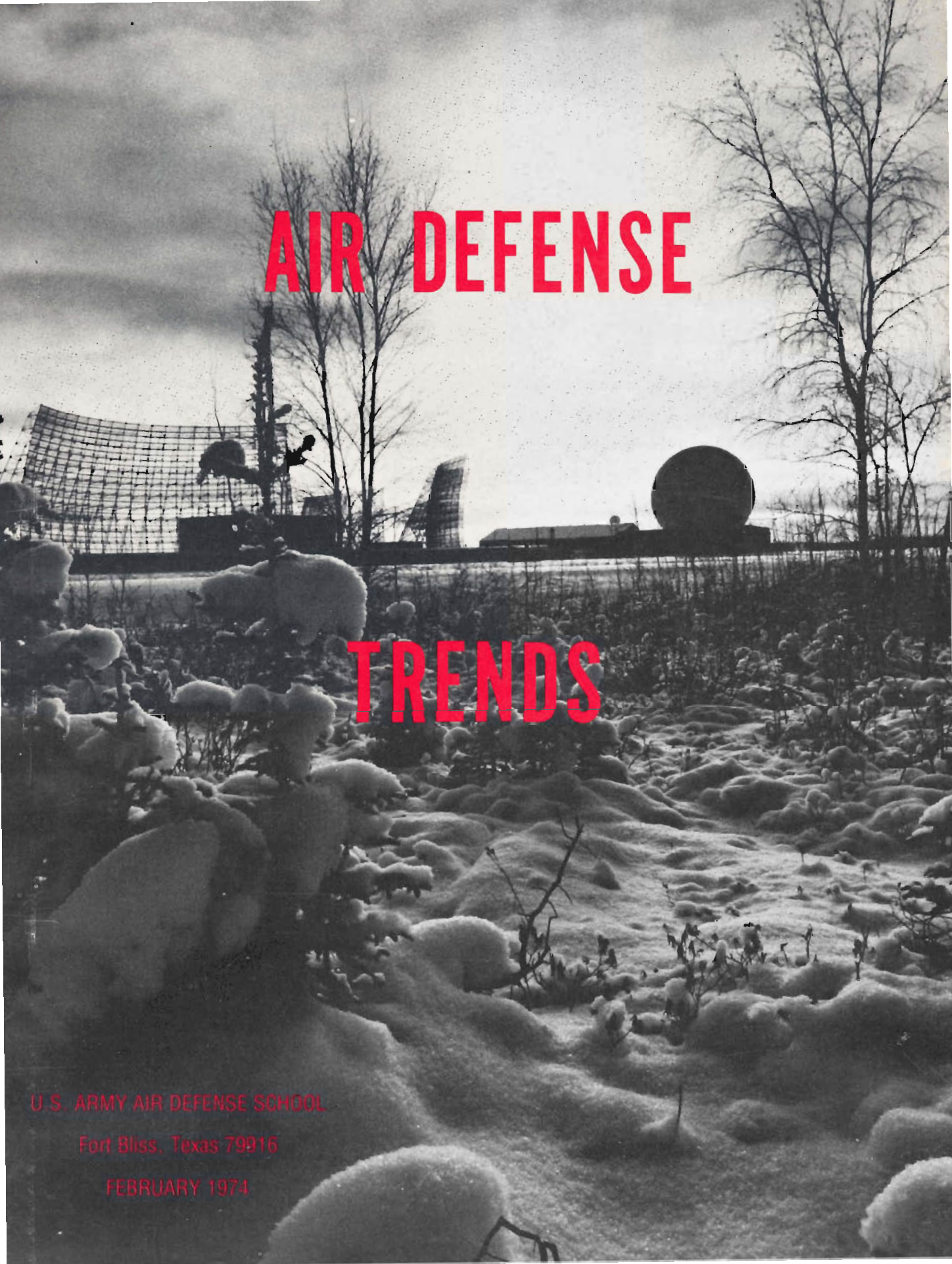


AIR DEFENSE TRENDS

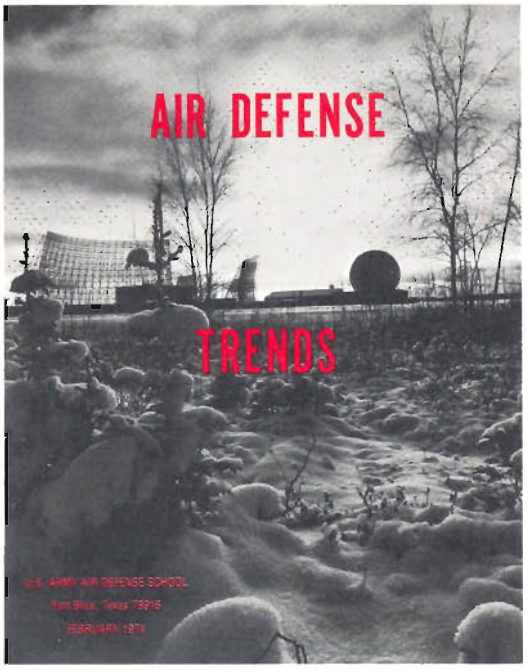
U.S. ARMY AIR DEFENSE SCHOOL
Fort Bliss, Texas 79916
FEBRUARY 1974

AIR DEFENSE TRENDS
US ARMY AIR DEFENSE SCHOOL
Fort Bliss, Texas 79916

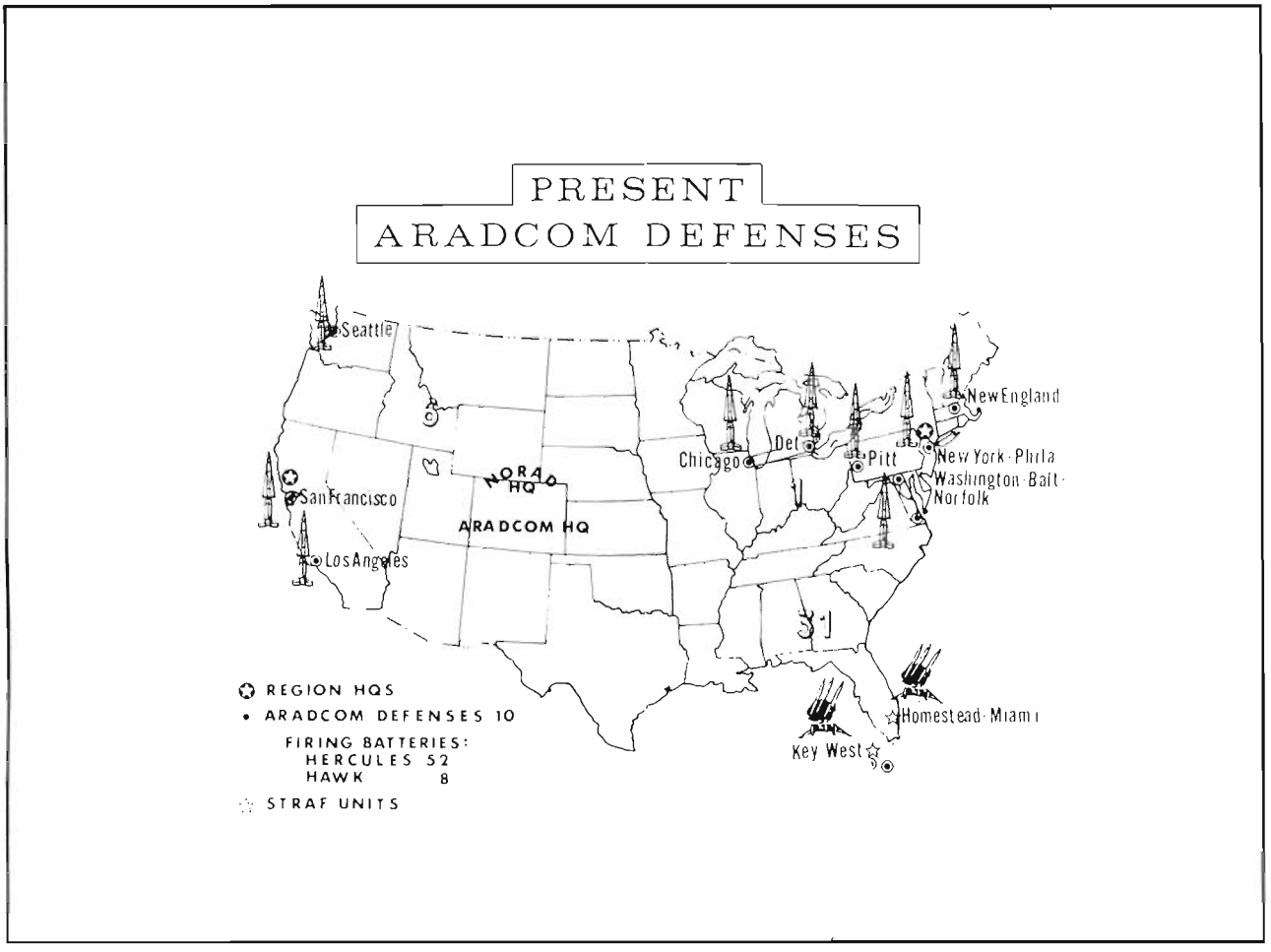
IN THIS ISSUE

Nobody in his right mind welcomes war, especially those who have seen it. The carnage, the destruction, the pain are beyond telling. But the less prepared we are, the more wishful our thinking, the greater the costs of war when it comes . . . Our country can avoid war only by showing clearly that, while anxious to avoid war, it is willing and able to fight if necessary; that within this nation abides the will to fight for its security and its interests . . . Each time we have faced a major war unprepared, we have barely gotten ready in time. In World War II it was months before we could act; in Korea it was weeks. In future wars, we will have only days to get ready. The costs of our being unprepared in the past have been atrocious. The Army is doing everything in its power to see to it that we do not have to pay that exorbitant price in lives and treasure again. With your support, we should not have to pay that price again.

– General Creighton W. Abrams
US Army Chief of Staff



COVER: COOL POST WITH HOT MISSION — It's in a cool part of the continent, but this radar outpost has a vital mission in helping deter a hot war by knocking out the element of surprise attack. This Ballistic Missile Early Warning System site at Clear, Alaska, is one of three such stations used by the North American Air Defense Command to warn of an intercontinental ballistic missile attack against the continent from the north. This station uses a combination of one scanner/tracker radar, under the 140-feet-in-diameter dome at right, plus three steel-webbed detection radars which stand 400 feet long and 165 feet high.



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AIR DEFENSE TRENDS

A US Army Air Defense School periodical, Air Defense Trends is published on the basis of three issues annually. 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, CONUS 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 at 75 cents a copy from the Book Store, US Army Air Defense School, Fort Bliss, Texas 79916. The form below is printed for convenience in ordering.

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

Articles appearing in this publication do not necessarily reflect the opinions of the US Army Air Defense School or the Department of the Army.

Use of funds for printing of this publication has been approved by Headquarters, Department of the Army, 1 September 1973, in accordance with AR 310-1.

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A Message to Young Noncommissioned Officers

Lieutenant Colonel George C. Wallace
Enlisted Personnel Directorate
Military Personnel Center
Headquarters, Department of the Army

The subject of this message is followership and leadership and it is directed to you because you are so very important to the future of our Army. Indeed, you are the keystone of the Army's chain of command.

You are the envy of older officers and noncommissioned officers, for you have many years of adventure and challenge ahead of you. As you move onward, you have their best wishes and support.

Some of you will become platoon sergeants, first sergeants, and even sergeants major. Some of you will go on to become warrant or commissioned officers. A future general officer may even be among you.

All of you have ambition and desire to develop your potential for leadership. And that is the purpose of this message — to help you develop yourselves as leaders by outlining some thoughts on followership and leadership as seen through the eyes of some of the "old heads" who wish that they were again starting their military careers.

These comments will not provide you a magic formula to develop yourself into a superleader because each of you is different. Though you are all different, you all have one thing in common and that is the fact that your superiors saw in you enough leadership potential to get you promoted. I urge you to accept their faith and to believe that you can develop your full leadership potential.

Before a man can be a good leader, he must be a good follower; and everyone, no matter how high his rank, is to some extent a follower, therefore, let us consider what we as followers owe to our superiors, whom we often refer to collectively as "they."

• Your superior deserves your loyalty. Be loyal to him just as you would want him to be loyal to you. Try to realize his problems and consider what you would do if you were in his position. Try to mentally "walk in his shoes" before you judge him.

• You owe obedience to his orders and instructions. If you disagree with his orders, tell him so and why, but do it with respect and at the right time. Once a decision is final though, carry it out as if it were your own. This is a test of your loyalty, particularly if it is an unpopular decision.

• You owe it to your boss to become as proficient in your job as possible. Know what you are responsible for and take care of those responsibilities. Try to do your job more effectively each day. It is worthwhile to set aside a short period each day or a few hours each week to improve yourself through systematic study. It will pay rich dividends. I recall the example of an outstanding NCO of 22 years ago who made a young corporal study field manuals each night. The young soldier didn't like it, but when he was selected to appear before a regimental promotion board he was prepared — and promoted (he liked it)!

• You owe it to your superiors to do your best in caring for your men. If you will take care of them, and this means at times you must be hard and demanding, they will take care of you when the "chips are down."

• You owe your boss your thanks for the opportunities and challenges he provides to you. Grasp those opportunities as a chance to excel and to gain new experiences. Do not avoid the more unpleasant tasks; rather seek them out if they will benefit you and your unit.

• And lastly, at times you can be a leader to your boss. Nothing can be as inspiring to a leader when he is depressed and things are going wrong than to see a subordinate standing tall, meeting an unpleasant situation head-on, and overcoming difficult obstacles with a smile on his face.

So much for followership. Let us consider a few thoughts on leadership and what your subordinates have a right to expect from you. Remember, you are now becoming *"they"* to those under your charge.

• Your subordinates expect you to be a man and all the things that go with it: honesty, diligence, and devotion to duty.

• They want, and deserve, a fair hearing to their grievances. They expect you to be firm, fair, and consistent.

• They expect you to take action against those who do not carry their fair share of the load or those who bring discredit upon the unit.

• You are expected to have, and to display, courage; the courage to take the blame when blame is due, to fight for them when they have been wronged, and to have the courage to "hang in there" when the going gets tough.

• They expect you to know your job, to be daily trying to do a better job, and to teach them to do a better job and to be better soldiers.

• They expect positive direction. Quoting Saint Paul: "If the trumpet sounds an uncertain note, who will answer the call to battle?" You are their trumpet and you must be positive and clear in the instructions you give. If you are uncertain and do not express yourself clearly, what can you expect from your men?

• Your men expect, and deserve, courtesy. When you are polite, you elevate them. When you are rude, you lower yourself. If you are impolite to your superiors, it is a shortcoming against discipline, but if you are impolite to subordinates, it is cowardly, for you are taking an unfair advantage. In other words, treat them with dignity.

• Do not make useless and unreasonable demands of your men, but what is demanded must be absolute. Make your subordinates understand the why of your demands, and then insure that they meet them.

Most of you are in the transition period between a specialist and a section chief or squad leader, and at times this can be a difficult position. Your old buddies may harass you a bit and the older NCO's might be slow to accept you, but you can make the transition by learning your job, doing your job, and taking every opportunity to show your men that you are looking out for their welfare.

And now for the payoff — when your men have accepted you as "their" leader, you don't need anyone to tell you because you can feel it in their support and devotion. Their responses to you will justify your dedication, self-sacrifice, and loyalty.

And lastly, the paraphrased words of a prominent civil rights leader, Doctor King, seem appropriate to a man who wants to improve himself. I hope that each of you will consider it for a personal motto as you move up the chain of responsibility:

"I ain't what I ought to be;
I ain't what I want to be;
I ain't what I am going to be;
But thank God, I ain't what I was."

AIR DEFENSE IN THE SOVIET UNION

(SUMMARY)

Major Tyrus W. Cobb

Parts I and II of "Air Defense in the Soviet Union" were published in the June 1973 and September 1973 issues of AIR DEFENSE TRENDS respectively. This summary terminates the series.

