensive it was apparent to the populace throughout the nine districts of Saigon that the war with the VC was a personal war and that, if they and their families were to survive, they would have to stand against the VC. During June and July 1968, the cry of the people for arms and ammunition to defend their homes and families against future VC attacks was headed by the government.

In June 1968 President Thieu decreed the national PSDF under the direction of the Minister of the Interior, thereby signaling a new era of government/people cooperation against the VC.

*Figure 1. District dedication ceremony. Self-defense group demonstrates bayonet drill.*

During this same period the city of Saigon underwent significant changes which included the appointment of COL Do Kien Nhieu as the mayor, and an advisory element, known as the Saigon Civil Assistance Group, under the direction of Hatcher H. James, was assigned responsibility to assist the city government in its defensive aspirations. Under the guidance of these two outstanding leaders, the reorganization and redirection of the city staff and the formulation of a new advisory element, directly interested in the metropolitan problems of Saigon, was accomplished in less than 60 days.

The participants in the PSDF program were to be young men, 16 to 18 years old (below draft age); older men, from 39 to 50 years old (above draft age); and all draft-age males who were otherwise deferred from military service (fig 2). Additionally, females between the ages of 18 and 25 would voluntarily participate as self-defense members. Their mission was to train to provide warning of imminent attack on their Khoms (urban hamlet) and Phuongs (urban village) and to stand off the enemy until regular forces could be employed to take up the fight. Intelligence cells were to be formed at the lowest level to provide information on

Viet Cong activities and movements. The prime purpose in establishing a program of this magnitude was to meet and stop the imminent threat of another Viet Cong attack upon the city. To accomplish this task, it was necessary to organize the people into groups, provide military training for them, and arm them. The magnitude of this undertaking is self-evident when we realize that the program had over 270,000 possible participants. The Saigon self-defense staff did not allow the size of the task to adversely effect its objectives, but rather immediately proceeded to do what was necessary with the resources at hand. The fruit of its determined work resulted in more than 160,000 people being trained in less than 1 year.

*Figure 2. Typical members of the Saigon People's Self-Defense Forces.*

During the formative months it became evident to the people and the government that PSDF could provide much more than security. For the first time in recent history a solidarity between the people and the government was developing which could provide what both wanted and needed most. The impetus from the people seemed to be found in their ability to have a voice in the government from the lowest level to the top (fig 3). Meanwhile, the government was gaining backing, commitments, and confidence from the people by assisting the self-defense program, thus satisfying the desires of the people.

The ensuing months saw many startling developments in the PSDF program. The most significant of these was the determination by the people that PSDF needed local headquarters from which to operate and that these offices could serve the dual purpose of providing

*Figure 3. Colonel Nhieu, mayor of Saigon, and other city officials at a meeting with the local populace. The purpose of the meeting was to explain the government's position and policies and listen to grievances and suggestions of the people.*

*Figure 4. Rooftop guard post.*

a headquarters for the local Khom and Phuong government officials to conduct their business and a place from which PSDF could operate. The commitment of the people to PSDF was seen in the building of these headquarters, at their own expense and with their own labor, with token support from the government. In less than 1 year more than 500 offices were constructed at a cost, mostly borne by the people, of between $1,000 and $2,000 each. With the building of these offices the local PSDF assumed the responsibility for defending them (fig 4), thereby providing a place for local officials to work in relative security from VC abductions and assassinations. The interrelation found in this joint people/government effort was to be the first of many sought joint actions which should eventually allow this underdeveloped country to survive the threat of communism.

Another important aspect of the program which reflects the versatility of the PSDF concept was the formation of volunteer firefighter teams from the ranks of the PSDF. The Saigon Fire Brigade trained the young men in firefighting, fire prevention, and population control during emergencies. The United States Agency for International Development provided flotation pump units to be used by the volunteer firefighters in those areas of high population that could not be effectively reached by fire trucks. The praise received by the teams as a result of their assistance during a series of fires in the city between January and June 1969 provided a new source of pride for the citizens and the government in their accomplishment.

The government is now attempting to establish an effective community development program within the framework of PSDF. The enthusiasm shown for community development can be attributed to the fact that it has been publicized through the PSDF channels which are currently the most effective government/people channels of communication. The overall magnitude of this facet of expansion has barely been touched; therefore, the extent to which its utilization will tighten the bonds between the people and the government cannot yet be accurately assessed.

The PSDF program is not a true military force, but it is one of the greatest deterrents to communism currently available to the people of Vietnam. This program can and will satisfy the true desires of the people and give maximum support to a government of and by the people to the extent that their oriental traditions and beliefs will allow.

# Soviet Military Capabilities and Strategy

*Contributed by the Air War College*
*United States Air Force*
*Maxwell Air Force Base, Alabama*

The mere fact that the Soviet Union is the only country in the world with the resources, industry, and technology to challenge the primacy of United States military power makes an assessment of Soviet military capabilities a matter of top priority. With communism as the driving force behind their industrial and military development, the Soviets have long since dispelled any doubt about their capacity to create a formidable array of land, sea, and air forces. Whether the moving spirit behind these accomplishments be international communism or Russian imperialism in a new guise is purely academic. What is important is that Soviet military capabilities be appraised realistically and viewed in their true perspective—both as an instrument of national policy and as a shield behind which Communist subversion seeks to erode the free world position.