The author has requested that correspondence concerning the article be addressed to him at ACofS for Intelligence, Soviet Branch, (DAMI-SD) Washington, D. C. 20310 (AUTOVON 225-0571)

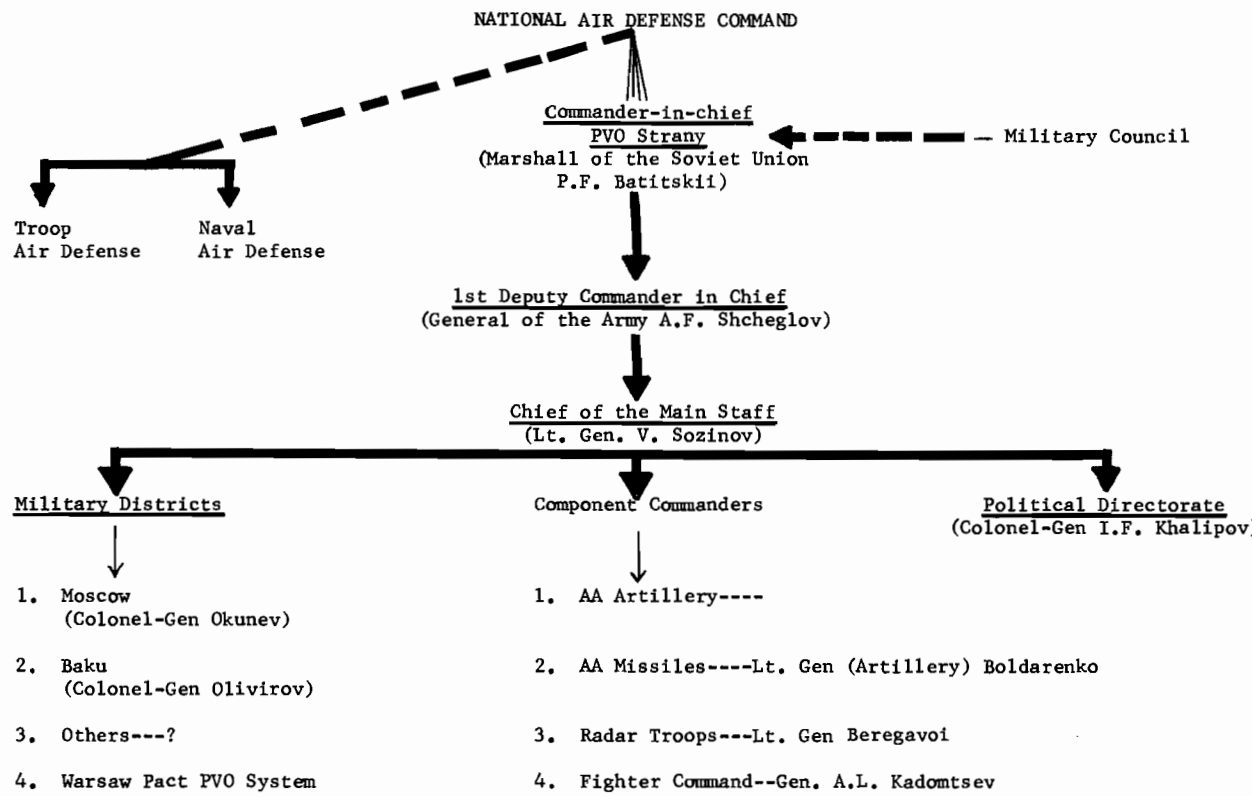
– Editor

"Soviet Strategic Offensive Forces pose an extremely formidable threat to the United States. Our primary method of coping with these forces is deterrence by threat of retaliation."

– Melvin Laird

Much attention has been focused in recent years on the Soviet buildup in strategic offensive weapons, especially in the ICBM area. To counter the threat the United States has not, as might be expected, devoted considerable resources toward the perfection of a defense against Soviet bombers, long-range ballistic missiles, and submarine-launched rockets. Instead, it has opted to rely, in the words of former Defense Secretary Laird, on the threat of retaliation to deter the Russians from considering an attack on the United States.

The Soviets, in contrast, have adopted a different strategy. The USSR has striven to seek at least parity with the USA in strategic offensive weapons and, at the same time, to construct a viable antiaircraft and antiballistic missile defense. This balanced offensive-defensive mix constitutes both a formidable threat against which our defensive forces must operate a potential bulwark that could mitigate the effect of our own retaliatory effort.



Beginning in 1963 a series of economy moves so reduced our detection and intercept capabilities, the committee summarized, that sovereign US airspace could not be effectively protected from intrusions by foreign aircraft.[63]

In this same period the Soviet Union embarked on its military-technological revolution designed to eradicate the overwhelming superiority of the United States which existed in the early 1960's. In no other area did the USSR enjoy as much success as in the field of strategic defensive weapons. The Soviet edge is manifested in nearly every aspect when one compares the two national air defense systems. The USSR now has five times as many interceptor aircraft assigned to its PVO Strany as the United States has earmarked to CONAD. But the quantity is only one side of the coin. Most of the Soviet fighters are relatively new, and such later-model aircraft as the Mig-23 Foxbat will account for over one-half the inventory by next July. The standard US fighters, the F-101B, F-102, and the 14-year old F-106A, cannot meet the performance characteristics of their later model Soviet counterparts. However, either the Navy's F-14 or the Air Force's F-15, if they were deployed today, could certainly be considered equal to the Soviet fighters. The projected Improved Manned Interceptor (IMI) the Defense Department has discussed could certainly eradicate any disparity that presently exists between US and Soviet fighters, but the IMI is not likely to go into production until the USSR unveils its heralded new strategic bomber, the Backfire.

In sheer numbers the Soviet Union enjoys a 10 to 1 superiority over the USA in terms of surface-to-air missile launchers in their respective air defense systems. The Russians have a broader inventory to draw from, having deployed four missiles in the medium-to-high altitude defense and three other versions for the low-altitude role. But The Soviet SA-2 Guideline, which accounts for 80 percent of the total, is certainly no match for the Nike Hercules. Although it has not been battle tested as has the SA-2, it is reasonable to assume that the Nike Hercules would perform better than the older model SA-2's have in Vietnam. Certainly the more advanced later models of that surface-to-air missile would be more effective, but they would be faced with a much greater task in defending such a broad landmass as the Soviet Union compared with the relatively simpler job of defending point targets in Vietnam. But it must also be noted that the SA-2, being semimobile and deployed with the field armies, possesses that great advantage over the Nike Hercules. The SA-2, because it is deployed in such great quantities, could also be effective if the Soviets were to use the salvo tactic. Certainly it would at least keep intruding aircraft down to a level where conventional AA artillery could spread a deadly layer of flak. The SA-5 appears to be a more effective weapon, but the USA could also erase this advantage when it deploys its SAM-D system.

The Soviet Union, though, is proud that, on one occasion, the SA-2 destroyed a target over its own territory. On 1 May 1960, so the official account goes, the airspace over the USSR was pierced by a high-flying intruder. The alert was sounded in the Sverdlovsk defense, covering the industrial heart of the Urals, and a unit under the command of Major M. R. Voronov locked on the intruder and brought it down with the first rocket fired. For downing Francis Gary Powers and the U-2, the unit was commended for its "demonstrated high political vigilance and military preparedness" and awarded the Order of the Red Star.[64] More than likely the U-2 was damaged by a near-miss by one of many SA-2's fired at the target.

If there is any area where the United States enjoys superiority, it would be in the early warning area. But even this is marginal. The Soviets have some modified TU-114 Cleat aircraft working in the Moss early-warning system, but must continue to improve the system until it can become very reliable. The United States plans to deploy an advanced airborne warning and control system (AWACS), which, in conjunction with the OTH-B (over the horizon) radars, should give it definite superiority in the early warning field. By 1975 we should have a highly classified operational satellite system, known as the 647 Advanced Warning System, to give detailed information in Soviet bombers and missile launches.[65]

The Soviet challenge represented by a deployed ABM system may have been somewhat mitigated by the recent SALT agreements. But the fact remains that the Russians do have a defense around their capital and will probably begin soon to construct the second allowable site around an ICBM field. The United States has not yet completed work on its first site at Grand Forks, North Dakota, and approval of funds for a second defense for Washington, D.C. is becoming increasingly doubtful. The Soviets also lead in the antisatellite defense, having already successfully intercepted several satellites. But this is really not too important since the United States could rapidly develop this capability.

No previous mention has been made of the passive means of defense, but this is one area that the Soviets treat quite seriously. The civil defense effort was reorganized in the USSR in 1965 under Marshal Chuikov and wide publicity was given to the program. Compulsory and universal CD training was decreed, beginning in the classroom and continuing at places of work. Large-scale evacuation of urban areas has been tested, alternate national command posts have been established (probably in the Volga Military District), and the entire population has been instructed on how to respond to the seven alarm signals.[66] Civil defense is virtually nonexistent on this side of the ocean.

The Soviet challenge, represented by the National Air Defense Command, to our retaliatory forces is a formidable one. The PVO Strany, one of the five services in the Soviet Armed Forces, receives a significant share of the Soviet defense budget, a fact which is reflected in its impressive arsenal. In response the United States continues to make reductions in its force levels committed to air defense, accepting for the time an admitted vulnerability and low effectiveness. While we are now working on the development of advanced weapons and early warning systems, it will be several years before they are deployed. Hopefully, potential aggressors will accommodate us by not attacking during that period.

63. Claude Witze, *The Gaps in Our Air Defense (Air Force Magazine,* March, 1972, p. 34.

64. *Voisk PVO, op. cit.*, p. 396.

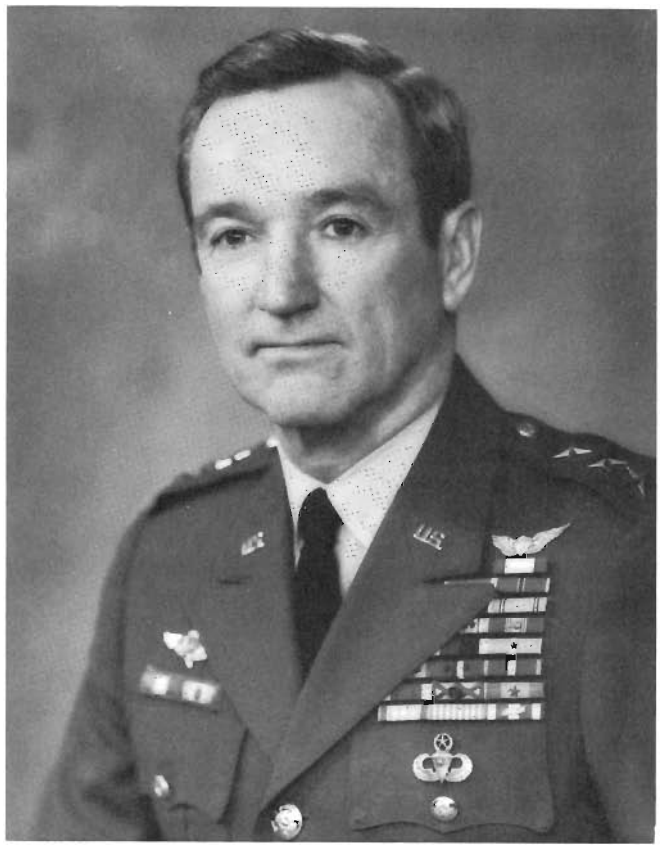
65. *Air Force Magazine, August, 1971, p. 35.*

66. Joanne L. Gailar, "Seven Warning Signals" *(Bulletin of the Atomic Scientists,* Dec., 1969), pp. 18-22.

The Comptroller Officer Program

(A Secondary Skill)

The Comptroller Officer Program is one of the 47 specialty career fields approved by the Secretary of the Army and the Chief of Staff that comprise the new Officer Personnel Management System (OPMS). The current program membership objective is 793 officers and at last report vacancies existed in all grade levels and all branches.



LTG Edward M. Flanagan, Jr.
Comptroller of the Army

LTG Edward M. Flanagan, Jr., Comptroller of the Army, has issued this message concerning the new career field:

Soon many of you will be faced with a milestone decision — the selection of a "secondary skill" under the recently approved Officer Personnel Management System. I welcome the opportunity to provide information that hopefully will assist you in making that decision.

I believe comptrollership is a vital, challenging, and extremely important function in today's Army. The day has arrived when we can turn from our role in developing information systems to the more important role of using the information to better manage Army resources — men, materiel, money, and facilities. Today's comptroller is mission-oriented. He develops objectives and goals based on the mission and is the right-hand man to his commander by focusing

all of the command's assets on accomplishing those objectives. He works with the entire staff to find better ways of doing things. This is the role of the comptroller — the manager.

In addition to the material offered here, I encourage you to seek out members of the Comptroller Officer Program and obtain their views. The success of OPMS will depend upon the matching of your skills and inclinations with Army needs whereby both will benefit from the experience. We need — and are getting — in the Comptroller Officer Program, the chargers, the doers, the organizers, the managers, the problem-solvers. This is what comptrollership is all about these days. Forget the clerk at the high desk with a green eyeshade on his forehead, garters on his sleeves, and black cuffs on his wrists, poring over huge lined ledgers, adding up long columns of figures with a sharp pencil. He belongs in Dickens. Visualize a manager with ADP data, an organizer with common sense, a problem-solver with brains and logical approaches. He's the new Comptroller.

Comptroller Positions

As a member of the Comptroller Officer Program, there are a number of challenging positions to which you may be assigned. Throughout the Department of Defense and the Army, there are presently designated 171 *key* Army comptroller positions and 387 *supporting* positions. You are required to have extensive experience in comptrollership to serve in the key positions. You may be assigned to a supporting position early in your career to develop the requisite experience level for service in the key positions.

At this time 610 officers are members of the Comptroller Officer Program. The goal is to increase the membership in the program to the point where program members can be assigned to all the key positions. The majority of the key positions are approved at the masters level for advanced civil schooling.

Program Enrollment

Officers may become members of the Comptroller Officer Program in one of two ways. You may be nominated for the program by your commander, your branch, the special career programming branch, or by any officer who is aware of your qualifications. Also, you may apply by letter to your career branch or the Colonels Division, Headquarters, Department of the Army, MILPERCEN, Alexandria, Virginia 22332.

All applications and nominations are processed through a selection board in the Officer Personnel Directorate. The board reviews the officer's complete record and determines if he meets the prerequisities for program membership. If you meet the criteria as established by the board, you are invited to join the program. However, if an officer is not selected, no record of the action is made in his official personnel file in the field or at the Department of the Army, and he is notified directly — not through channels.

Prerequisites

Membership in the Comptroller Officer Program is voluntary and highly competitive. Enrollment in the Program is open to all officers on active duty in the grades of major through colonel, and captains on the promotion list.

The Comptroller Officer Program is governed by AR 614-136 which prescribes additional requirements for membership.

Branch Development

For the combat arms officer who desires to develop a specialty while maintaining his branch proficiency, the Comptroller Officer Program offers opportunities for challenging assignments in progressively more responsible positions. In today's Army there is a great demand for the branch qualified officer who is interested and has developed the aptitude for comptrollership.

The Comptroller Officer Program provides a system wherein your career is managed so as to produce officers who are both branch proficient and comptroller proficient. The program is not a substitute for — but a complement to — the officer's basic branch. While each officer should have generalist capabilities, it is also very appropriate and wise to pursue specialist activities in which to contribute between basic branch assignments. This fact is borne out constantly by the Chief of Staff's guidance to promotion boards where he has pointed out the increased need for officers who are both career branch and specialist qualified.

The responsibilities open to the members of the Comptroller Officer Program are closely allied to the responsibilities of the commander. The emphasis being placed by both the Department of Defense and Department of the Army on the commander's management of resources will make the experience gained in the Comptroller Officer Program invaluable to officers during their command and staff tours.

Program Advantages

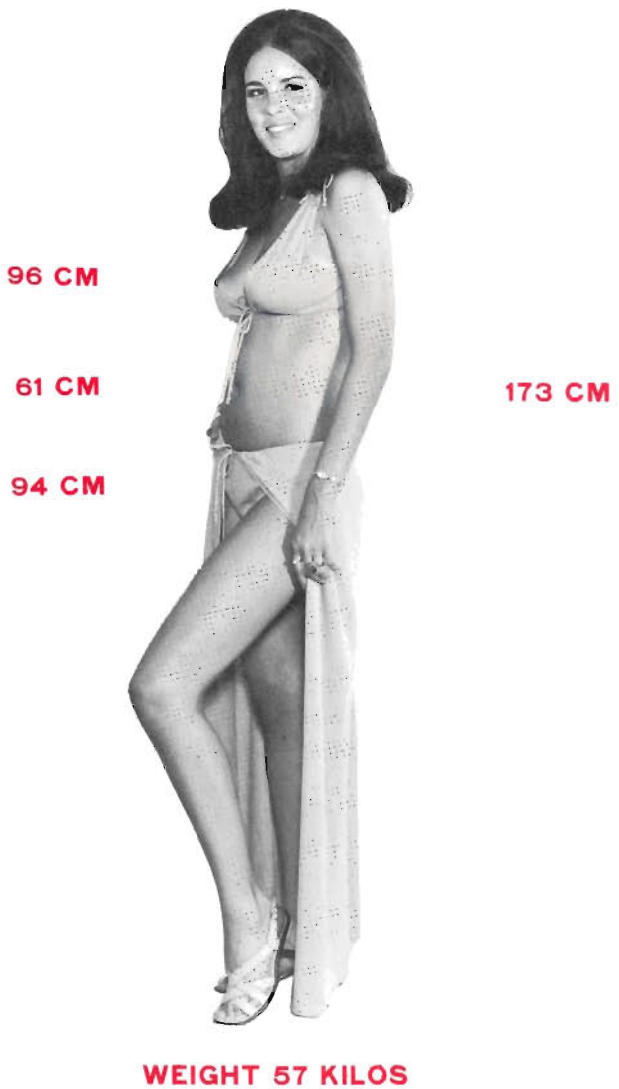
Your opportunity to attend graduate school is increased in that priority is given to members of the Comptroller Officer Program for selection to fill the advanced civil school quotas which have been validated in comptrollership and the comptroller-related disciplines. You will receive equal consideration with your contemporaries for attendance at military colleges.

Career development is enhanced through the planned assignments of program members to positions of increased responsibility. The expertise you achieve in the management of the Army's resources will prove invaluable to you during your command and staff assignments. For those officers who are so inclined, the Comptroller Officer Program provides an opportunity to develop expertise in a second profession which is in great demand in our society today.

The International System of Units (SI)

(The Metric System)

Sam Lorette
US Army Air Defense School



The primary source of information for this article is the US Department of Commerce National Bureau of Standards Handbook 102.

Major countries in the world are converting more and more to the use of the metric system because it facilitates scientific endeavor and growth of commerce and trade. Recently, for example, Canada proposed to make a major conversion to the metric system (England converted in 1965). The United States Army is using the metric system in certain applications to weapon systems. This article points out highlights of the development of the metric system. You may be surprised to discover that the system entails considerably more than just the meter.

In 1970 the French National Assembly, as an outgrowth of the French Revolution, requested the French Academy of Sciences to work out a system of units suitable for adoption by the whole world. The French people had been using the decimal system since the 16th century when there was considerable confusion in a jumble of units of weights and measures. The new system derived by the Academy of Sciences was adopted as a practical measure to benefit industry and commerce. Physicists soon realized the advantages* of the new system and it was adopted by technicians and scientists. The system was based on the gram as a unit of mass and the meter as the unit of length. The meter (39.37 inches) was intended to be (and nearly is) one ten-millionth of the distance from the equator to the North Pole. The importance of the regulation of weights and measures was recognized in the Constitution but it was not until 1866 that the metric system was legalized by Congress in the United States. In 1893 the international meter and kilogram became the fundamental standards of length and mass in the United States for metric and customary weights and measures.

International standardization began with an 1870 meeting of 15 nations in Paris that led to the May 20, 1875, International Metric Convention, and the establishment of a permanent International Bureau of Weights and Measures near Paris at Sevres, France. A General Conference on Weights and Measures (CGPM) was also constituted to handle all international matters concerning the metric system. The CGPM normally meets every 6 years in Paris and controls the International Bureau of Weights and Measures which preserves the metric standards, compares national standards with them, and conducts research to establish new standards. The National Bureau of Standards represents the United States in these activities.

AR 700-75, *Use of Metric Units of Measurement in United States Army Weapons,* stipulates certain provisions for conversion of United States Army weapons and associated equipment to use the meter for measuring linear distances. Also, velocity and temperature measuring equipment for accurate firing of United States Army weapons will be converted to the use of meters per second and degrees centigrade, respectively (Army meteorological sections will express wind speed in knots and altitude for various meteorological data in meters (STANAG 4061)). AR 700-75 further states that known distance ranges will be redesignated to the nearest 10 meters and new ranges will be constructed in round hundreds of meters. The regulation states that training programs will incorporate the training necessitated by the regulation.

Of particular interest to the air defense artilleryman is the radar mile or radar nautical mile because some ADA systems have ranges stated in nautical miles. On numerous occasions individuals have erroneously assumed that the radar mile or radar nautical mile (one minute of arc of the great circle of the earth) is 2,000 yards where in fact it is 2,025.37 yards (6,076.11549 feet — SI system). Based on the SI definition that each international inch is equal to exactly 2.54 centimeters, the nautical mile is defined as exactly 1,852 meters.

In 1971 the Secretary of Commerce recommended to Congress that a systematic, nationally coordinated United States changeover to the metric system be made. The recommendation was in a report prepared by the National Bureau of Standards and represented 3 years' work. The SI system, when fully accepted and used by the United States and its Allies, will facilitate technological advance through standardization of units of measurement.

* See Table.

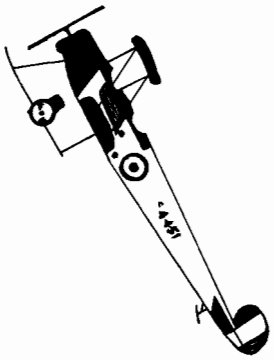
TABLE OF METRIC AND US CUSTOMARY UNITS

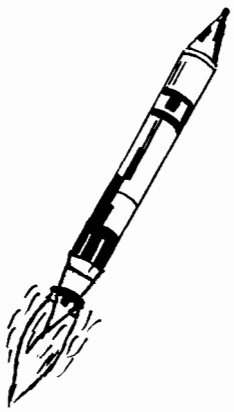
(Asterisk denotes commonly used metric units)

METRIC		US CUSTOMARY	
	Length		
myriameter	10,000 meters	mile	5,280 feet
*kilometer	1,000 meters	mile	1,760 yards
hectometer	100 meters	furlong	220 yards
decameter	10 meters	rod	5.5 yards
*meter	1 meter	yard	36.0 inches
decimeter	0.1 meter	foot	12.0 inches
*centimeter	0.01 meter		
*millimeter	0.001 meter		
	Area		
sq km	10^6 sq meters	sq mile	3,097,600 sq yd
*hectare	10,000 sq meters		27,878,400 sq ft
*are	100 sq meters		640 acres
centare	1 sq meter	acre	43,560 sq ft
sq cm	0.0001 sq meter		4,840 sq yd
		sq yard	1,296 sq in
			9 sq ft
		sq foot	144 sq in
	Capacity		
kiloliter	1 cu meter(1,000 liters)	barrel	42 gallons
*hectoliter	100 liters	cu foot	7.48 gallons
decaliter	10 liters	peck	2.0 gallons
*liter	1 liter	gallon	8.0 quarts
deciliter	0.1 liter		(231 cu in)
centiliter	0.01 liter	quart	2.0 pints
milliliter	0.001 liter	pint	16.0 ounces
	Weight		
*metric ton	1,000 kilograms	2,240 lb	1 ton (long)
quintal	100 kilograms	2,000 lb	1 ton (short)
myriagram	10 kilograms	16 oz	1 lb
*kilogram	1,000 grams	1 oz	437.5 grains
hectogram	100 grams		
decagram	10 grams		
*gram	1 gram		
decigram	0.1 gram		
centigram	0.01 gram		
*milligram	0.001 gram		

Note. In the metric system computations can be made by multiplying or dividing by 10, 100, 1,000, etc. In the US Customary System approximately 50 different units, not in multiples of 10, must be used.

History of Air Defense





Editor's Note:
Having discussed the efforts of the United Kingdom in the early development of radar and countermeasures, we now turn to the efforts of the United States in this field of science.

In 1922 while Dr. A. Hoyt Talor and Leo Young of the Naval Research Laboratory were conducting a radio communication test, a boat passed between the transmitter and the receiver. At the time of passage of the boat it was noticed that the receiver signal was distinctly changed. This discovery was the forerunner of further tests and very quickly it was discovered that airplanes flying nearby also disturbed or modulated the signal. The eventual evaluation of this phenomenon was that the interfering objects were causing a reflection of the transmitted electromagnetic radiation. Actually, in 1932, a complete system using this principle was devised to detect aircraft intrusion over a circular area some 30 miles in diameter. The Navy became very much interested in this development and, by 1936, an original model pulse-type transmission radar had been devised. At this point, the Navy placed a SECRET classification on the project and gave great impetus to the development of similar types of equipment suitable for use aboard ship with the objective of seeing objects during darkness, fog, and foul weather.

At this time the Army Signal Corps research and development agencies were working on thermolocators or infrared types of detection equipment for the Chief of Coast Artillery. It was contemplated that these would be used to replace the acoustic corrector in the pickup of aerial targets. Although some minor success had been achieved, it did not appear promising for the future, and in March 1936, the Coast Artillery Board declared that the thermal equipment developed by both the Signal Corps and the Corps of Engineers was inadequate for aircraft detection. In December 1936 a Signal Corps reflected-signal-type radar was tested and gave some promise of success. This was the turning point of a tremendous amount of research and development in the reflected radio wave and thermolocator types of aircraft detection.

In May 1937 the Signal Corps demonstrated another piece of equipment, the SCR-268, a mobile, short-range radio locator for controlling searchlights. Its objective was the rapid location of aircraft at night, providing range, elevation, and azimuth accurately enough for the coast artillery AA searchlights to pinpoint and illuminate the aircraft.

Many agencies witnessed these successful tests. The Army Air Corps immediately established a requirement for similar equipment but with a longer range to give vitally needed early warning of approaching aircraft. The mobility requirements forced the Signal Corps to higher frequencies in order to have antennas of smaller size: hence, the SCR-268 frequency of 205 megahertz. The Navy requirement aboard ship for antennas with smaller physical size also forced the trend to higher frequencies.

The success of the prototype SCR-268 in the May 1937 tests led to the further delineation of antiaircraft military characteristics for a gun-laying radar that could provide precise target data, day or night, thus eliminating the requirement for searchlights. In May 1939 the SCR-268 T-2 was ready for testing and evaluation. The beginning of World War II in September sealed the research and testing program;

production was immediately started on the T-3 model which became known in the field as the SCR-268.

It followed logically that the SCR-268, primarily a searchlight control radar, was of necessity adapted to the role of a gun-laying radar. It accomplished this mission, despite inadequacies, until superseded by the gun-laying radar SCR-584.

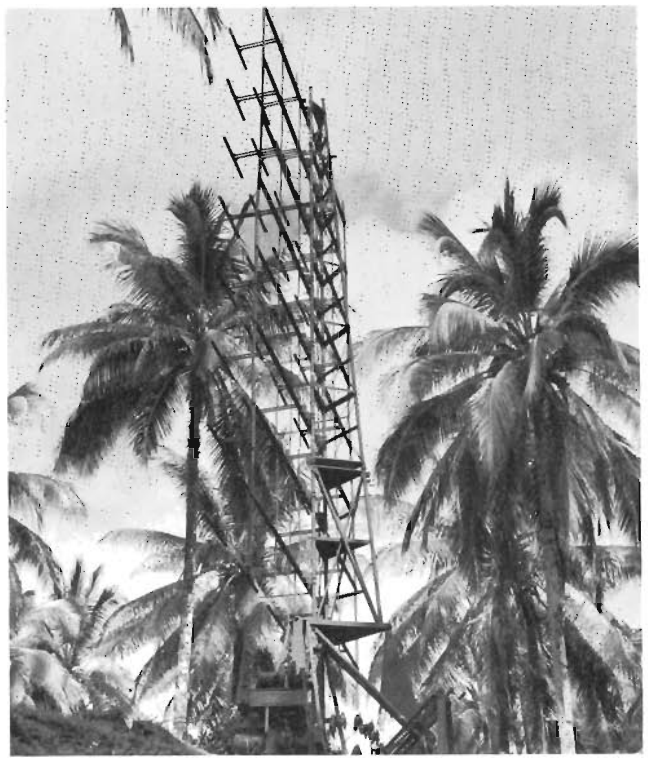


Figure 1. SCR-270 radar.

BG Henry H. Arnold, Assistant Chief of the Air Corps, watched the May 1937 demonstration of the SCR-268 at Fort Monmouth. A short time later MG Oscar Westover, Chief of the Air Corps, along with Secretary of War Woodring and others, watched a similar demonstration. As a result, the Air Corps stated requirements for early warning radars which subsequently were to bear the nomenclature SCR-270 and SCR-271. Further development proceeded on these requests. The SCR-270 (mobile) and the SCR-271 (fixed) were adaptations of the SCR-268, with major modifications for the early warning role. Tests from May through December 1940 proved the mobile SCR-270 and the fixed SCR-271 would work, and production started immediately.

As a result, the United States entered the war with workable, though often maligned, radars in the early warning, searchlight, and heavy anti-aircraft fire control fields.

Like the British, a major problem was to get these new type electronic equipments manufactured, issued, and into operation in the field. With the sudden onset of World War II, great increases in production, allocations of available materials, and a host of attendant difficulties presented tremendous problems; a lack of adequate visualization of requirements and needs in the radar field also manifested itself.

After the beginning of World War II, the Air Corps began evaluating requirements in light of the existing world situation. The result was a deluge of requests for more of existing radar equipment, new radar equipment in the recently developed field of airborne radar, early warning radar with altitude-determining capability, and radar equipment using the new PPI tube for the ground control of interceptor aircraft. This last-minute visualization resulted in requirements incapable of fulfillment; following this,

there was an inundation of requests to modify existing procurement radar programs as emergency measures.

A flood of requests for British equipment for interim use followed, but the British could not spare any radar at the time, and a general clamoring followed which dwarfed the "too little, too late" British radar programs of 1938 and 1939. The net result was reallocation of some SCR-268's for modification and usage, and partial fulfillment of Air Corps demands.

In the field of fire control radars there were several developments. The SCR-547 was a microwave height-finder radar, with which the target was tracked optically, and radar range was converted to altitude for use by a director.

Figure 2. SCR-547 radar height-finder.

The SCR-545 really was two radars in one. A relatively long wavelength radar was used for search and local warning. A microwave radar was used to track a target automatically. An advantage of this set was that a second target could be located while tracking another plane. Production was limited.

The gun-laying radar project, started in 1938, culminated in the SCR-584 which had a microwave radar used for both search and tracking. Automatic tracking in azimuth and elevation was a feature of this set. Tracking in range was by aided manual methods, a feature that paid huge dividends in countering the use of chaff by the enemy. In production by 1943, it saw its baptism of fire in 1944 and produced dramatic results during the V-1 attacks in the United Kingdom. This was the best and most advanced fire control radar to be produced during the war by any of the powers.

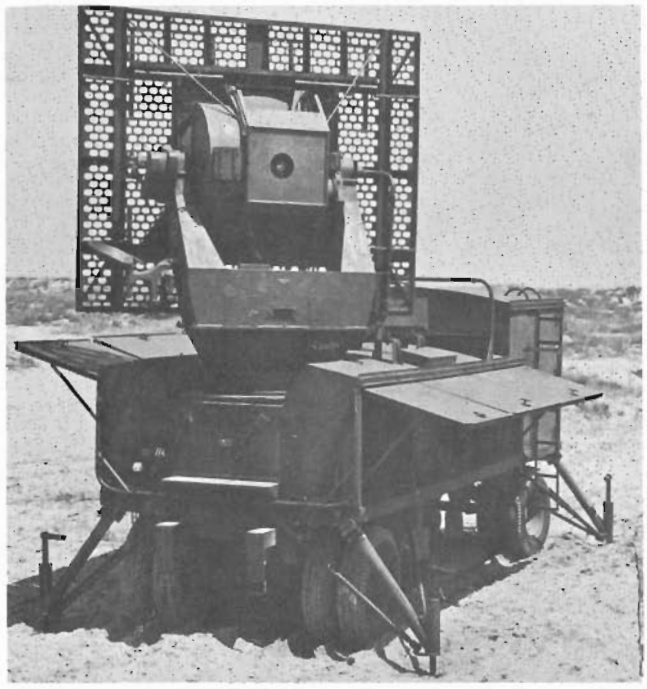


Figure 3. SCR-545 radar.

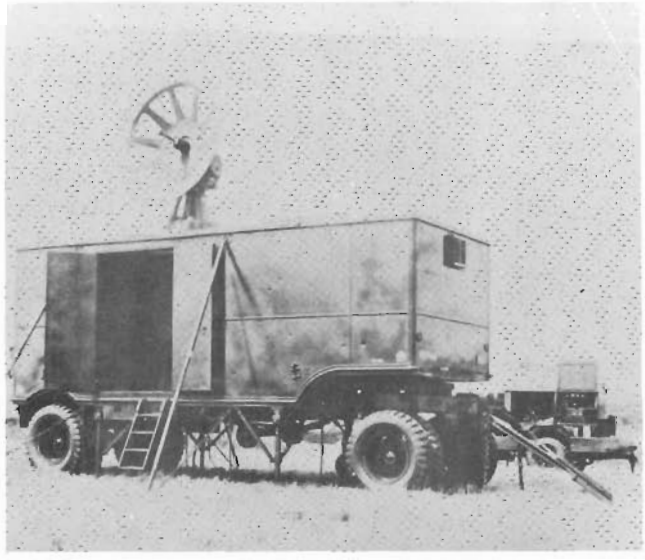


Figure 4. SCR-584 radar, one of major breakthroughs during war.

The SCR-584, with some minor modifications, was used by the Air Force during the war and for many years thereafter. One use was by forward direction posts which could direct fighter bombers to target areas. Another use was made in experiments with the P-38 as a night interdiction bomber, where single planes or flights would be vectored to a target, such as a crossroad. Bombs would be released by the pilot upon voice or radio signal from a ground controller who used bomb release data obtained from a Norden bombsight located in the SCR-584 van.

The period 1943-1945 still found the United States in the process of getting the three basic radars into the field with operating troops. In addition, the requirements for a ground controlled interception radar; an effective (and within the Allied realm), universally usable IFF; and the addition of elevation determination equipment to existing early warning radars occupied the major effort of United States research, development, and production.

A British long-wavelength local warning radar was copied and became the SCR-602. Further improvement, including increasing the frequency, resulted in the AN/TPS-series of United States early warning radars for use by Army antiaircraft units. It was one of these types that, with modifications, eventually became the countermortar radar AN/TPQ.

Another British radar which was copied and improved was the SLC (searchlight control), which was modified and became the SCR-768. A similar United States design, the SCR-668, eventually became the AN/TPL-1. A number of these sets were produced and issued to provide instantaneous searchlight pickup. After it was realized that gun-laying radars made the searchlight obsolete, the project was dropped.

The SCR-270 and SCR-271 early warning radars eventually were superseded by a new, larger, and longer range radar, the AN/CPS-1. This radar operated on microwaves (3,000 MHz) and had a range of 200 miles. The AN/CPS-4, a height-finder radar, was used originally to provide target altitude to sites using the 270 and 271, and was then used to provide height to the MEW (microwave early warning) sets, such as the AN/CPS-1.

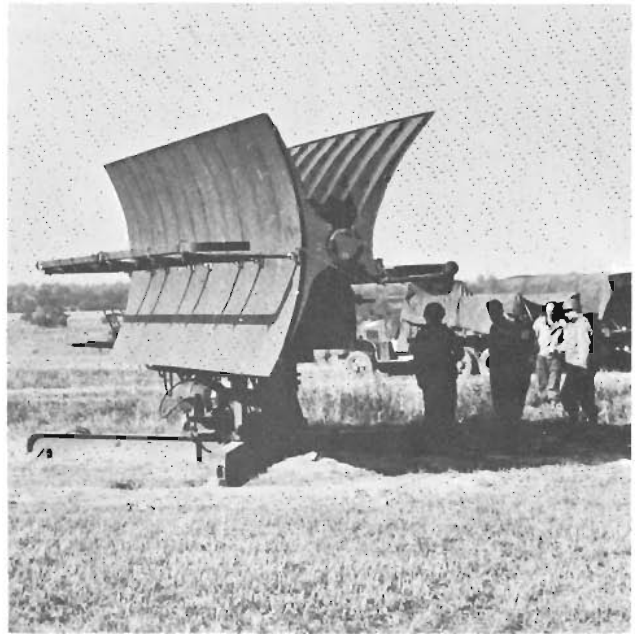


Figure 5. Microwave early warning (MEW) radar, also used for ground control of aircraft.