Not quite half a century elapsed from the Bolshevik seizure of power in 1917 to the detonation of the first Soviet thermonuclear device. During this relatively brief interval, the Soviet armed forces progressed from a chaotic mass of men and guns to the thoroughly modern war machine that now challenges the nations of Western Europe and the United States. As Soviet military policy evolved, it was influenced by such factors as the internal struggles of the 1920's, the Stalinist purges of the late 1930's, the limitations imposed by geography, and the growth of heavy industry which enabled the Red army eventually to attain technological parity with Western armies. Although the ground forces remain, as always, the solid core of Soviet military strength, in the years since Stalin's death the U.S.S.R. has made startling advances in rockets, missiles, and nuclear devices. Today, the Soviet military establishment, with its arsenal of nuclear ICBM's in various megaton categories, ranks qualitatively as well as quantitatively among the best in the world and constitutes a greater menace to the West than ever before.

The scope and gravity of the threat have been increased significantly by the recent emergence of the Soviet Union—traditionally a continental land power—as a challenger of United States naval supremacy. The shadowing and harassing of US vessels on the high seas; the Soviet naval presence in Arab ports; and recent Soviet efforts to establish naval stations in Egypt, Algeria, and Malta are manifestations of a significant change in the Soviet attitude toward the use of naval power. Furthermore, reports that the Soviets are constructing additional aircraft carriers have far more subtle significance than the obvious implications of a buildup of nuclear submarines. Assumptions concerning the Soviet Union's capability to project its military power beyond the Eurasian periphery are being revised accordingly. Jane's Fighting Ships (1967-1968 edition) offers this analysis of the new Soviet strategy:

> The Soviets appear convinced that the aircraft carrier, with its long-range attack capabilities, is a vital weapon in the kinds of conflicts—small and faraway—that are fought today. It is evident that the Soviet Navy will for years to come be a force to be reckoned with, deployed on a worldwide scale, on the move as never before, and capable of exerting a strong maritime influence on universal affairs.

Yet, despite significant advances in the development of modern military power, the overall Soviet military posture is not without some weaknesses. There is the vastness of the territory to be defended; the encirclement by NATO bases; rumblings of hostility along the 6,400-mile Sino-Soviet frontier; uncertainty regarding the military reliability of the increasingly restless satellites; the risks inherent in supporting wars of national liberation; and, especially, the deterrent influence of United States strategic power. Beyond these major considerations, there are signs of internal tensions that could erupt into power struggles with possible repercussions on overall military effectiveness. The high cost of arms competition has put a heavy strain on Soviet resources, and the military are concerned lest consumer-oriented policies detract from the development of weapons needed for combat readiness. Additional problems stem from the traditional friction between the Communist Party and the military hierarchy, particularly concerning the role of the military in policy-making. Although the armed forces are the mainstay of the Party, the latter has generally been reluctant to allow the military a voice in national security policy. Another source of irritation is the burdensome and time-consuming system of political control and indoctrination which the Army resents as a form of Party interference. Notwithstanding these signs of friction, the Party leadership remains in firm control. In a recent study of the relationship of the Party and the Soviet armed forces, Roman Kolkowicz, an authority on Soviet military affairs, points out that:

> The typical Soviet military unit is a microcosm of the tensions and conflicts that have beset the Red Army as a whole since its very creation. These internal tensions have not succeeded in crippling the Soviet military, but they frequently cause inertia and low morale, and their cumulative effect at times is such as to pose a challenge to the Party.

Changes within the Soviet armed forces during the past decade have appreciably altered their appearance and structure. In the next issue of Air Defense Trends, Dr. Kenneth R. Whiting, member of Aerospace Studies Institute of the Air University, offers a rationale for Soviet strategic views and provides a current profile of the Soviet Ministry of Defense and of the ground, air, strategic missile, and naval forces. Dr. Whiting concludes with a brief assessment of the overall threat posed by these forces and an indication of possible strategies for their future employment.

# Noncommissioned Officers' Education System (NCOES)

*Master Sergeant Richard E. Roberts*
*Office of Director of Instruction*
*US Army Air Defense School*

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The big question is: DO YOU QUALIFY?

To provide the Army with a noncommissioned officers corps of highly trained and dedicated men, a Noncommissioned Officers' Education System (NCOES) has been established.

> The choice of noncommissioned officers is an object of the greatest importance. The order and discipline of a regiment depend so much upon their behavior, that too much care cannot be taken in preferring none to that trust but those who by their merit and good conduct are entitled to it. Honesty, sobriety, and a remarkable attention to every point of duty, with a neatness in their dress, are indispensable requisites; a spirit to command respect and obedience from the men, an expertness in performing every part of the exercise, and an ability to teach it, are also absolutely necessary; nor can a sergeant or corporal be said to be qualified who does not write and read in a tolerable manner.

Baron von Steuben wrote those words at Valley Forge in his Regulations for the Order and Discipline of the Troops of the United States in 1778. Are these comments as true today as they were 200 years ago? We may phrase them differently, but there is little we can add.

The basic objectives of the NCOES are to increase the quality of the noncommissioned officers corps, provide enlisted personnel the opportunities for progressive and continuing development, enhance career attractiveness through formal military education, and provide the Army with highly trained and dedicated noncommissioned officers to fill positions of increasing responsibility. Scientific management in an ever-increasing technologically complex Army necessitates development of a formal systematic training program that will certify a host of professionally qualified noncommissioned officers.

To meet the needs within the Air Defense Artillery branch, the US Continental Army Command (CONARC) has instructed the US Army Air Defense School to develop a basic and an advanced noncommissioned officer career course within the 16 MOS career group. (A third course, the Senior Noncommissioned Officer Course, is being developed by the US Army Command and General Staff College on a branch immaterial basis.)