The first GCI was the SCR-516, an adaptation of the SCR-268; a later model, the SCR-527, was a copy of the British GCI and saw considerable service with United States forces.

The continued use of ECM, plus operational difficulties with fixed echoes, saw the development of a moving target indicator (MTI). One was developed for and installed on the SCR-584 and greatly facilitated the tracking of targets through clutter (fixed echoes). A number of anti-jamming (ECCM) kits were produced and used with the SCR-270, -271, and -268 radars. As new equipment was produced, these attachments or circuitry changes were built into the newer equipment.

The GCI radar (in conjunction with radar-controlled searchlights) made possible the operation of the fighter-searchlight teams. Early warning radars eventually became so effective that air defenses were not the victims of surprise attacks, except those from a low level.

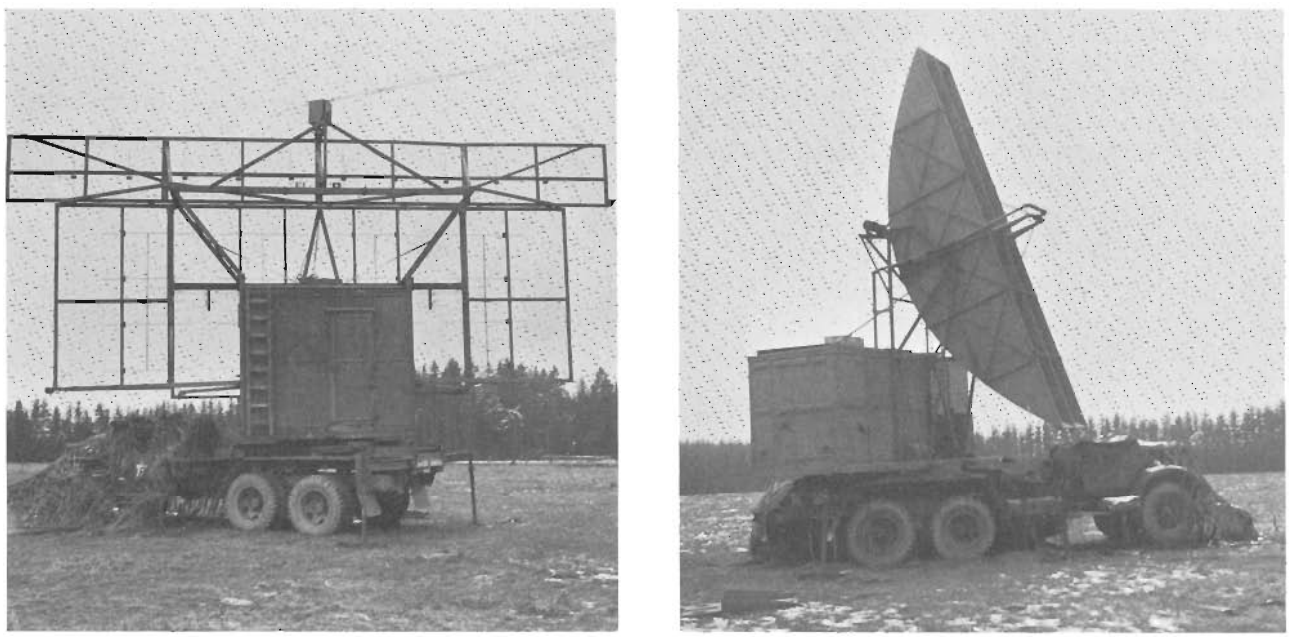


Figure 6. Surveillance radar and nodding height-finder radar together form GCI site.

The first application of radar to bombing techniques was made by the British with an airborne radar called H2S, which was of great value in navigating to and from the target. Accuracy was sufficient to allow bombing against area targets, but it was next to impossible to distinguish industrial targets which were part of a large built-up area. The Americans modified the radar into what was called the H2X, which was an improvement but still did not permit selection of pinpoint targets. Nevertheless, it was used with considerable success in bombing through clouds.

Radio navigational systems devised by the British, known as Gee, Gee-H, and Micro-H, permitted area-type blind bombing within about 200 miles of the ground radio equipment.

Two advantages accrued through the use of blind bombing. The foremost, of course, was that it permitted the bombers to hit the enemy on the high percentage of days when the Continent was obscured by clouds and overcast. An additional important advantage was the loss factor. On days of poor visibility, fighter losses and flak were always much lower than on clear days.

MILPERCEN Revamps ADA Section

(Exclusive Release)
AVN 221-8853

The US Army Military Personnel Center (MILPERCEN) Enlisted Personnel Directorate recently reorganized its Air Defense Artillery Section to provide what SFC John Uffendell, section chief, calls the first opportunity for real career management of enlisted personnel.

The Air Defense Artillery Section has been organized into three teams:

- Team 1 manages all actions involving the 16-series MOS.

- Team 2 manages the 22, 23, 24, 25, 27, 28, 00G, 51S, 52W, and 62P MOS.

- Team 3 — the records maintenance section — keeps the career branch files of air defense artillerymen updated and in order.

SFC Uffendell leads a highly qualified staff ready to help resolve any problems soldiers may have which may not be solved by their unit commander or personnel office. "We take an active interest in each soldier in the Air Defense Artillery," Uffendell said, "We're here to supply a service to the Army: to be available for advice and assistance in helping air defense artillery members plan their careers."

The two management teams are responsible for the career management of their troops from the date of their AIT graduation until they either separate from the service or retire, a system "We think is great!" Uffendell declares.

"Of course, even with the emphasis on long-range coordinated career planning, this still leaves the individual soldier a lot of the responsibility for his future success.

"For instance, we try to select volunteers first to fill our oversea requirements, then make the remaining assignments from other soldiers. If a man doesn't have a current preference statement in his file, we may well be considering sending him some place he is no longer interested in going. Naturally, we sometimes have to fill the requirements based on other criteria, but volunteers have first consideration."

ADA enlisted career managers also give high consideration to education. "Each individual should do everything he can to advance his civilian and military education. A man's selection for NCOES, promotion, or assignment to a position of greater responsibility depends primarily on his demonstrated abilities. One of our tools in gauging his capabilities is education."

Other points to consider are MOS test scores and EER's. "Be sure," SFC Uffendell pointed out, "that the EER includes an accurate job description for the rating period. If you weren't working in your primary MOS, be sure it's explained on the EER. Get a narrative, too, to help us better understand you and your work."

"The files we keep here are career management files (CMF) on senior enlisted NCO's (E-6 — E-9). These differ from the official military personnel file (OMPF), which is kept at Fort Harrison, in that we use our files to make assignments, while Fort Harrison uses the OMPF for Department of the Army board actions, such as promotions. The MILPERCEN career management file contains a copy of the DA Form 20, EER's, MOS test scores, preference statements, an official photo, and personnel actions which will help us assign the right man to the right job at the right time.

"We suggest that each person audit his Form 20 and field 201 file at least once a year. This helps insure that they are kept current and accurate, with all the data they should have, such as schooling completed during that year. We also recommend our EM submit a preference statement at least once a year."

Correspondence to the branch should include the individual's SSN and PMOS. "Many of the queries we receive could have been settled at the unit level," said SFC Uffendell. "Personnel should be sure to check there first. If you still have a problem, let us know. We answer all correspondence."

More information from the career management branch:

• If at all possible, make the time to review your OMPF. Notify the AD section, MILPERCEN, several days in advance of your expected visit.

• Personnel who find themselves in overstrength MOS should strongly consider volunteering for reclassification in another MOS, especially one where they may be able to use some of their past training.

• The current shortage and overage MOS are as follows:

CRITICAL	OVERSTRENGTH
16H (all grades)	16C
16P40	16D
16R40	16J
16Z (E-8)	23W
22L20	27G
23H (all grades)	52W
23Q (all grades)	16Z (E-9)
23U20	
23V (all grades)	
24B40	
24C40	
24E (all grades)	
24G (all grades)	
24K (all grades)	
24M (all grades)	
24N (all grades)	
24Q (all grades)	
24V (all grades)	

• Senior NCO's, especially E-7's and E-8's, are encouraged to seek positions of leadership, particularly first sergeant positions. If you're interested, send a letter to Branch.

• ADA Branch has most of its oversea requirements in Germany and Korea. An attempt is made to mix assignments in long-to-short and short-to-long sequence, but the high number of critical MOS in ADA makes this difficult. Standard turnaround times for the different CMF's are listed in the following table:

Air Defense Artillery Turnaround Time

MOS	GRADE	MONTHS	MOS	GRADE	MONTHS	MOS	GRADE	MONTHS
16B	7	24	24B	7	12	27G	6	24
16C	7	24	24C	7	24	27H	6	24
16D	7	24	24D	7	12	27Z	7	48
16E	6	24	24E	7	24	27Z	8	24
16H	7	24	24F	7	16	28M	7	24
16J	6	24	24G	7	24	28M	8	24
16K	7	24	24H	6	24	34G	6	24
16M	7	24	24J	6	24	46D	6	24
16P	7	24	24K	6	24	00G	7	24
16R	7	24	24M	7	12			
16Z	8	24	24N	7	12			
16Z	9	50	24P	7	24			
22G	6	24	24Q	7	72			
22K	6	24	24U	7	24			
22L	6	24	24V	7	24			
22M	6	24	24V	8	24			
23N	6	24	25D	7	24			
23Q	6	24	25G	7	24			
23S	6	24	25H	6	24			
23T	6	24	25J	7	24			
23U	6	24	25K	7	24			
23V	7	24	25Z	8	24			
23V	8	24	27B	6	24			
23W	7	36	27E	6	24			
23W	8	36	27F	6	24			

Convoy Early Warning

From a study by a team of students attending the 2-44-C22 course consisting of CPT's S. R. Weatherspoon, F. L. Powell, R. Llano, K. Johnson, and 1LT R. M. Schneider.

Since airplanes were first used in warfare, convoys have been ideal targets for airstrikes, and they remain so today.

Because convoys are lucrative targets, this article explains the use of the forward area alerting radar (FAAR) and target alert data display set (TADDS) in alerting convoys to immediate air threats along their routes. The following is confined to the alerting procedures and does not explore the types of countermeasures that might be available to the convoy commander.

Basic assumptions:

- The area of operation could be anywhere in the world in any conflict in which FAAR and TADDS would be employed.

- The FAAR and TADDS will be in the Army inventory, organic to the division, and deployed in the division area in accordance with current doctrine.

- The divisions will have an airspace control element for the coordination of the airspace over the division area.

- All types of convoys have need for early warning of an air threat.

- Strip maps, TADDS overlays, and extract communications electronics operation instructions will be prepared and distributed, as appropriate, at the time convoy personnel receive the predeparture orientation.

The FAAR is a low-altitude, short-range, pulse-doppler radar installed in and on an S443 shelter mounted in an M561 Gama Goat.

Prime power is supplied by a 5-kw generator mounted in an M101A1 trailer pulled by the M561 prime mover.

Communications and radio frequency data link (RFDL) are provided by two AN/VRC-46 radios mounted in the S433 shelter with the FAAR.

The radar is operated by a three-man crew and is capable of 24-hour operation. Even though the radar will not normally operate at night in conjunction with the division air defense battalion, it can be used at night for convoy alerting.

Under present deployment guidelines, the FAAR will be deployed well-forward along low-altitude routes of approach into the division area. They may be emplaced on any terrain with a slope gradient of not more than 10°, and each FAAR should be located far enough from other FAARs to prevent mutual interference yet maintain overlapping coverage and mutual support.

The TADDS display is a 7-square by 7-square matrix (49 squares) which corresponds to the grid squares superimposed on the FAAR control indicator.

The TADDS receives encoded digital data from the FAAR which causes certain events to occur on the TADDS. A warning tone will alert the operator to check the TADDS display. The display will indicate the location of a hostile or unknown aircraft by showing an orange disk in the grid square in which the target is located. A friendly aircraft will be displayed by a green disk. These actions inform the TADDS operator that an aircraft is located at a certain azimuth and range from the radar. If a target previously identified as hostile or unknown indicates an IFF response of friend, the FAAR operator can cancel the previous message with the CLEAR pushbutton, then press the FRIEND pushbutton while the cursor is on the target. The orange disk on the TADDS display will flip to black, and a green disk will be exposed. This shows the TADDS operator that the target has been identified as a friendly aircraft.

Before the TADDS will accept any information, three requirements must be met. First, the proper frequency and address code must be set on the receiver. Second, the TADDS antenna must be extended to a length required for the frequency set. Third, the TADDS antenna and FAAR RFDL antenna must have line of sight between them.

The following information and equipment are required: Primary and alternate frequencies of the FAAR RFDL, RFDL address codes, primary and alternate locations of the FAAR during the time the convoy is on the road, a 1:250,000 map which covers the convoy route, and acetate overlay(s) to the scale of the map and the size of the TADDS.

Should the distance along the route of march be greater than the distance covered by the TADDS, additional overlays must be prepared. The route of march, FAAR operating location(s), and prominent landmarks along the route of march must be plotted on the overlay(s). The TADDS operator must know his location along the route of march to determine his position on the TADDS matrix in respect to the FAAR.

At the start point (SP) of the convoy route, the TADDS operator places the overlay on the TADDS, centering the location of the FAAR that will provide the best early warning at the center of the TADDS, and orients the TADDS to north. He then contacts the FAAR operator and requests test RFDL to insure proper FAAR/TADDS operation. During the time the convoy is on the march, the operator, upon getting an indication of an unknown, hostile, or friendly aircraft, gives voice-tell on the command net to the convoy commander. For example, "Unknown aircraft 2 o'clock, 15 kilometers." At this time the convoy commander makes a determination as to the type of active or passive air defense measures to take. The TADDS operator continues to use the initial FAAR until he reaches a point along the route where another FAAR provides better early warning. At this time the TADDS operator repositions his overlay to position the new FAAR location at the center of the TADDS and relocates himself on the TADDS matrix. The TADDS operator continues in this manner until the convoy reaches its destination or release point.

The TADDS operator designated to report early warning to the convoy commander should be near the head of the convoy. Should there be more than one serial in the convoy, two or more TADDS may be positioned in the convoy. If this is the case, one TADDS operator should be designated primary and the other(s) secondary, tertiary, etc., and each should voice-tell in sequence. This action will require coordination prior to the convoy proceeding from the SP and will reduce use of the command net.

An alternate method of convoy control may place the serial commander(s) in total control and each TADDS would voice-tell to the serial commander(s) after each serial passes the SP. The convoy commander would then monitor the command net and direct the serial commander(s) if required.

Training Extension Course

Captain James H. Graham II
US Army Air Defense School

Training is what today's Army is all about and the combat arms are about to field the latest innovation in the training business — the audio-visual lesson. The program is called TEC — Training Extension Course — and is the most recent venture in service school efforts to assist the soldier in the field to maintain MOS proficiency and the unit commander in discharging his responsibilities for individual training.

The TEC program was conceived at Fort Benning, Georgia, and a pilot program called UTEC (Unit Training Extension Course) was developed, using an audio-visual format (sound slide) by the Infantry School for infantrymen in MOS 11B40. The program was fielded in late 1971 and received such favorable comment that it was expanded to include 8 MOS, two from each of the four combat arms. The two MOS selected for air defense were 16R, Vulcan Crewman, and 16P, Chaparral Crewman, in grades E-1 through E-7.

The unique component of the system is the software design. The instruction is based on a field-validated systems engineering effort that was used to determine *exactly* what tasks the soldier in the field needed to know to perform both as a soldier in a combat environment and as an incumbent in his specific MOS. These tasks were further broken down into three categories — common, branch, and MOS. The common category includes those tasks that are performed by all soldiers. Included are such subjects as first aid, the M16 rifle, and field sanitation. The branch category consists of those tasks performed by personnel in a specific branch, as in the case of air defense: air defense command and control, air defense weapon systems, and air defense wheeled vehicles. The MOS category represents those tasks that are performed by job incumbents only in their specific MOS, such as tuning the Vulcan radar and maintaining the Chaparral main power unit.

The hardware designated for use in the TEC program is the Bessler Cue See teaching machine. The machine is ideally suited for individual use in a learning carrel. It can also be used for group instruction. The main advantage of the Bessler is its capability for either single frame advancement or slow or full motion, all synchronized with the sound track. The unit reproduces both the sound and visual presentation. Instruction received on the Bessler is self-paced, allowing each man to study at his own speed. The machine can be programmed to stop automatically when a question is asked, providing the man as much time as he needs to answer the question. This feature affords instant reinforcement by giving the soldier an immediate answer to his response. The Bessler's portability also permits its use in any reasonable enclosure at the unit level or at a learning center.

Each TEC lesson has two specific applications. One is the individual mode, where the soldier takes individualized instruction to improve his skills and increase his job proficiency. The other is the group mode, where the instruction is presented under the supervision of an officer or NCO. The lesson is accompanied by administrative instructions which consist of a lesson outline (lesson plan) and instructions for follow-on training to be conducted outside the classroom. The follow-on training can be conducted using audio-only instruction for on-site equipment training or the lesson outline may be used to provide guidance for practical exercises that can be developed within the unit's resources.

The lessons are designed using the CISTRAIN (Coordinated Instructional Systems Training) model which teaches the soldier only what he needs to know about the subject. This is done in a unique manner by reversing the normal instruction preparation technique and writing the test first. Once the test has been written, and it has been determined that the student can perform the job if he can perform the test items, then a teaching program is designed to teach only that material which the student needs to know to answer the questions. This reduces the instructional time by about 20 percent because the Bessler machine will not expound on its personal experiences, tell war stories or old jokes, or expand on the instruction by introducing "nice to know" information not essential to job performance.

The determination of what TEC lessons an individual should take can be made by administering a performance test, provided along with the TEC lessons. These tests determine the individual's proficiency at performing the tasks which have been designated critical to acceptable job performance. The questions are keyed to specific TEC lessons that enable the training NCO to evaluate the test results and assign only the necessary lessons to the individual for study. The tests also provide the commander with a tool by which he can determine overall unit skills in specific areas and establish unit training programs to eliminate any deficiencies. Unit training programs would be conducted in the group mode and normally would be considered refresher training for those skills that are critical to maintain at a high level of proficiency but are difficult to maintain in a peace-time environment.

TEC's use for on-the-job training of individuals is unlimited. Utilizing the TEC program to train each individual — at his own speed on a self-paced instructional basis, on his own time or during designated special training periods, only in those areas where he needs further instruction — will assure his achievement of a satisfactory level of performance as a member of the unit and on his annual MOS test. It is as simple as picking up a cassette and playing it; and make-up instruction is just as easy. TEC performance tests will help identify strengths and weaknesses in the individual's performance, but it is incumbent upon the unit commanders and training NCO's to supervise this instruction.

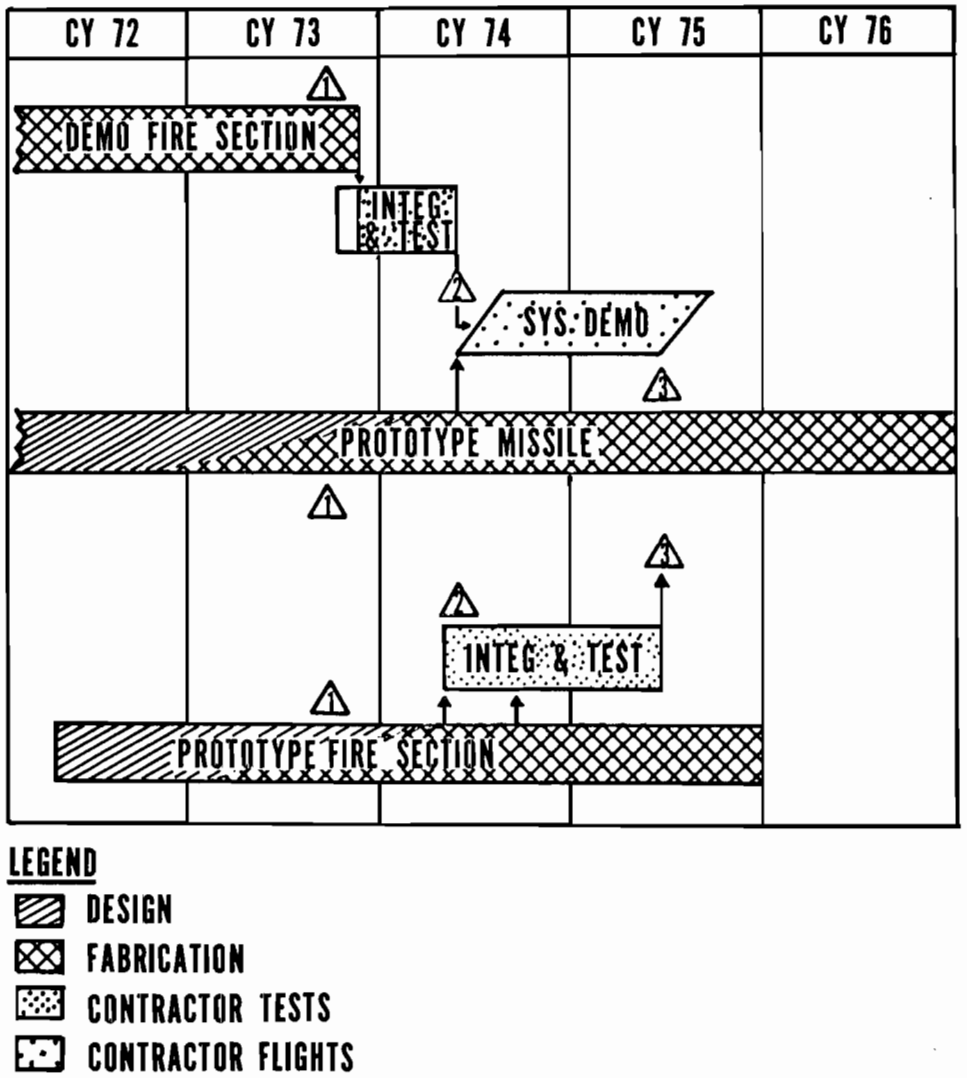
The TEC program works! Each lesson is validated on a cross section of personnel here at the Air Defense School. The target population is the AIT graduate or man who has not been employed in his primary MOS for a while. Each lesson is tested against individuals from this group and is proven before it goes to the field. The TEC program works! Let it work for you!!

SAM-D
Program Status

Lieutenant Colonel Eugene Fox
Office Chief of Staff
Washington

The SAM-D program has been in full scale engineering development (ED) since March 1972. Indicators point to satisfactory progress and a successful development effort. The current SAM-D system configuration should meet the Army's requirements. The next twelve to eighteen months will contain several vital development activities.

The major objectives of the engineering development program are to develop a prototype air defense weapon system and its related technical data package and to demonstrate its acceptability for service use through a comprehensive test program. The chart below portrays an overview of the time-phased development plan.



There are three major hardware developments as shown:

1. Modification of the advanced development fire control group (AD FCG) into a demonstration fire section for use in early flight tests.

2. Design and fabrication of prototype missiles for ground and flight testing.

3. Design, fabrication, and checkout of tactical prototype fire control groups and other system ground support equipment.

Three major program milestone points are shown in the triangles . . . they are tied primarily to demonstrating the system and the concurrent design and fabrication of the prototype equipment.

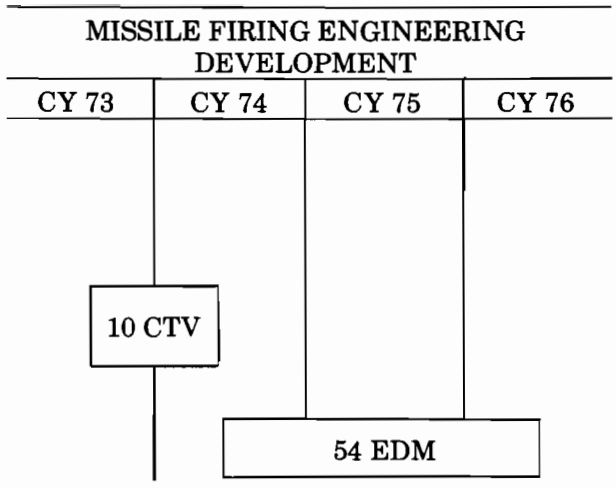
The first year of engineering development has resulted in design and release for fabrication of many components of the system. Testing consisted of: performance measurements of the prototype electronic equipment; additional performance measurements made on the phased array radar in preparation for guided missile firings in 1974; and simulation of engagement performance with actual missile and ground equipment in a test facility. The missile rocket motor has undergone 10 initial static firings all of which were well within the desired test objectives. In addition, at the end of Fiscal Year 1973, the cumulative financial liabilities were at the level planned for and authorized by the Department of Defense.

Fiscal Year 1974 brings a rapid acceleration of hardware testing as hardware fabrication nears completion. Missile firings at White Sands Missile Range to measure aerodynamic control functions are being conducted from November 1973 through April 1974. This portion of the flight test program, composed of 10 controlled test vehicles, is to obtain a measure of missile performance and design characteristic verification prior to utilizing airborne and ground based command guidance equipment. The missile configuration will include engineering development structure, propulsion, controls and autopilot. An on-board programmer will be used to provide command guidance during flight.

Concurrent with these firings there will be manned aircraft tracking tests in conjunction with the necessary missile and ground control equipment checkout in readiness for the May 1974 guided firings. This phase of the captive flight testing sequence will employ an actual engineering development model missile attached to the wing of an aircraft. The demonstration model radar and modified operational software will be used to automatically control the intercept of the missile carrying aircraft and a target aircraft in the White Sands Missile Range environment. Objectives are to evaluate performance of the airborne guidance section, to evaluate the ground based guidance hardware and software that will be used in actual missile firings, to determine any detrimental effects, of the White Sands Missile Range electromagnetic environment, and to increase confidence in satisfactorily completing a guided firing test.

In May 1974 guided firings will begin. The engineering development model (EDM) missile flight test program is the proof of the SAM-D system design. These flight missiles will represent the tactical configuration. The EDM flight program will provide a matrix of tests covering the boundary conditions for system operation, a data base for the simulation program, as well as a verification of system intercepts against a variety of environmental conditions. These conditions include all types of electronic countermeasures (ECM), target maneuvers, formations, clutter, and chaff. These flights will also establish a base for missile flight reliability prediction.

Fiscal Year 1975 ends the initial system demonstration phase. During this period the guidance modes will have been demonstrated along with the fuzing functions using missiles fired against target aircraft at White Sands Missile Range. The final checkout of the prototype ground equipment radar under computer control and the acceptance testing of the prototype launcher will be completed. Prototype missiles will be launched from this tactical prototype launcher during Fiscal Year 1975.



CTV — Control Test Vehicle
EDM — Engineering Development Model

CRITICAL DATES

May 1974 — First EDM flight.
Sep 1974 — First guidance flight w/operational software (flight #5).
First TVM test flight.
Mar 1975 — First fuze test (flight #11).
Mar 1975 — First use of ED launcher (flight #12).

2d Infantry Division Antiair Warfare Tactics Techniques and Concepts

Lieutenant Colonel Buddy G. Beck
Former Commanding Officer
2d Battalion, C/V, 61st Air Defense Artillery

This article describes the latest information from the field on 2d Infantry Division antiair warfare tactics, techniques, and concepts. For several months the 2d Battalion Chaparral/Vulcan, 61st Air Defense Artillery, 2d Infantry Division, tested an antiair package concept for integration of all air defense artillery weapons in the division. The testing culminated in a battalion operational readiness training test that resulted in all units being rated combat ready. The division commander subsequently approved the antiair package concept as division tactical operational policy.

Future battlefield conditions in Korea will require that the 2d Infantry Division maintain the organic capability and readiness to defeat enemy air attacks. With the ever-increasing numbers of aircraft in the aggressor inventory and the high priority of their threat to the division, antiair warfare has taken on an increased significance. There is little doubt that, if hostilities were initiated, the first attack would be from the air. Accordingly, the division must, with its organic antiair weapons, protect its combat power.

The concept of antiair warfare in Korea involves one where enemy aircraft are engaged, as they come into range, with an increasing number of antiair weapons organic to the division. Chaparral, Vulcan, and Redeye units are the primary forward area weapons (FAW) concerned. However, final destruction of any surviving attacking aircraft will be done with each unit's automatic and individual weapons fire. The idea is that the aggressor faces an ever-increasing volume of fire as he approaches our units.

The division subscribes to a concept of an antiair package for forward area antiair protection. This package is a highly flexible combination of Chaparral, Vulcan, and Redeye which can be tailored to best support a variety of missions. The concept calls for employment of one battery from the organic Chaparral/Vulcan (C/V) battalion in direct support of each maneuver brigade and one battery in general support of the division rear. The Chaparral/Vulcan battery commander functions as the brigade antiair warfare officer, and advises the Brigade commander on the best use of organic Redeye and supporting C/V units. Chaparral and Vulcan fire units are cross attached to build a tailored unit that provides the best mix of weapons. Factors considered in tailoring the package are the supported unit's mission, location, and priority for protection, together with fire unit availability, maintenance, and logistic support. Redeye is incorporated into the total defense design to provide coverage for its parent battalion by filling gaps in the Chaparral/Vulcan antiair package in support of the unit.

The concept of maximizing the antiair effect of all weapons in support of maneuver elements, without changing the command and logistical support arrangements, is the key to successful formation of antiair packages. Accordingly, Redeye sections in the division remain under command of the maneuver and field artillery battalions. This is the original concept for employment and has several inherent advantages in that it tasks the commander with the responsibility for training, maintenance, and support of a specialized system. This responsibility for tactical proficiency of the Redeye section enhances the commander's awareness of the impact of enemy air activity on his operational capability.

The divisional C/V battalion is charged with monitoring the Redeye program. The mission is assigned to the airspace control element (ACE) which operates under the staff supervision of the ACofS, G3. Weekly unannounced division Redeye readiness exercises have proven to be invaluable in improving the quality of training and readiness. The division's 13 Redeye sections are composed of 58 teams. Each section is tested quarterly by an ADA team. Much command attention is gained through this program. These unique exercises begin by notification through command channels from the division tactical operations center (DTOC) to the battalion whose section is to be tested. The entire Redeye section is directed to report to an assembly area within 2 hours plus travel time. At the assembly area the section leader is given a situation that paints a realistic setting for the employment of Redeye. He must conduct a map reconnaissance, design a real-world defense, and deploy all of his teams. Evaluation consists of complete inspection of all TOE equipment and a test of personnel on aircraft recognition, use of communications-electronics operation instructions (CEOI), knowledge of rules of engagement, and Redeye system tactical proficiency. Each team is evaluated on its ability to read maps, select and prepare firing positions, camouflage, communicate, and operate with the Redeye weapon. Results of all inspections are given directly to the division commander.

The antiair package concept provides maneuver elements with a formidable antiair capability. The division gives priority for distribution to combat power maneuver elements. This is a deviation from suggested point and area defense design taught in the classical manner. Credibility for this priority is gained by reviewing the minutes of the Middle East war (1967) where it was unmistakably proven that tactical aircraft with modern weapons are extremely effective in destroying tanks, mechanized vehicles, and artillery. Further, once these critical combat power elements are defeated, air defense of main supply routes, airfields, bridges, etc., is of little or no value.

The success of the 2d Infantry Division antiair package is in many ways directly related to the

successful techniques of employing organic FAW communications equipment. Three elements of critical antiair information are passed to all weapon systems with minimum delay by using the C/V battalion's organic communication capability and a technique of collocating command post and fire units.

Air defense intelligence generated by the sector air defense commander is disseminated to the 38th Air Defense Artillery Brigade, the senior air defense headquarters in Korea, and its command posts. The Chaparral/Vulcan battalion positions a liaison officer with the nearest Hawk battalion command post (CP). He immediately retransmits this intelligence information over the AM air defense air intelligence net. This net is monitored simultaneously by the ACE of the DTOC, the Chaparral/Vulcan battalion antiair CP, and each Chaparral and Vulcan battery antiair CP that is collocated with its respective brigade tactical operations center. Each battery CP retransmits the data over the battery command net, which is monitored by the platoon CP's and every Chaparral and Vulcan fire unit. If the Redeye section headquarters is collocated with the battery, the section leader will monitor the Chaparral/Vulcan battery command net and disseminate the information to his teams.

This communications network is backed up by the system whereby the ACE, having monitored the air defense intelligence net, passes the information to the G3 Air who transmits it over the AM TOC net to each division brigade. Each brigade, in turn, retransmits the information over the brigade command net to the Redeye section headquarters. The final retransmission occurs as the section leader passes the information to the Redeye teams.

In summary, the 2d Infantry Division recognizes that without adequate antiair protection in any future conflict, it would invite a battlefield disaster. Consequently, a well-coordinated package of organic FAW systems has been designed so that it affords maximum flexibility in tailoring organic assets to give the best combination of antiair support for the division scheme of maneuver.

RECOMMENDED AIR DEFENSE PRIORITIES

1. NUCLEAR CAPABLE DELIVERY UNITS
2. DIVISION COMBAT POWER (ARMOR/MECH BNS)
3. FIELD ARTILLERY BATTALIONS
4. CRITICAL POINTS
   - A. DIVISION HEADQUARTERS
   - B. DIVISION AIRFIELD
   - C. DISCOM
   - D. BRIDGES
   - E. SECTIONS OF MSR'S

Editor's Note. The Trends is an excellent forum to have articles published, such as the one you have just read, that deal with ideas and concepts either implemented or not in the field of how air defense assets may be or are employed. If you have comment concerning LTC Beck's article or if you would like to have your own ideas of weapon employment published, please send us your thoughts for future articles.

Viewpoints From The Field

This article contains comments from the field considered to be of value to stimulate thought among Air Defense Artillery units in general. The comments are examples of viewpoints based on day-to-day operations and real-world problems. We strongly encourage replies to the current article. We also desire field units to submit for publication their own ideas and viewpoints.

Chaparral/Vulcan with the Mechanized Infantry Division

As a unit with the primary mission of general support (GS) to the division, we are involved in an unusual amount of training with all the division maneuver elements. Not only do we conduct our own firing and field training exercises, we participate with the armor, infantry, and field artillery battalions and the armored cavalry squadron during their training tests. We also participate in brigade and division exercises.

During the last 8 months, we have been studying and analyzing the adequacy of the organization and equipment of the battalion to perform its mission and the employment doctrine in FM 44-3, "ADA Employment, C/V," dated April 1968. Concerning the battalion organization, our study involving the rationale for devising the present organization was based on the concept of an area-type defense for Chaparral and point defense for Vulcan. Little or no consideration was given to the requirement to execute support-type missions for divisional combat and combat support elements.