The Air Defense Artillery Basic Noncommissioned Officer Course is designed to prepare selected enlisted men in grades E-4 and below to perform duties as noncommissioned officers in grades E-5 and E-6. Course objectives include development of leadership skills, willingness to assume responsibilities, confidence to apply technical knowledge, and the instilling of dignity and a sense of duty and obligation in the student.

The Air Defense Artillery Advanced Noncommissioned Officer Course is designed to prepare selected enlisted men in grades E-6 and E-7 to perform duties as noncommissioned officers in grades E-8 and E-9. Course objectives are to upgrade supervisory skills, increase technical skills, and develop confidence and a sense of pride and obligation for service in the student.

To start the program, a team of highly qualified senior noncommissioned officers, under the direction of the Director of Instruction of the Air Defense School, was meticulously selected to develop and systems engineer the two courses.

CONCEPT OF TRAINING

It is envisioned that a services academy environment will exist. The formulated and adopted curriculum will make the student more aware of his responsibility and role in air defense artillery and in the United States Army. Attendance at either or both of the courses will be a distinct honor, a privilege, and a realistic challenge to the noncommissioned officer.

During the Basic NCO Course, emphasis will be placed on leadership skills and knowledge of military subjects which are needed to supervise effectively enlisted personnel at the squad, section, or comparable level. To assist the junior noncommissioned officer in developing those skills necessary to accomplish his tasks, some of the subjects to be taught are general tactical operations, unit administration, personnel management, training (MOS and general subjects), operations and maintenance supervision of communications and vehicles, logistics, command and control of air defense weapon systems pertinent to student's MOS, personal and world affairs, and motivation. Each subject, whether it be common or technical, will focus on increasing the technical and supervisory skills relevant to the student's MOS. Practical work will be stressed throughout the course.

During the Advanced NCO Course, emphasis will be placed on supervisory skills and subjects required to effectively perform duty as first sergeant, sergeant major, staff sergeant major, or comparable noncommissioned officer at battery, battalion, group, brigade, and air defense artillery commands and on the philosophy underlining Army objectives and Army systems. Training will be directed toward a firm comprehension of the noncommissioned officer's role in air defense artillery.

The Senior NCO Course is being developed as a single course of instruction. The purpose of the course is to prepare selected NCO's in the grade of E-8 to perform duties as key sergeants major at division, equivalent level installation headquarters, or at higher headquarters of the Army. The objectives of the course are to provide students with an understanding of the Army and of joint and combined commands and to develop the students' intellectual depth and analytical abilities.

HOW YOU CAN QUALIFY

The immediate question is—who is going to be chosen, and when? The following model of enlisted career progression provides some of the answers.

| Input grades | Years in service | NCO progression |
|---|---|---|
| E-1 | --- | Basic training |
| E-3, E-2 | --- | AIT (School, ATC, unit) |
| E-4, E-3* | 1-3 | Basic NCO Course<br>16B, C, D, E, F, H, J, R;<br>24B, D, F, M, N, P, Q, U (tentative) |
| E-7, E-6 | 5-10 | Advanced NCO Course<br>16B, C, D, E, F, H, J, R;<br>24B, D, F, M, N, P, Q, U (tentative) |
| E-8 | 11-26 | Senior NCO Course<br>(Branch immaterial) |

The following prerequisites, although not necessarily complete, give an indication of the qualifications needed to be selected for the program:

Basic NCO Course. Army enlisted men, active or Reserve component, in grade E-4 or below. Standard aptitude area GT score of 90 or above. Excellent character rating. Selected by unit commander. Must have demonstrated a potential for middle-grade NCO positions. Must have 1 year remaining in service upon completion of the course. MOS-qualified in one of the 16 career group MOS's.

Advanced NCO Course. Army enlisted men on active duty in grade E-6 or E-7, with 5 to 10 years' service. Must have demonstrated a potential for senior NCO positions. Must

*Noncommissioned officers and specialists who are not programed into the NCOES at the appropriate phase of their career may apply for attendance provided they meet the prerequisites, excluding the grade level requirements.

have satisfactorily completed the basic level NCO course or its equivalent. Must have 2 years' service remaining upon completion of the course. MOS-qualified in one of the 16 career group MOS's.

Senior NCO Course. Noncommissioned officers on active duty in grade E-8. Must have demonstrated a potential for senior NCO positions. Final SECRET clearance. Must have 2 years' service remaining upon completion of the course. Must have satisfactorily completed the advanced level NCO course or its equivalent.

Additional course prerequisites are to be developed by the US Army Air Defense School and Command and General Staff College.

Not everyone will be able to attend a resident course. Annual input is programed for 400 students to the Air Defense Artillery Basic NCO Course and 300 to the Air Defense Artillery Advanced NCO Course.

Selection procedures will be controlled by CONARC for the basic course to insure that enlisted personnel with leadership potential can be identified and programed into the course at an appropriate point in their career.

Selection procedures for the advanced course will be controlled by Department of the Army to insure that noncommissioned officers with the highest performance potential are programed into the course on a best-qualified basis.

Specialists in MOS's leading to noncommissioned officer positions (4 and 5 skill level) will be programed by Department of the Army into the noncommissioned officers' education program at an appropriate point in their career.

Again the big question: DO YOU QUALIFY?

# Lessons Learned in Vietnam

## TACTICAL EXPERIENCES OF DEPLOYED UNITS

*(Introductory comments by the Editor)*

•Here is a report on some of the experiences of the 269th Combat Aviation Battalion that should be of interest to most operational combat units as well as to individuals who may join them•

A UH-1C helicopter was assigned to battalion headquarters in place of the usual UH-1D/H. The UH-1C proved inferior to the UH-1D/H for several reasons. The value of the UH-1C as a liaison or courier is limited due to the small number of passengers that can be transported. The aircraft is difficult to operate fully loaded in confined heliports. When used as a command and control aircraft, with the command console installed, the size of the command party is limited. The UH-1C aircraft is not recommended for use as a command and control aircraft.