Since deployment to the field, the battalion missions have been, to a large extent, support-type missions rather than providing area or point defense. In short, the battalion assets primarily are supporting the maneuver brigades, nuclear delivery units, and the armored cavalry squadron. Normally, a composite C/V battery will have as its priority the brigade, or the battery may be placed in direct support (DS) of a brigade. The composite battery's fire units still perform the traditional point defense and area coverage; however, it must be accomplished normally within the brigade zone of action or sector. Under these conditions, we have an inadequate number of fire units to perform the area coverage and selected point target defenses for the entire division. The traditional four firing battery battalion cannot completely or efficiently provide air defense for the division.

This fact has been recognized in the organization of the divisional engineer battalion. The engineer battalion personnel strength is 1,002 and it is organized with five line companies and a mission-capable headquarters company. The strength and organization of the engineer battalion enable it to provide adequate support to all divisional elements. The divisional ADA battalion, consisting of 590 personnel and 4 firing batteries, is spread too thin when attempting to support three brigades, the division command post, the division support command, and nuclear capable delivery units in division artillery.

Admittedly, when organic assets are not sufficient, additional resources can be requested from corps. However, the mission discussed above seems to be gaining acceptance in other divisions and corps assets will be depleted early. A logical solution is to increase the size of the battalion to four Vulcan batteries and two Chaparral batteries (Previous example was the organization of the six firing battery Nike Hercules battalion for employment in Korea).

The lack of appropriate mobility and communications equipment in the firing batteries for command and control is another problem. The commanders and platoon leaders in the firing batteries urgently need combat mechanized vehicles and communications equipment to be as mobile as the supported unit. Under the present organization, the battery commander in the Chaparral/Vulcan units and the Chaparral executive officer and platoon leaders do not have an armored personnel carrier (APC) to provide cross-country mobility or to provide an adequate vehicle for command and control. By contrast, each platoon leader and the executive officer of Vulcan batteries are assigned an APC.

In my view, and based on my experience with the mechanized infantry and armor battalions, the Chaparral and Vulcan battery commander, executive officers, and platoon leaders should have a tracked command post vehicle for mobility, swim capability, and command and control. Further, the flexibility and mobility required for Chaparral/Vulcan units to respond to changing air defense priorities make it imperative that command and control vehicles be as mobile as the fire units. Additionally, the vehicles to transport ammunition should be on tracks for cross-country mobility. Here, the mechanized ammunition carrier would serve this purpose.

In the area of communications, we find it difficult to follow the doctrine as listed in chapter 6, FM 44-3. The Chaparral and Vulcan batteries are not equipped to operate and monitor the nets as listed in paragraph 6-5, FM 44-3. The battery commander's and executive officer's vehicle (¼-ton) is equipped with a VRC-47 radio.

The platoon leaders' vehicles (APC) in the Vulcan batteries and the Chaparral platoon leaders' vehicles (¼-ton) are also equipped with VRC-47 radios. None of these radios enables the battery officers to follow the doctrine as listed in paragraph 6-5, FM 44-3.

We have discovered during our FTX's that the leapfrog concept using Chaparral to provide convoy air defense is not workable. Basically, the speed of the vehicles in a mechanized convoy makes it nearly impossible for Chaparral to pass other mechanized vehicles on barely improved roads. We have determined that Chaparral must be positioned throughout the convoy for effective coverage and defense. This is not the best solution since Chaparral must stop before firing.

Note. The items suggested for change and/or improvement are being staffed within the Air Defense School.

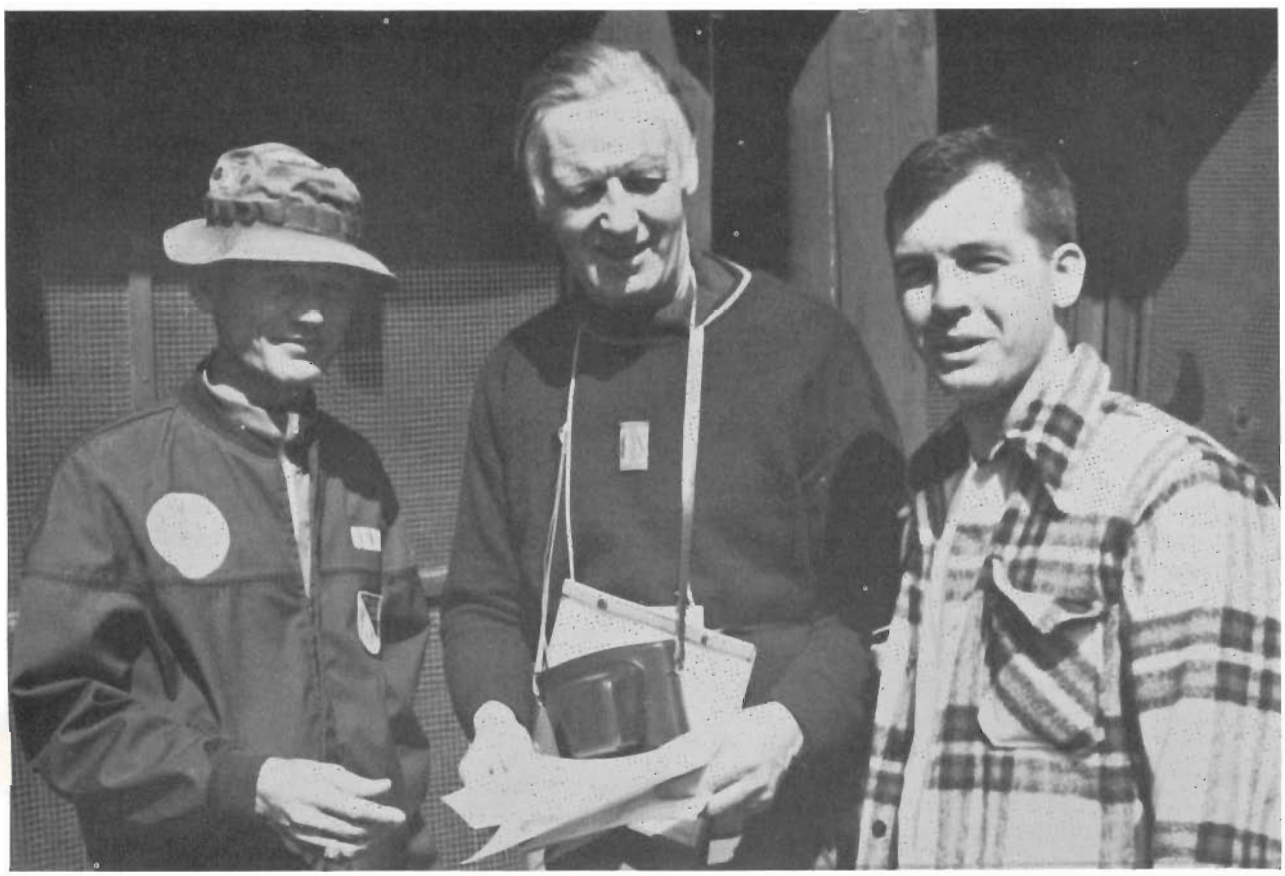
Orienteering

(Where the Winners Are)

Captain Don Devlin

Editor's Note:

Captain Don Devlin, Air Defense Artillery, recently coached orienteering at the University of Dayton with outstanding success. Captain Devlin was the Assistant PMS at the University of Dayton from 1971 to 1973. He obtained his Master of Business Administration there in 1973. Captain Devlin led his team to sweeping victories in every major orienteering event. The University of Dayton took first place team honors at the North American Team Championships in the school year 1972 - 1973. The team also captured first in collegiate and ROTC team categories in the Spring Orienteering Festival of 1973. The author suggests orienteering as a prime opportunity for air defense units to provide public service via orienteering clinics for Explorer Scouts, Boy and Girl Scouts, and other interested community groups. He correctly describes orienteering as a recreational sport of international prominence and a military skill that develops physical fitness and stimulates mental alertness.



Captain Devlin (right) with Bjorn Kjellstrom, Swedish ski champion (center), and Jack Dyess professor at Ohio University and President of the US Orienteering Federation.

Man has always sought to penetrate the unknown. In his approach to that goal he wants to know exactly where he is located in time and space. The art of navigation relates this need to know to a scientific procedure. Navigational aids vary from the complex electronic computers and optic systems to the human computer and human eye. The human computer is the most complex of all systems, so it is readily understandable that, given a compass, map, and timepiece, the human can logically determine his position at any given moment. This ability is an extremely important part of the equation for successful orienteering. The other important parts of that orienteering equation are stamina and speed.

What is orienteering? There are those that liken the sport to driving in a road rally - without bucket seats, without four on the floor, and without a separate navigator. Some compare orienteering to cross-country track or cross-country skiing, except without skis. There is a major difference though, because in cross-country track or skiing you follow a course that is laid out for you and you race against time. Orienteering requires you to move as quickly as possible to all target points, and to record the coordinates of each point. In orienteering you race against time, but *you* must plan your course and find your check points. The skill with which you are able to do these things plays the major part in how successful you are in orienteering competition.

Probably the single individual who has done more to make orienteering a growing sport of international significance is Bjorn Kjellstrom. Kjellstrom, a Swedish cross-country ski champ, has worked internationally to help increase the interest in orienteering. He originated the sport in Sweden in 1918. Today every child in Sweden's grammar school system is trained in the sport of orienteering. Kjellstrom also developed the Kjellstrom compass, a familiar tool to hikers. Evidently the Swedish people feel that the benefits of map reading, use of compass, and physical stamina are important to the education of their young. Orienteering does it all.

As should be expected when entering a new sport, some problems were encountered in developing our orienteering team. When the orienteering club gathered in August, we agreed upon our objective. Our objective was that in 45 days each person would be able to jog for 90 minutes and sprint for five 2-minute sprints with a 1-minute rest between each sprint. The idea was that jogging would benefit the heart and lungs while sprinting would strengthen the legs. The goal was excessive; only 4 members out of 30 completed the schedule. As with goal setting in general, morale of the club dropped because success seemed too distant for many. The goals would have made sense for a 90-day period except that many young people were in such poor condition they were disheartened at the outset.

After we were physically ready to orienteer, little coaching was needed. The Cadet Rangers, the heart and soul of the Dayton Orienteering Club, needed only the fundamentals of orienteering route choice selection since basic map reading was part of the ROTC program of instruction.

Officials prepare master maps.

Runners copy checkpoints from master maps, select their own routes, check map and compass, and start running.

Each competitor needs a sequence or plan to follow while competing. This is the sequence we decided to use:

1. Know where you are, exactly!

2. Look for the most level route from you to the next point. (To ascend 25 feet in elevation requires the same effort as 100 meters horizontally.)

3. Look for the simplest route; i.e., readily recognizable terrain or manmade target points; use the fewest stops possible to check one's position. In fact, the ability to do this while running is crucial to placing high in competition. Stopping at checkpoints while figuring steps, directions, and routes to the next checkpoint can obviously cost valuable time.

4. Pick the best surface; roads and paths are five times better than woods while open fields are two times better than woods.

5. Use identifiable target points and practice aiming for the next one. Don't run off area shown on the map.

6. Always compute pace distance while running.

Probably a greater understanding of running techniques suitable for orienteering can be obtained from the United States Marine Physical Fitness Academy at Quantico, Virginia. One of the main points the Academy emphasizes is how uninhibitedly grade schoolers run. Relax and hang loose; simply run. Don't smoke. Brush your teeth and rinse your mouth several times before running; you don't want foreign matter or saliva to hamper breathing. Learn to sprint up inclines and jog ridges and roads.

To prepare for navigating, any group of two or more students should use the following two exercises:

The first is to have one person run through the woods with the group in pursuit; then, stopping abruptly, require each person to point out his location on the map. This technique was also suggested by the Marine Physical Fitness Academy.

The second exercise can be accomplished with one energetic coach, or a coach and one good orienteerer. It is simply a series of one and two point courses.

Step 1. Describe a target point to the group of individuals.

Step 2. Get them started.

Step 3. Collect the group at the target point and conduct an informal critique. Continue as before; follow a successful one-point course with a two-point course exercise holding the critique at the second point.

Make orienteering fun.

- Don't try to prove that you're a better man to a group of students.
- Offer rewards and promote social interaction at the conclusion of exercises.
- Don't spoil the outdoor fun by overfatiguing students. Use common sense.
- Don't doubt people — they always win.

As for the University of Dayton's success, I went along as the "bus driver" and watched some great young people win it all. They coached themselves.

Military Personnel Notes

New Leave Form

Within the next few months a new leave form (DA Form 31) will replace the current DA Form 31 (Aug 65 edition). Concurrently, with the implementation of the new leave form morning report entries now required for leave will be discontinued. Likewise the requirement to sign "out" and "in" on the personnel register (DA Form 647) will be discontinued. The new DA Form 31 will be self-contained; that is, it will provide space for registering departure and return dates together with any extensions granted. Change 8 to AR 630-5 will contain the detailed instructions for preparation and use of the new leave form. Implementation date will be announced as soon as possible.

Personnel Accounting Activities

US Army Military Personnel Accounting Activities (MILPAC's) I, III, V, and VI have been established at Fort Meade, Fort McPherson, Fort Sam Houston, and the Presidio of San Francisco, respectively.

These MILPAC's are subordinate to the US Army Military Personnel Center and are servicing Base Operating System (BASOPS), Personnel Management and Account Card Processors (PERMACAP), and Standard Installation/Division Personnel System (SIDPERS) organizations/personnel as well as those units that continue to submit morning reports direct to MILPAC's.

Specifically, the mission of each MILPAC is to:

- Collect, audit, and maintain Active Army personnel and organization data from personnel sections and designated installations for meeting requirements of HQ DA.
- Conduct training at divisions and installations in preparation for reporting under SIDPERS.

Each MILPAC is now providing service within the same geographical boundaries that applied to the former CONUS Army AG Military Personnel Accounting Branch at the same installation. Data processing activity codes for MILPAC I, III, V, and VI are A, C, D, and F, respectively.

Conus Assignment Preferences for Enlisted Personnel

The next change to AR 680-29 will revise CONUS assignment preferences and the codes that are maintained on the enlisted master file (EMF), SIDPERS personnel file, and DA Form 20 or 2. The revision realines preferences with CONUSA reorganization and provides additional choices such as United States (less Alaska and Hawaii), several major cities, Army Readiness Regions, ROTC Regions, specific brigades or regiments, and CONUS-based divisions and corps. Preference codes on the EMF and SIDPERS personnel file were automatically converted to the revised code structure at the end of October 1973. In a few cases where preferences were deleted, the conversion will automatically select others in the revised code structure — for example, recruiting duty in the 3d US Army area, without specific location, will be converted to Fort Jackson, South Carolina, because of the recruiting district location. US Army Military Personnel Center (MILPERCEN) will provide detailed information and guidance for the individual soldier and the DA Form 20 or 2 custodian soon.

New Personnel Qualification Records

The methods for recording personnel qualifications and data are undergoing major change within the Army. Present editions of enlisted and officer qualification records (DA Forms 20 and 66) will be replaced by a new two-part record applying to all military personnel.

Part I (DA Form 2) is automated under SIDPERS and produced quarterly with copies for the individual's personnel records, personnel staff NCO, unit of assignment, and each member of the service. For designated enlisted personnel, MILPERCEN copies of DA Form 2 will be computer prepared from the HQ DA Enlisted Master File.

Part II (DA Form 2-1) reflects other essential and/or historical information not available or retained in the SIDPERS data base. It is assembled as a continuous feed form for limited automation at reception stations. Military personnel offices will manually prepare and maintain DA Form 2-1 in essentially the same manner as current qualification records. Duplicate copies will not be furnished HQ DA for officers.

Reports of change (DA Form 2876) will be eliminated for enlisted personnel.

Governing directive will be AR 640-2-1, Personnel Qualification Records. The regulation should be available in the field by 1 October 1973 and will become effective upon notification by HQ DA.

Command Personnel Management Inspections

Background

In early 1969 the Department of the Army established the requirement for command personnel management inspection (CPMI) teams. Since January 1970, CPMI teams have been inspecting military personnel offices, and other activities having personnel management responsibilities, at least annually. As a result of CPMI's, commanders have been much better informed about the kind of personnel service support provided their troops. Reports made by US Army Audit Agency and Department of the Army personnel management teams substantiate improvements brought about by CPMI team visits and the resulting command interest.

Inspecting the System — Not the Troops

CPMI's are conducted using standardized inspection procedures. They take a random sample of records and reports based on the population served by the military personnel office. Qualification records are reviewed with the individual because it is his record and he is the best source of information. Various personnel systems such as promotion system, Army casualty system, personnel accounting and data reporting system, as well as the automatic data processing support system provided by PERMACAP, BASOPS, or SIDPERS, are also checked. Additionally, personnel readiness files, suspense cards or rosters, and enlisted and officer evaluation procedures all are given a thorough going over.

New CPMI Standards

A standard scoring system is used and these scores are converted into a rating of "Excellent," "Satisfactory," or "Unsatisfactory." All pertinent information concerning the inspected unit is placed in a standard format and forwarded to the major commander concerned for his information and corrective action required. Comments relating to excellent as well as inadequate performances in the personnel support system (PSS) are included in the narrative part of the CPMI report.

Commanders need to know who is doing exceptionally good work as well as who needs to make improvements. The Commanding General, US Army Military Personnel Center, also has a need to know personnel support and service problems in order to start corrective actions.

Revised standards for conducting CPMI are contained in AR 600-61 (CPMI) which was distributed to the field late in 1973. The CPMI handbook, DA Pamphlet 600-7, which simplifies policy guidance contained in AR 600-61, has been completely revised and should now be in the hands of field units.