The policy has been to shut down an aircraft every two fuel loads or not later than 4 hours for a maintenance check. Occasionally, pilots become preoccupied with their missions and fly longer than 4 hours without a maintenance check. Recently, a pilot who did this found at the end of the day on a postflight inspection that a hanger bearing had overheated excessively and was about to fail. Failure of the part would most likely have caused a fatal accident if it occurred in flight. Numerous critical areas in a helicopter cannot be checked without shutting down the aircraft, and these areas must be checked several times during a long mission day.

All units should have in their SOP a required period after which an aircraft must be shut down. A 4-hour limit seems to be most satisfactory, considering both the mission requirements and aircraft safety.

To obtain an effective smoke screen, it is necessary to fly low and slowly along tree lines, etc. During the slow, maneuvering smoke run, the ship is vulnerable to ground fire. As a minimum, a second gunner should be employed on the smoke ship. He can be fastened into the aircraft by the tiedown cargo rings on a safety belt which will permit him to move to both sides of the aircraft to reinforce the firepower as necessary during smoke runs. This unit utilized two door gunners, in addition to the crew chief, on the smoke aircraft.

Recently this unit has been required to pick up observation towers from 30 to 40 feet in height. This is often impossible due to heavy dust. The observation towers are normally in the center of a fire support base in the most dusty area. It is impossible to hook onto the tower before the aircraft is completely on IFR (instrument flight rules) in the dust. Due to the extremely high hover required, the pilot is unable to maintain ground reference. During the dry season, sorties to lift observation towers should not be scheduled unless the area is

watered down prior to the arrival of the CH-47. A 50-meter radius around the tower should be cleared of all personnel.

Experience by company safety and standardization officers indicates they are unable to perform their jobs adequately in an additional duty status. Each company safety officer must closely monitor operations, maintenance, and the environment in which his unit operates. To accomplish this, he must maintain close coordination with aircraft service detachments, infantry brigade S4 shops, POL, direct support maintenance units, his own battalion, and others. He also must monitor and follow up all unit aircraft mishap reports and investigations. These average approximately one a day. And since he is most probably the unit standardization officer, he must give a majority of the unit's check rides while training other instructor pilots and monitoring their check rides. Finally, he must also initiate and run an active accident prevention program among the aircrews in his company. The company TOE should be changed to authorize a safety and standardization officer as primary duty.

Safety officers of this unit are instructor pilots, and company commanders have been encouraged to assign them to the headquarters platoon rather than to a flight platoon. This has been done so that the safety officer may avail himself to each unit aviator, gain time to perform safety duties since he is not hampered by platoon duties, and be directly responsible to the commander for unit safety and standardization.

The 187th Assault Helicopter Company was assigned three AH-1G's (Cobras) to replace the "C" model in the armed platoon. The Cobra is limited to some extent when working with "C" models because of the slower airspeed. In every other respect the "C" model and Cobra fire teams work together in an outstanding manner. When phasing in the Cobra as an armed escort, two major problems were encountered. The pilots who were assigned did not have experience in assault helicopter company operations. This retarded the efficiency of their performance for a period of time. The other problem was maintenance. No experienced personnel were available to perform maintenance on the Cobras. Before assigning Cobras to other units, pilots who are Cobra-qualified and familiar with the unit's tactics should be assigned. Also, experienced maintenance personnel should be assigned.

Electrical system failures have occurred on all of this company's M35A2 $2\frac{1}{2}$-ton trucks due to a recurring malfunction. All electrical failures were originally attributed to generator or regulator failure. It was later found to be a short in the wire harness connecting the generator and regulator. This harness, enclosed in a rubber sheath, is routed behind the engine and rests against the engine block. In all cases the short was found at the point where the harness touches the engine. At this point excessive moisture and corroded wire were found within the rubber sheath. This short has caused the loss of numerous regulators. The wire harness should be rerouted so that it passes over the air lines on top of the engine or in some other way so that it is well spaced from the engine. In this way, excessive heat and the resulting buildup of moisture within the rubber sheath is avoided.

Recent changes to the TOE (MTOE) have caused some difficulty in reporting equipment authorized. Due to the modification list for the TOE, there are now separate TOE and MTOE lists, causing confusion and the possibility of erroneous reporting of authorized equipment. The two lists should be combined with additions and deletions directed by the MTOE; thus, there would be one clearly defined list of authorized equipment readily available. The TOE

and MTOE have been combined through pen-and-ink changes to allow this battalion to be as accurate as possible in reporting authorized equipment. All additions and deletions authorized by the MTOE have been posted to the TOE to make one complete list.

Experience has proved that personnel on duty as aircraft security during hours of darkness find it difficult to effectively engage targets with M16 rifle fire. Because of excitement created by the attack and the limited visibility during darkness, personnel are ineffective with the M16 rifle during these periods. All personnel used for aircraft security during hours of limited visibility should be armed with shotguns.

# Tactical Terms Test

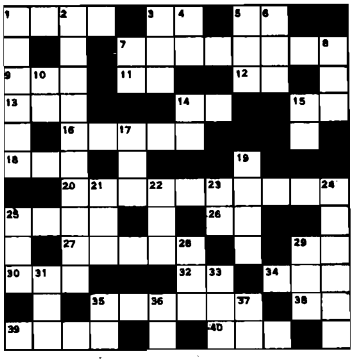
In this issue, Air Defense Trends forgets about electronics (at least in the puzzle department) and offers something for the "men of letters." We are referring to the doctrine experts, etc. We call them "men of letters" because they are always dealing in acronyms or abbreviations. In fact, AR 310-50, Authorized Abbreviations and Brevity Codes, is our authority. The answers to the puzzle are on page 91.

**Across**

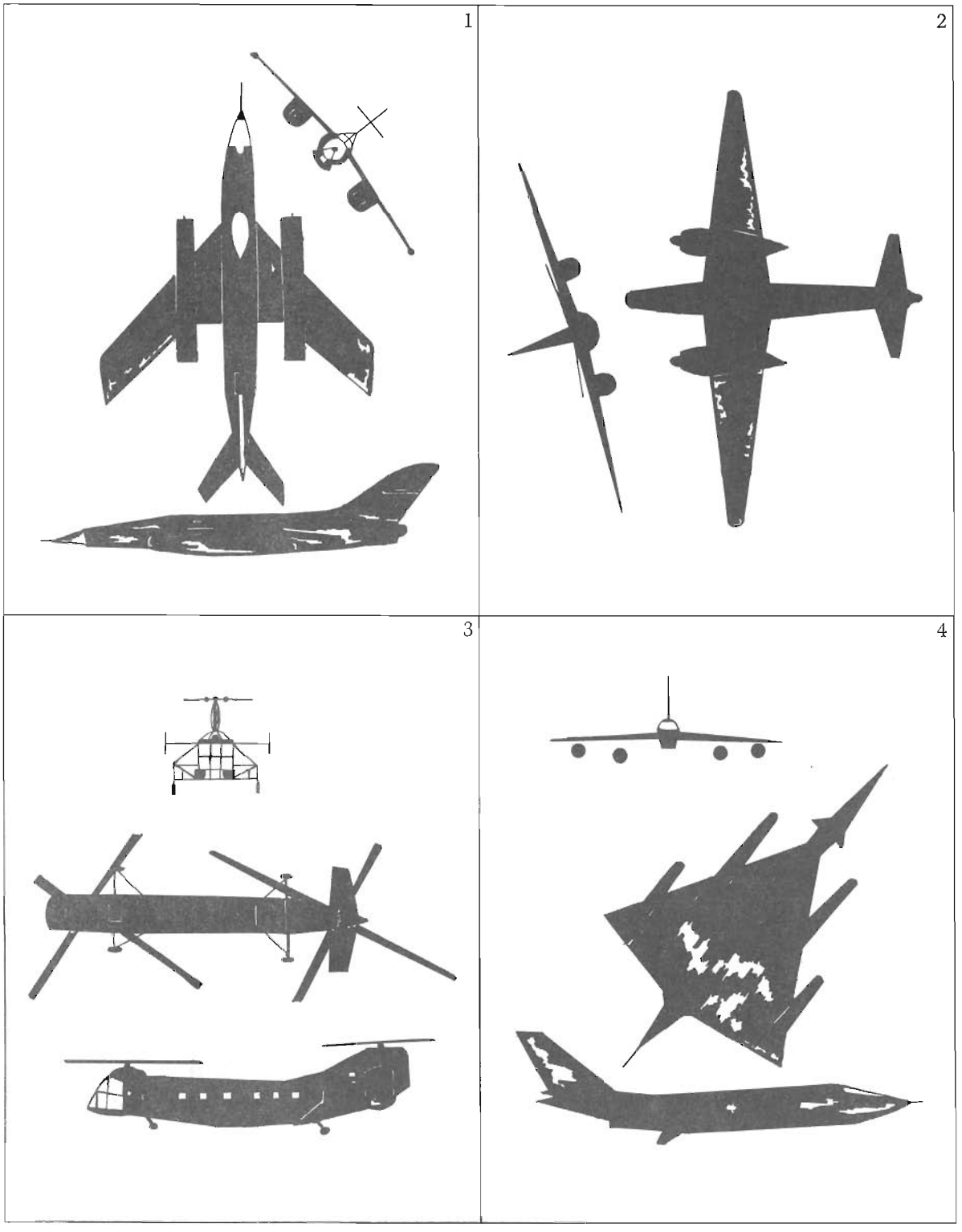
1. Necessary steps when changing to a new location.
3. Brigade commander.
5. Type of air defense.
7. ADA weapon system. (Not abbv.)
9. Necessary for data processing.
11. Maintenance manual that is equipment-oriented.
12. Represents the commander at higher, lower, or adjacent headquarters.
13. A recommendation to improve things.
14. Something "special" in the way of weapons.
15. Forward observers call this home.
16. Army air defense commanders call this home.
18. What to do until the doctor comes; a required subject.
20. Air defense in which two or more vital areas are defended with a single overall defense. (Not abbv.)
25. Provides coordination between the Air Force and Army.
26. The M42, M55, and Vulcan fall into this classification.
27. A plan to help control nuclear accidents and incidents.
29. A commander should always integrate these fires.
30. A geographical subdivision of an air defense region.
32. Use of this combat arm lends dignity to what would otherwise be a vulgar brawl.
34. Directly subordinate to the TACC and provides current air situation information to the TACC.
35. ADA weapon system. (Not abbv.)
38. Employed at OP's.
39. Forward _____ weapons. (Not abbv.)
40. An area defended by weapons.