Officer Record Briefs

The Officer Record Brief (ORB) is produced from information maintained on the automated Officer Master File (OMF) at US Army Military Personnel Center. It is used as a personnel management tool by the officer career branches and other DA agencies, to include DA selection boards. It is a preprinted form which displays most of the data contained on DA Form 66.

During calendar year 1972 a preliminary audit of data on the ORB's was conducted by individual officers (with their personnel officer's assistance) who were given the opportunity to review their briefs in conjunction with the field copy of DA Form 66. Changes or corrections, as required, were annotated on the ORB and annotated briefs returned to HQ DA. In most cases changes and corrections were processed to the Office Master File and revised ORB's were furnished to the respective career branches.

A mandatory annual audit of the ORB's began in July 1973. Under this program ORB's are being forwarded for audit by the individual officer during the anniversary month of his date of birth.

The annual audit will include all commissioned and warrant officers except recent accessions whose DA Form 66 information has not been added to the Officer Master File at the time ORB's are produced. Initially, it will exclude general officers whose ORB's are currently being audited on an accelerated schedule.

Instructions for conduct of the audit are included in Change 1 to AR 640-2, Personnel Records and Identification of Individuals, Qualification Records, and Management Data Reporting.

Enlisted Record Briefs

AR 640-10 provides that units may obtain Enlisted Record Briefs (ERB's) to aid in reconstructing lost military personnel records jackets (MPRJ's). Requests for these ERB's received in MILPERCEN are computer processed on Fridays and mailed to units the following Wednesday. This limits minimum turnaround time to 7 days after receipt of requests. Requests may be made by message (CDRMILPERCEN ALEX VA/ / DAPC-PSS-E) or letter (CDR MILPERCEN, ATTN: DAPC-PSS-E, Alexandria, VA 22332). Be sure to include the solider's SSN and first 10 positions of last name.

New Qualification Records

The Army-wide conversion of DA Forms 20 and 66 (Enlisted and Officer Qualification Records) to a consolidated, two-part personnel qualification record (DA Forms 2 and 2-1) began January 1, 1974. The conversion timetable spans a 10-month period, with the new forms being phased in on a grade and MOS series basis.

1 Jan	—	28 Feb 74	COL, LTC, E-9, E-8
1 Mar	—	15 Apr 74	MAJ, E-7
16 Apr	—	30 Jun 74	CPT, E-6, and E-5 on E-6 promotion list
1 Jul	—	31 Jul 74	1Lt, 2Lt, E-1 through E-5 in special categories MOS series
1 Aug	—	31 Aug 74	WO (all grades)
1 Aug	—	31 Oct 74	All other enlisted (by MOS career groups O through 99)

Converting over an extended period of time will permit an orderly transition and provide better distribution of the administrative workload at the local level. Those installations already operating under the Standard Installation/Division Personnel System (SIDPERS) will prepare computerized DA Forms 2. Installations not operating under SIDPERS will use MILPERCEN-produced DA Forms 2 and be responsible for manually maintaining the forms until SIDPERS is established at their location, validating all entries on the records and submitting corrections through normal channels.

Records will not be converted for troops with separation dates scheduled during CY 1974 unless they are reenlisting. Personnel offices at the losing installations will be responsible for converting records for personnel on PCS, TDY, leave, or in transit during the conversion period. DA Form 208 (Court Martial Convictions) will be used in conjunction with DA Forms 2 and 2-1 to prepare the Basic Qualification Record for enlisted members.

Personnel offices receiving records with DA Forms 2 and 2-1 before they receive the governing regulation (AR 640-2-1) are urged to contact MILPERCEN (Mr. Samuel B. Morris, AUTOVON 221-0509 or 221-0593) for further instructions. Additional details will be announced in a future DA circular.

Change in Rating System

Deletion of the conduct and efficiency ratings from the enlisted personnel DA Form 20 became official 15 Sep 73. Conduct and efficiency ratings have been used primarily to determine eligibility for the Good Conduct Medal and the different types of discharges. The reason for the change was the frequent conflict between the conduct and efficiency rating and the enlisted evaluation report. Both systems judged an individual's duty performance for the same period of time, but often the rater reported different scores; for example, the serviceman might receive "excellent-excellent" conduct and efficiency ratings, but only "good" ratings for the same period covered by the EER. Enlisted personnel will now be rated only by time periods on the EER instead of both conduct and efficiency and EER assessments. Where the words "conduct" or "efficiency" appear on the DA Form 20, they will be lined through and replaced with "BP YR/MO" (beginning period, year, month). Good Conduct Medals will still be awarded as directed, based on an individual's performance, but without reference to the conduct and efficiency rating previously entered on the DA Form 20.

Air Defense Briefs

New Training Target
(For Chaparral, Vulcan, and Redeye)

A recognized need for a realistic yet economical training target for Chaparral, Vulcan, and Redeye aerial tracking practice has resulted in fabrication and testing of a model radio controlled (RC) airplane. Here is a report on procedures and lessons learned by testing units and what is "in the mill" concerning availability of the model plane to units concerned.

In a test by The Air Defense Artillery (ADA) Training Brigade, Fort Bliss, a 1/10 scale model aircraft was used. The plane was flown through all types of aircraft maneuvers in winds gusting to 15 mph. Flights of 15 minutes duration were performed. Tracking courses presented varied from straight and level to challenging inflight maneuvers.

The ADA Training Brigade test revealed: 15 minutes flight time is available before refueling; aircraft maneuvers can range from challenging to the gunner to impossible to track; instructors can rapidly change flight paths; gunner training time is increased because targets can be flown at close-in training areas; and by replacing manned target aircraft with model aircraft substantial monetary savings can be achieved.

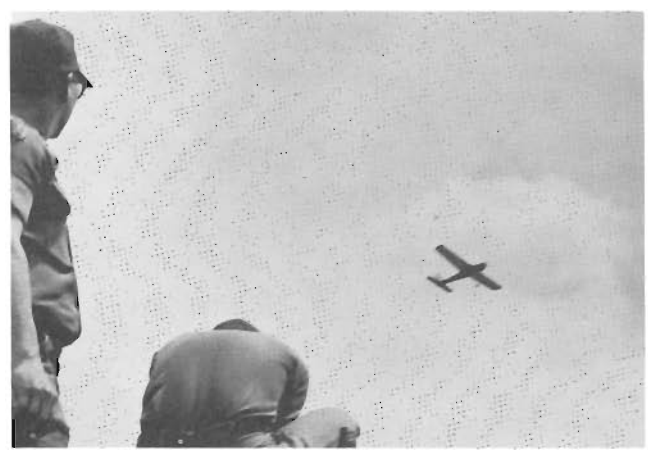
Conclusions reached by The ADA Training Brigade indicate that the model aircraft target is highly effective, responsive, realistic, and economical.

In a test by the 4th Battalion (C/V) (SF), 61st Air Defense Artillery, Fort Carson, Colorado, a model aircraft similar in size, power, and design to that employed by The ADA Training Brigade was used.

The RC model used at Fort Carson begins takeoff from dirt road.

Essentially the same test procedures were exercised by both testing units. The 4th of the 61st, however, made two modifications to improve lock on. A strip of aluminum foil was fastened to each wing for Vulcan practice and a highway flare was attached below one wing for Redeye practice.

Testing by the 4th of the 61st revealed results similar to those of The ADA Training Brigade plus certain other findings: The target aircraft can be tracked at ranges up to 600 meters; at ranges less than 20 meters the plane, depending on throttle setting, can easily exceed the tracking rate of both Chaparral and Vulcan, and the gunner is provided a realistic comparison to a confrontation with high-speed combat aircraft at close range.



A Vulcan tracks the model target aircraft.

Conclusions reached by the 4th of the 61st parallel those reached by The ADA Training Brigade regarding realistic qualities and cost effectiveness. Other observations point out that the plane facilitates progressive training of gunners by advancing from simple, slow aerial maneuvers to fast, complex maneuvers. Ballistic aerial target simulator (BATS) and actual aircraft cannot provide this valuable quality. Maintenance of the RC airplane is simple and inexpensive. Pilot training is expected to require 8 to 10 hours. A "buddy box" would improve training, allowing the student pilot more "stick time" without increasing the risk of crashing the plane.

The airplanes and necessary equipment are expected to be manufactured by commercial producers. When planes and equipment are ready for purchase, units would be allowed to make purchases from the contractor of their choice through local procurement. It is expected that specific funding procedures will have been determined and kits will be available for purchase in the near future.

Improved Hawk
(Current Status of Development)

The Improved Hawk (IH) now entering the inventory represents a significant step forward in the air defense capability of the Army in the field. The IH system has been, and continues to be, rigorously tested to insure that the equipment fulfills the specified requirements. The system underwent extensive testing during initial production test conducted by the Air Defense Board at Fort Bliss, May - July 1972.

During the next few months the system was subjected to an initial operational test and evaluation, an in-process review, and a special missile reliability verification test (RVT). The RVT was completed prior to system deployment, culminating in five successful firings of field-handled missiles, and conclusively demonstrated IH missile field reliability. Other identified system problem areas had final or interim solutions applied, with engineering analysis continuing to provide final solutions where feasible. Consequently, and in accordance with the recommendations of the IPR, IH was successfully deployed to Europe with the 2d Bn, 62d ADA of the 32d Army Air Defense Command (AADCOM). A second battalion underwent training in Europe for its deployment as an IH unit. A recommendation of the IOTE was that additional operational testing of the IH system was required. DA approved that recommendation and assigned testing responsibility to the Army's Operational Test and Evaluation Agency (OTEA) at Fort Belvoir. Plans called for OTEA, assisted by representatives from the Air Defense School, to conduct an operational evaluation in Europe with elements of the 32d AADCOM beginning in June 1973. This evaluation focused on operational aspects of the IH system, including TOE and training adequacy, and utilized results of both air defense and field training exercises. Other scheduled tests and evaluations included the Tropic Zone phase of the service test conducted by the Air Defense Board in Panama; preliminary engineering analysis of a digital moving target indicator (DMTI) for the improved pulse acquisition radar (IPAR) which was scheduled for evaluation at White Sands Missile Range during June and July 1973; initial investigations into replacing the present modulator-oscillator of the improved continuous-wave acquisition radar (ICWAR) with a more reliable, higher powered, tunable klystron; and a systems operations/firing doctrine (SYSOPS/FIDOC) study conducted under the auspices of the Air Defense School which is designed to maximize system performance through the use of optimum firing doctrine. This SYSOPS/FIDOC study is a three-phase effort; Phase I was a subjective quantification of the recommended system operations and firing doctrine for the conventional IH battery and was scheduled to end with the preparation of a draft field manual the 4th quarter, FY 73. Phase II will validate the results of Phase 1 including the IH operational program and doctrine for the improved assault fire unit (IAFU). Phase III is scheduled to commence during FY 75, upon completion of Phase II, and will be essentially a program to monitor and update SYSOPS/FIDOC throughout the IH system life cycle.

In October 1973, the improved platoon command post (IPCP) was shipped to the Arctic Test Center for storage preparatory to Arctic testing, including missile firings, in January and February 1974. The IPCP is designed to provide selected conventional IH batteries with a deployment flexibility, by fielding autonomous improved assault fire units (IAFU), similar to that

provided by the assault fire command console (AFCC) of Basic Hawk, but with several notable differences: the IPCP contains the same automatic data processor, Mark XII IFF, and battery terminal equipment as the IH system, and also contains a completely new firing console known as a tactical display and engagement control console and automated software routines which appear to offer truly outstanding command and fire control capabilities for the IAFU.

Countersurveillance (essentially active and passive camouflage, disguise, and deception) is getting a fresh look for Improved Hawk because of a proposed required operational capability (PROC) document for IH countersurveillance staffed at HQ, AMC, prior to forwarding by HQ, TRADOC, to DA for approval. This PROC covers the total countersurveillance spectrum from passive camouflage methods and material to convoy disguise and active and passive decoys. When approved, the required operational capability will replace the existing DA approved small development requirement (SDR) for Hawk camouflage.

Incentives for Enlisted Redeye Personnel

Enlisted personnel assigned to Redeye positions have been given an added challenge since they are expected to remain proficient in their primary MOS fields while assuming the additional duties and responsibilities involved in Redeye operations. This compounding of duties and responsibilities requires a dedicated, intelligent, and mature individual. For example, the Redeye gunner is expected to be able to identify a multitude of different types of aircraft as either friendly or hostile and then decide whether to engage or not engage based upon that identification. The crucial point is that the Redeye gunner receives no additional compensation, monetary or otherwise, for these increased duties/responsibilities. Furthermore, the Redeye gunner finds that his time is divided between his primary MOS skills, which may provide compensation for superior performance, and Redeye duties which do not. Even though dedicated to his Redeye duties, there can be little doubt as to where the man will place his priority of effort.

What can be offered to qualified enlisted personnel to have them seek Redeye positions and to remain in them? The first of these might be advanced promotions or grade authorizations which would allow promotions as soon as normal promotion criteria are met. This alternative would be an inducement only so long as other personnel having the same MOS and not performing Redeye duties do not receive advanced promotions or promotions without regard to vacancy. At the same time it would cause problems upon his reaching a grade and experience level which would make him otherwise eligible for grade E-7. At this point he would be competing with other soldiers of the same MOS who were better qualified in that MOS due to constant association.

Another alternative might be the authorization of special privileges or special insignia or items of uniform, etc., coupled with additional emphasis by recruiting personnel. Probably none of these tidbits is sufficient in itself to properly motivate and/or retain personnel, but it could greatly enhance other motivation techniques.

A third alternative could be awarding superior performance pay for Redeye personnel in Redeye positions. The pay would be in addition to any primary MOS performance pay that the man might already be getting. The individual would thus be motivated to excel or at least remain proficient in both his primary MOS and the Redeye field, with the possibility of rewards in both areas. There would be no imbalance in the rank structure because the proficiency pay would be independent of rank.

This discussion is not all-inclusive, but it is not intended that it be considered a complete answer to the problem. Rather, it is intended to stimulate some thought toward possible solutions to an inequitable situation faced by the enlisted men assigned Redeye positions.

European FAW Procurement

Three European all-weather forward-area air defense systems are being studied by the Department of Defense (DOD) to verify claims of American manufacturers that any of the three can be produced for US inventory within the next few years. The systems being studied are Crotale (France), Roland (West Germany/France), and Rapier/Blindfire (England). All three have been tested by the US Army. An Army study group has established the need for an all-weather system in the Chaparral surface-to-air missile class, and answers to various questions are being sought. One of the questions to be resolved is: which if any of the three European systems will best serve US Army re-

quirements? Another is: will the adoption of one of the European systems, as opposed to development of an American system, in fact, save three years in production time as some claim?

Recently the United States joined with the United Kingdom in conducting further tests of the Rapier/Blindfire system. Firings were conducted at the Aberporth, Wales, Air Defense Range and later in Australia. Rapier is capable of tracking targets during adverse weather conditions employing a differential tracking radar. The complete system includes the acquisition radar, computer, command transmitter, and launcher with four ready missiles, along with the Blindfire target tracking system. Rapier testing is connected with our NATO "assignment" of studying air-to-air missile systems to keep pace with the accelerated advancement evident in this particular classification of armament.

Rapier/Blindfire system

In the most recent test of the Roland system in the United States, six out of seven missiles were successfully launched and all test objectives were met. Roland II is a vehicle-mounted, all-weather missile system that defends troops and installations against low-flying aircraft. Hughes Aircraft Company and the Boeing Company, Seattle, have a license agreement for production of the system in the United States. In the test, conducted at the Army Missile Command, Redstone Arsenal, Alabama, and Fort Bliss, Texas, more than 600 passes were flown by airborne targets ranging from hedgehopping helicopters to supersonic F-111 fighter bombers. The Roland system was required to track the targets either optically or by radar, under varying weather and in severe ECM environments.

Crotale, one of the newest air defense systems to enter production, has been designed specifically to meet the challenge of low-altitude attack by the most modern fighter class aircraft. Crotale, an all-weather system, consists of two main units, the acquisition unit and the firing unit, both vehicle-mounted. The effectiveness of high- and medium-altitude air defense systems in driving the threat down to the very low-level avenues of approach has added new significance to low-altitude systems such as Crotale, Roland, and Rapier.

If studies confirm the opinion held by some that one of the European systems should be procured, there will be no conflict between currently used air defense systems and whichever all-weather system is adopted.

Redeye Launch Simulator

With the deployment of the Redeye weapon system, the Marine Corps' Fleet Marine Force (FMF) had its first man-transportable, shoulder-fired Air Defense System. This system was designed to provide protection for front line troops against attack by low-altitude aircraft. Like any new weapon system, once it was fielded, a new era of training requirements and equipment was ushered in. In addition to the normal classroom training requirements, two new training devices were developed by the US Army to train the Redeye gunner. The first device was the tracking head trainer, a full-scale model of the Redeye system, identical in weight, size, position of controls, and handling characteristics. The tracking head trainer performed all of the firing functions of the Redeye except launching a missile. Additionally, a moving target simulator was developed. The two devices, when used in conjunction with each other, provide the trainee gunner with experience in tracking synthetic targets in a variety of environments.

Subsequent to the fielding of these training devices, the Marine Corps commenced an extensive field evaluation to test the deployment concepts of the Lightweight Air Defense System (Redeye). One of the objectives of this evaluation was to determine the adequacy of Redeye training aids. It was noted during the course of the evaluation that certain shortcomings existed relative to Redeye tracking training and apprehension on the part of the Redeye gunner to fire live ordnance. These two shortcomings were instrumental in the Marine Corps submitting a statement of work for producing a Redeye Launch Simulator (RELS). The Atlantic Research Corporation proposed three design concept variations for such a training system. The variation selected for production represented the most complete Redeye simulator. This new training device included the use of an expended Redeye launcher, a Redeye seeker section, and a dummy-eject only missile. The system was designed to provide the trainee gunner with an actual aircraft acquisition capability and a capability to launch the eject only missile. The combination of these two capabilities, being implemented into one device, provided the Marine Corps with a dynamic training aid that would be applicable to both the student Redeye gunner and for periodic refresher training of the Marine Redeye gunner in the FMF. Further, it enables the Marine Corps to program more realism into its field exercises for the Redeye platoon as relates to the exercising of deployment and command and control concepts; and provides the gunner the opportunity to engage live tactical aircraft.