**Down**

1. All-arms AD system. (Not abbv.)
2. The S3 has primary staff responsibility for this. (Not abbv.)
3. Probable circular error.
4. A good place to practice gunnery.
5. A forward area weapon.
6. Air Force representative.
7. Type of warhead.
8. This is the way it's done.
10. Type of radar scope.
14. Moves by itself.
15. G2 has a team to handle this.
17. Authorized abbreviation for decision logic table.
19. ADA weapon system. (Not abbv.)
21. An agency responsible for national security.
22. Criteria concerning serviceability of equipment.
23. Nonreservist.
24. A condition of defense readiness.
25. Newest combat arm.
28. Tables used in planning AW defenses.
29. Ready force-division level.
31. An acquisition radar used in an air defense.
33. Airborne early warning.
35. Subordinate to the Department of Defense.
36. Commands a "Duster."
37. All the parts that make up the ammunition necessary in firing one shot.



# Recognize These Aircraft?



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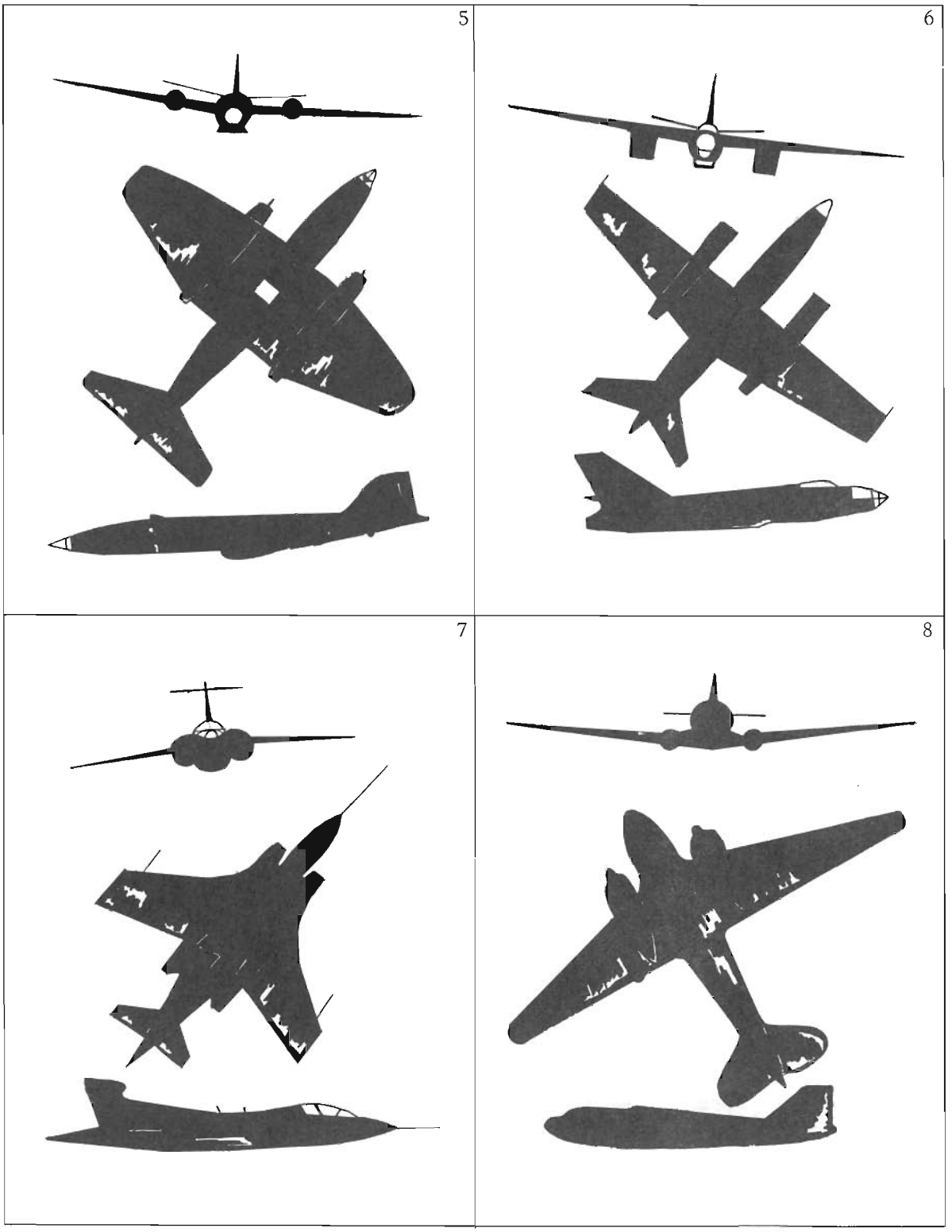




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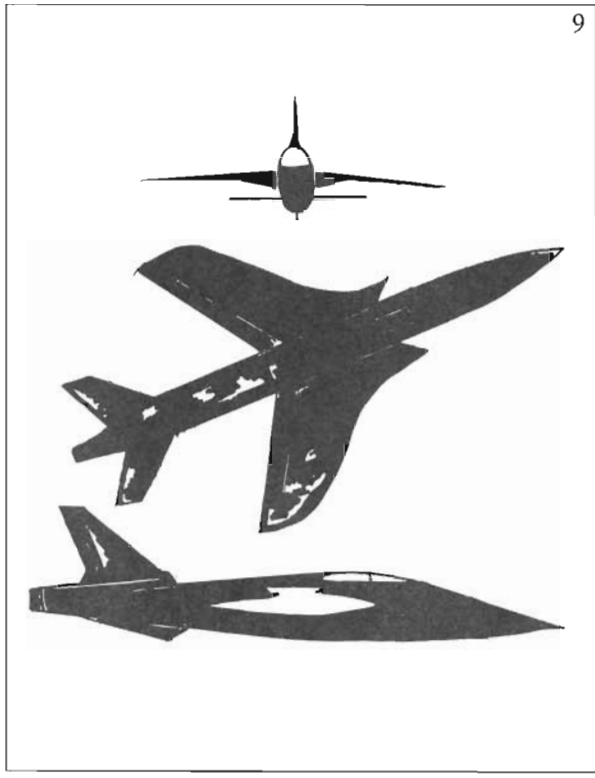


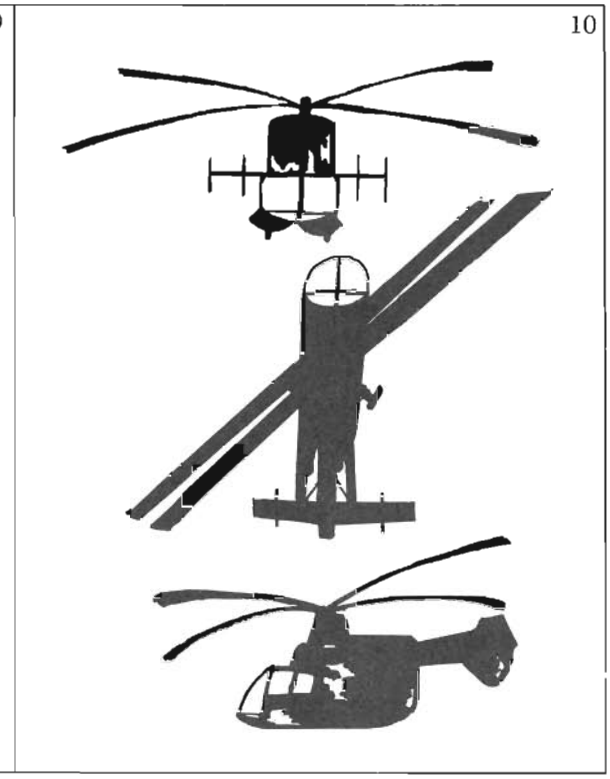


Correct identification of aircraft:

1. Brewer (U.S.S.R.)
2. B-26 (US).
3. YAK-24 (U.S.S.R.).
4. B-58 (US).
5. Canberra (RAF).
6. Beagle (U.S.S.R.).
7. NA-39 Buccaneer (RAF).
8. Alcotan (Spain).
9. F-105 (US).
10. UH-43 Huskie (US).

Answers to crossword puzzle:

Across

| | | | |
|---|---|---|---|
| 1. | RSOP | 20. | Integrated |
| 3. | CG | 25. | AGOS |
| 5. | VA | 26. | AW |
| 7. | Hercules | 27. | NAICP |
| 9. | DPE | 29. | DF |
| 11. | EP | 30. | ADS |
| 12. | LO | 32. | FA |
| 13. | EIR | 34. | CRC |
| 14. | SW | 35. | Duster |
| 15. | OP | 38. | FO |
| 16. | AADCP | 39. | Area |
| 18. | EMT | 40. | WDA |

Down

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|---|---|---|---|
| 1. | Redeye | 19. | Hawk |
| 2. | Operation | 21. | NSA |
| 3. | CEP | 22. | ESC |
| 4. | GR | 23. | RA |
| 5. | Vul | 24. | DEFCON |
| 6. | ALO | 25. | ADA |
| 7. | HE | 28. | PFT |
| 8. | SOP | 29. | DRF |
| 10. | PI | 31. | DAR |
| 14. | SP | 33. | AEW |
| 15. | OB | 35. | DA |
| 17. | DLT | 36. | SL |
| | | 37. | RD |

# Reader's Corner

## CURRENT BOOKS AND ARTICLES OF MILITARY INTEREST

*This list is published to draw attention to worthwhile and informative books and articles in other publications. We realize that not all items will be available to all readers. Our motive is to be helpful to as many readers as possible.*

*The content of these publications does not necessarily represent the opinion of the US Army Air Defense School.*

*—Editor*

BOOKS

The Book of Survival by Anthony Creenbank, Harper & Row, New York, 1968.
"The Book of Survival is all about staying alive - living through every conceivable catastrophe our dangerous world can produce."

The Bitter Woods by John S. D. Eisenhower, Putnam, New York, 1969.
"A major work of contemporary history that tells the dramatic story, at all echelons of command, of the European campaign during World War II, with special emphasis on the crisis that shook the Western coalition: Hitler's surprise Ardennes offensive - the Battle of the Bulge."

The Peaceful Uses of Military Forces by Hugh Hanning, Prager, New York, 1967.
This book describes the nonmilitary uses of military personnel in our own country as well as in many other nations in education, health, disaster relief, and many other jobs.

Rockets and Rocketry, a Picture History by David S. Akens, Strode Publishers, Huntsville, Alabama, 1967.
"A unique treasury of the world's most historic photographs of rockets and rocketry. An educational and entertaining approach to the vastness of space."

The Logic of Computer Arithmetic by Ivan Flores, Prentice-Hall, Englewood Cliffs, New Jersey.
This presents a complete analysis of high-speed parallel binary computer arithmetic.

Outlawing the Communist Party; a Case History by Germany (Federal Republic, 1949), Bookmailer, New York.
"An English translation of the decision and findings of the Constitutional Court of West Germany, dated 17th August 1956, outlawing the Communist Party."

Analysis and Design of Electronic Circuits by Paul M. Chirlian, McGraw-Hill, New York.
"This book is an undergraduate college textbook on electronic circuits for uses in junior or senior level courses."

Modern Dictionary of Electronics by H. W. Sams, Indianapolis.
"The content of this dictionary is an analysis of words and their meanings as determined by common usage, and as researched and written by its author and editors."

Thailand: The War That Is, The War That Will Be by Louis E. Lomax, Random House, New York, 1967.
"This disturbing eyewitness report is the first full account of American military and political involvement in Thailand."

The Latin American Tradition by Charles Wagley, Columbia University Press, New York, 1968.
The essays in this volume focus on Latin America in order to understand and analyze the difference between Anglo-American and Latin-American culture.

Radar Detection by J. V. DiFranco, Prentice-Hall, Englewood Cliffs, New Jersey, 1968.
"Offering a complete discussion of the principal approaches to radar detection, including a comprehensive treatment of detection theory, this important book treats a number of topics which have never before appeared in book form."

101 Questions and Answers About Transistors by Leo G. Sands, W. H. Sams, Indianapolis.
"This book is written to fill a gap in existing technical literature on transistors and their applications."

Medals for Brave Men by Naomi Talley, Dial Press, New York.
"Today there are many medals for brave men - the Medal of Honor, the Distinguished Service Cross, the Silver Star, the Air Medal, and others. Here is the history of these medals - how and why they were established, how they look, and who may receive them."

Our Space Age Army by Carroll B. Colby, Coward-McCann, New York.
This book describes in words and pictures much of today's best weapons, combat equipment, vehicles, electronic devices, and aerial tranportation.

Ambush; the Battle of Dau Tieng by S. L. A. Marshall, Cowles Book Co., New York, 1969.
"With the unequaled eye for details of combat and his trained ear for the ordeal of participants, Brig. Gen. S. L. A. Marshall tells in Ambush, a story rich in drama and excitement, as GI and Vietcong grope for one another, fall into traps, fight to stay alive."

Westmoreland; the Inevitable General by Ernest B. Furgurson, Little, Brown; Boston.
"Many people with a stake of one sort or another in Vietnam will be interested in learning more about this soldier who was responsible for the welfare of so many servicemen and women there."

## ARTICLES

AIR DEFENSES
"Air Defense Missiles for the Army," George J. Geiger, Military Review (December 1969), pp. 39-47.
This article describes air defense missiles which are employed by all the principal nations of the world.

ALASKA
"Alaska's $50-Billion Boom," Forbes (November 15, 1969), pp. 30-46.
"The 49th state's boom is a threefold pheonmenon of capital equipment, oil and minerals - in that order. Everyone wants in. But can everyone get in?"

ELECTRONICS
"Careers in Electronics," Byron G. Wells, Radio-Electronics (December 1969), pp. 69-70.
"Today's $20 billion electronic industry is expected to double in dollar volume in the next 10 years. How can you become a part of this growth?"

INFORMATION STORAGE AND RETRIEVAL SYSTEMS
"Magnetic Recording," Victor E. Ragosine, Scientific American (November 1969), pp. 71-82.
"The storage in information in magnetic particles is an integral part of communication and data processing. The demands of different kinds of information have given rise to variations on the basic theme."

IONOSPHERE
"Short Wave Radio and the Ionosphere," George Jacobs, CQ (November 1969), pp. 16-22.
"This article discusses the formation of electrified, or ionized regions in the earth's upper atmosphere which reflect high frequency radio waves over long distances."

MILITARY SERVICE, COMPULSORY
"What Kind of Army?", Blair Clark, Army, November 1969), pp. 26-29.
"Before we give up our present draft system in favor of an all-volunteer army, we had better examine the problem because the wrong decision, the writer argues, could destroy us."

"The Last Volunteer Army 1946-1948," Rocco M. Paone, Military Review (December 1969), pp. 9-17.
Those who believe that a volunteer army is the answer to our draft problems would do well to look back on our experiences from 1946-1948 when we last attempted to meet our military requirements through voluntary enlistment.

NARCOTICS
"Basic Facts About Abusable Drugs," Jules Saltman, The American Legion Magazine (November 1969), pp. 16-21.
"Step One in a war against misuse of drugs today is clear information about them. Here is a rundown of the facts now known."

NEGROES - US - HISTORY
"Black America: A Historical Survey," Current History (November 1969), entire issue.
"In this issue seven authors examine the facets of black experience in America from colonial days to the present."

PRISONERS OF WAR - US
"I Was a Prisoner in Hanoi," Robert F. Frishman, Reader's Digest (December 1969), pp. 111-115.
"An eyewitness account of the mind-bending, body-warping prison camps that North Vietnam so carefully hides from the eyes of the world."

RIOT CONTROL
"New Weaponry for Riot Control," Rex Applegate, The National Guardsman (November 1969), pp. 10-14.
"American industry, responding to urgent civil law enforcement needs, has developed and is marketing specialized riot equipment and police armament that should be of interest to the Guard."

SPACE FLIGHT
"1973 Viking Voyage to Mars," Viking Project Management, Astronautics & Aeronautics (November 1969), pp. 30-135.
"Like the first Norse sailors to reach the shores of America, the 1973 Viking will scout a New World for explorers to follow by embarking on a voyage of scientific discovery to Mars."

VIETNAMESE CONFLICT
"Vietnam: Which Way Out?", Mark E. Swenson, Air Force/Space Digest (November 1969), pp. 42-45.
"The strategy of withdrawal and extrication is much more difficult than one of involvement and escalation. The crucial questions are whether or not the South Vietnamese can build strong enough political, economic, and social institutions while at the same time creating military forces strong enough to counter and contain the enemy.... "

Readers are invited to submit for publication articles and informative notes that are of professional interest to the air defense artilleryman. Articles should be current and forthrightly stated and should relate to some aspect of what air defense units in the field are doing to accomplish their mission, particularly in the technical and tactical areas. Miscellaneous articles expressing either technical or nontechnical ideas that may be of value to air defense will also be considered for publication.

Direct communication to the editor is authorized:

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