The RELS system since its initial inception has undergone extensive testing and evaluation by the US Army and Marine Corps; and will be fielded by both services in the near future. The austere funding situation faced by the military today precludes providing each Redeye trainee/gunner an opportunity to fire a live round. The RELS system does provide the opportunity to fire a semi-live weapon round and at the same time increase the individual's knowledge and operating proficiency with the Redeye. Additionally, troop tests conducted utilizing the RELS system prior to firing Redeye have indicated that gunner apprehension diminished and the confidence level in using the Redeye weapon system increased.

Quadrant Bullet Counter Test

Babcock Electronics Corporation recently tested a quadrant bullet counter as a possible air defense gun scoring device. The device is mounted on the target and senses projectiles as they pass the target. Information as to the number of bullets passing within the effective radius of the counter and the direction of each from the center of the target (ahead, behind, high, low) is transmitted automatically for evaluation to a recording device located on the firing line.

Three tests were conducted. The first test consisted of firing .50 caliber bullets, single shot, at a counter attached to a stationary target at 60 yards range. No hits were recorded and it was tentatively determined that the cross sectional area of a .50 caliber bullet was too small to activate the counter. The second test used the same target/counter setup but substituted the 20-mm Vulcan for the .50 caliber. Hits were recorded in all four quadrants. For the third test the counter was mounted on the wingtip of a Firebee drone flying at a range of about 600 yards from the firing line. The first Firebee test was unsatisfactory because of spurious signals from the drone activating the counter. A filter was installed to eliminate the undesired signals and a second test produced satisfactory results.

These tests demonstrated that development of an electronic sensor for scoring air defense gun training firings was feasible. Additional development may produce a device that will relieve Vulcan annual service practice from dependence on visual line and lead observers for scoring.

Self-Paced Instruction

The Ground Guidance Division, High Altitude Missile Department, has phased-in self-paced individualized instruction for the Radar Signal Simulator Maintenance Course (MOS 24Q30). This resident course was selected for transition to self-paced instruction as a pilot program. The course lectures and laboratory presentations were reviewed and adapted for audio-visual packaged programs to be used in conjunction with programmed texts, workbooks, and functional schematics. One class in Radar Signal Simulator Maintenance graduated after having completed their instruction thirty days prior to the scheduled resident course completion date. The conduct of instruction for this class included every concept and program of self-paced instruction that Ground Guidance Division has developed to date.

The students were initially exposed to standard platform and laboratory instruction; however, their course advancement was based entirely on examination results and the students' personal assessment of material retention. During the last two annexes of the course, the students were exposed to those self-paced programs that have been completed. During this portion of the course, student retention of material increased and accelerated course progress was experienced. The introduction of self-paced instruction has verified its learning effectiveness in addition to providing a very cost effective means of education. The early graduation of the foregoing class provided a cost savings of $2,350 per student. A marked reduction of training time and early return of qualified radar signal simulator maintenance technicians to field duty will be more fully realized in the future.

Mark XII IFF

Manufactured by Hazeltine, the Mark XII identification system resulted from recognition by the Joint Services of the need for a rapid, positive and secure identification system. Design and development of this system started in 1957 and service tests and comprehensive evaluations are still in progress. Preparations are being made, and equipment is being installed, at the Air Defense School to develop courses in organizational maintenance training on Mark XII equipment used with Nike and Hawk weapon systems.

Mark XII is a cryptosecure identification system that is capable of identifying friendly aircraft with a high degree of accuracy. It consists of Mark X IFF (SIF) equipment plus a cryptographic mode of operation that has been added to achieve the secure identification function. It has been designed to fulfill the requirements of and be compatible with all data processing and fire distribution equipment of our air defense environment and the strategic and tactical needs of all services.

System security is achieved by incorporating cryptographic coding of the interrogation and response with periodic changes of this key code relationship. Interrogation consists of a 32-pulse word whose pulse content changes in a random manner from one interrogation to the next. The response consists of a group of three coded pulses coded to appear at any of 16 positions, with different delay positions possible in the response to succeeding interrogations. A code key, together with computing operations, is used at the interrogator and the responder (transponder) to determine the correct reply to each challenge. The identification of friendly targets is based on the fact that only friendly transponders set with the correct key code can return the specified number of correct replies in the fraction of a second allocated for identification. Each coded challenge is immediately preceded by a special synchronizing pulse group. In conjunction with suitable transponder circuitry this sync pattern permits Mark XII transponders to reply only to cryptographic interrogations rather than to noise or interfering signals.

The Mark XII system was specifically designed to prevent compromise by an enemy who may know everything about the system except the code for the specified period. Provisions for the automatic or manual destruction of code key information are an integral part of each system. Thus, if a system were actually captured, the Mark XII system could be useful to an enemy only until the end of the then current code key period.

Although some problems remain in the interface of the Mark XII with the Nike system, this equipment offers an effective means for satisfying operational requirements for a positive, secure, rapid, and reliable identification system.

TACOS

The tactical air defense battle may now be simulated more efficiently by use of improved, large scale computers. Although this concept is not new, it is certainly an improvement over the older method.

The computer model TACOS (Tactical Air Defense Computer Simulation) has undergone recent modifications that speed up the simulation and also improve the reality. The modification that saves the most time is the Quick Reaction Scenario Generator, or QRSG. This submodel generates the deployment of air defense systems, provides each with coverage of a designated quality, develops an enemy air attack against the area and the air defense, as well as associating terrain masking between air defense sites and enemy aircraft. The submodel saves computer time on approximately an 8:1 ratio over the older, more detailed procedures.

Other available modifications are antiradiation missile (ARM) provisions. They include radiation turn-off or decoy turn-on. The turn-off was developed as a procedure to study ARM tactics. It is designed to examine the possible defense response to an incoming ARM. After it has been determined that an ARM has been launched, the simulation schedules a time for turning off doctrinally specified radars. The turn-off of the radar will occur only if the site is not engaging critical targets and/or it does not have enough radar decoys to keep its probability of survival at a required level. The radars turn back on after impact of the ARM.

The simulation of decoys is closely associated with the radar turnoff. When the ARM is launched it heads for the radiation source. This source may be composed of any number of decoy radars and one real radar. The ARM has some probability of choosing a real radar from the source. On impact a kill may be assessed against a decoy, the real radar, or neither.

The TACOS air defense model has been in existence for approximately seven years and is a primary tool for air defense studies being conducted by the Studies and Concepts Division of the Office of the Deputy Commandant for Combat and Training Developments at the Air Defense School.

Postscripts

NATO Air Defense Now Operational Throughout Europe

With the handing over of the last four sites in the eastern Mediterranean, the $300 million NATO Air Defense Ground Environment (NADGE) computerized air defense system is now operational throughout NATO. This was disclosed in London by Robert S. Reed, president of Nadgeco Ltd., the United Kingdom-based consortium of international electronic companies responsible for the design and installation of the 3,000-mile system defending NATO territory from above the Arctic Circle to Asia Minor.

A ceremony in Athens marked acceptance by the Greek government from the contractors of the final site — the 84th to become operational. Earlier, a key eastern mediterranean site in Turkey was handed over to complete that country's network.

In March 1973 Nadgeco announced that NADGE was fully operational in western Europe. With the eastern Mediterranean now integrated into the total NADGE system, NATO has the best large-scale air defense system in the world. This has been achieved with only a modest increase in cost despite exploding inflation, considerable industrial unrest during the implementation stage, and some significant additions and changes to the program.

NADGE illustrates what can be achieved by NATO and industry working together. The lessons learned and experience gained can be used in future projects for both common defense and nondefense objectives.

Phoenix Tests End With World Record

The Navy's F-14 Tomcat Fighter mounting a Phoenix missile under each wing.

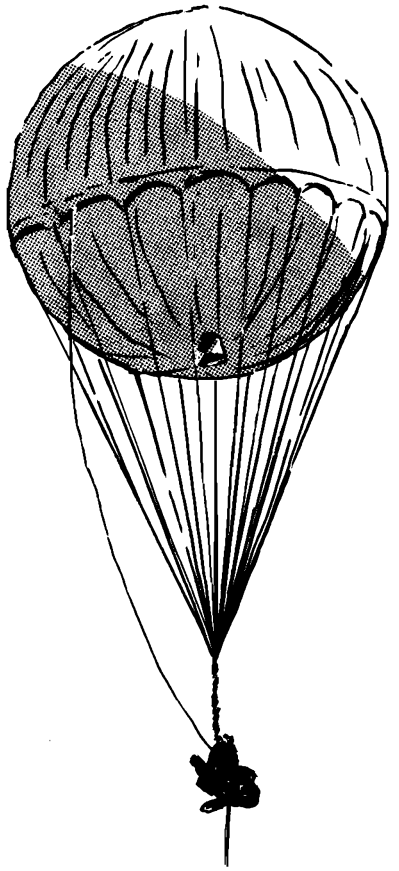
Contractor testing of the US Navy's Phoenix missile has been concluded with an extra-long-range launch that set a world's record — a hit on a target 110 nautical (126 statute) miles away. Hughes Aircraft Company, which builds the missile system, conducted the test. The missile was launched from a Grumman F-14 Tomcat fighter at the Navy's Pacific Missile Range, Point Mugu, California, against a tiny supersonic jet drone that tried to jam the missile's radar. During flight, the Phoenix reached a high point in its trajectory of more than 100,000 feet — also a record — and then passed the drone within the lethal distance of the missile's warhead. The launch simulated a typical defensive intercept of an attacking high-altitude enemy bomber.

The target, a BQM-34E Firebee drone augmented by radar signal to look as large as a bomber and equipped with an on-off blinking noise jammer, approached at an altitude of 52,000 feet and a speed of Mach 1.55. The F-14, flying at 45,000 feet and Mach 1.45, began tracking at very long range, locked on, and launched a single Phoenix at 110 nautical miles.

A total of 56 Phoenix missiles have been launched from various aircraft during the contractor test phase of the program. Of these, 43 were scored as hits for an over-all success rate of 77 percent. The success rate for the 17 Phoenix missiles launched from the F-14 is 88 percent.

Only a few additional tests need to be completed by Navy crews prior to fleet introduction of the weapon aboard the F-14 at the Naval Air Station, Miramar, California, where two F-14 squadrons were recently activated.

First ICM—Just A Paper Balloon



Details have just been published of the most secret and unusual weapon of World War II. Japan released 9,300 paper balloons to drift across the Pacific and bomb the North American Continent.

The Smithsonian Institute in Washington released the information to the public for the first time, almost 30 years after the first balloon was launched in November 1944.

Never before had the United States been attacked directly from an enemy shore. These balloons were the first truly intercontinental missiles. Of these, 285 carried antipersonnel and incendiary bombs and caused incidents from Alaska to Mexico. A few reached as far inland as Iowa, more than halfway across the United States.

The military significance of the bomb balloons was negligible, with only six people being killed. The psychological impact, however, was considerable and caused much anxiety and uncertainty. Large numbers of men, radars, and fighter aircraft were tied up in countermeasure activities. The most serious incident involved the electrical power supply for the atomic station at Hanford, Washington. Power was interrupted for 3 days at this station where the explosive material for the third atomic bomb was being produced.

The "Fu-Go Weapons"—"Fu" being the first syllable of the Japanese word "fusen" (balloon) were originated as a reprisal for General Doolittle's 1942 raid on Tokyo. The Fu Go attack came to a decisive end, even though 1,000 balloons were ready for launching, because B-29 raids on Japan disrupted the large supplies of hydrogen gas required for inflation. The balloons had to be kept in the prevailing westerly jet stream at about 35,000 feet altitude to achieve their flight over the Pacific for 2½ days.

The design of the paper balloon was ingenious. When the hydrogen gas expanded during the heat of the day, it escaped through a release valve (standard ballooning practice). However, when the balloon cooled at night and began to

lose height, a unique system of four barometers automatically released small paper ballast bags filled with sand. Thus, the balloon's altitude was maintained. When all the bags had been released, the incendiary and antipersonnel bombs were dropped. Then a fuze kit exploded a charge of picric acid which destroyed the balloon.

Only a relatively small fraction of the total number of balloons caused incidents so the campaign was a military failure — but interesting.

German Antishipping Missile

Two Messerschmitt-Bolkow-Blohm Kormoran air-to-surface antishipping missiles recently scored hits when fired at a target ship facing the attacking aircraft head-on at maximum range. The missiles, which were fired from an operational German Air Force Lockheed F-104G over a test area off the French coast at Biscarrosse, did not carry warheads.

Six NATO Countries Select TOW

Two more NATO nations, Luxembourg and Denmark, have selected the US Army's TOW missile system for their armed forces. Thus far, six NATO countries and Iran have ordered the antitank weapon for their infantry forces. The NATO nations are the United States, Germany, Italy, The Netherlands, Luxembourg, and Denmark.

TOW Helicopter Sight

This first gyrostabilized sight developed by Hughes Aircraft Company for the Huey Cobra helicopter for firing TOW missiles has been delivered to Textron's Bell Helicopter Company. In operation, the gunner simply holds his target in the sight crosshair and presses a trigger to launch a TOW missile. The missile then automatically follows the gunner's line of sight and impacts on the spot on which the crosshair is sighted. Hughes, under contract to Bell, will build nine TOW/Cobra systems. Flight testing is being conducted at the US Army's Yuma Proving Grounds. Technician holds the gunner's TOW launch control unit.

Air Force Airborne Warning and Control System

A $6.15 million contract has been awarded Hughes Aircraft Company's space and communications group to build audio distribution systems for 707-type jet aircraft being developed for the US Air Force Airborne Warning and Control System (AWACS). The long-range jets carrying the ADS systems will serve as mobile command and control centers to manage the conduct of air warfare.

The Boeing Company, prime contractor to the Air Force for the AWACS program, selected Hughes in a competition for the multimillion dollar award. The contract calls for production of seven systems to be delivered to Boeing beginning in 1974.

The new audio intercommunications equipment is an outgrowth of the advanced development work performed for the military aircraft field both internally and under Air Force sponsorship. The system, which is extremely lightweight and requires very low power for operation, will feature use of advanced electronic devices, including metal oxide semiconductor and large scale integration technology. System engineering and circuit development will be conducted at the space group's facility in El Segundo, California. System manufacturing will be performed by the Hughes microelectronics products division in nearby Newport Beach.

US Bases in Australia Come Under Attack—Politically

Elements within the Socialist left wing of the Australian Labor Party are expressing their disapproval of US policy in Southeast Asia by pressuring leaders of Australia's new Labor Party to close down strategically important US satellite control facilities located in their country.

As a peaceful but effective means of alerting the US against a surprise USSR or People's Republic of China land-based missile attack, the US has maintained, with the agreement of the Australian government, several military facilities in Australia. The US satellite control facilities at Pine Gap and Nurrungar are two of the more important of these bases. The continuance of these and other US bases in Australia have become major political issues by the Labor Party.

US-imposed secrecy surrounding Pine Gap and the Nurrungar sites has prompted speculation in the Australian press that these facilities have offensive-weapon missions.

The facts are: Pine Gap is located near Alice Springs in central Australia and provides control signals and readout from a US early warning satellite over the Indian Ocean that watches for a surprise USSR land-based missile attack. The Pine Gap facility construction began in 1966 and the site became operational in 1969.

The Nurrungar facility is located in south-central Australia near Woomera approximately 600 miles southeast of Pine Gap. This facility receives photos transmitted from reconnaissance satellites shortly after each spacecraft passes over the People's Republic of China. Construction of the Nurrungar base began in 1969 and the base became operational in 1971.

Other US facilities in Australia besides Pine Gap and Nurrungar have come under fire from some members of the Labor Party. The US Navy's large communications station at North West Cape and the announced plans to install an Omega global radio navigation facility near Deniliquin in southeast Australia are becoming major political issues within the government.

The US Navy's facility serves primarily to provide very low frequency (VLF) communications to Polaris/Poseidon submarines. This US facility was constructed under terms of an agreement signed with the Australian government in 1963. Provision for the use of this facility by the Royal Australian Navy for as much as 6 hours a day had been made by agreement with the US.

At a recent conference, the Australian Labor Party adopted a platform that called for the elimination of foreign-owned, controlled, and operated bases and facilities in Australian territory. The platform called for taking the wraps off the Pine Gap and Nurrungar facilities to the extent of having the Federal Parliament inform the public of the general purpose and possible consequences of these operations on Australian soil. Australian Labor Party members stated that there was a growing concern that these US stations might be considered prime Russian targets in event of thermonuclear war.

The previous Australian government, in referring to the Pine Gap and Nurrungar facilities,

would only comment that the two stations were, "space communications facilities."

In commenting on the importance of the US bases at Pine Gap and Nurrungar, some Washington military authorities have stated that their loss would handicap the US early warning and reconnaissance satellite programs but not cripple them. The function of the Pine Gap facility is essentially duplicated by one on Guam. Dual facilities are provided to assure a reliable link between the US and early warning satellites stationed over the Indian Ocean to monitor Soviet land-based missile sites.

The loss of Nurrungar would require the US to reduce the frequency at which it presently conducts full search-and-find satellite reconnaissance missions over China.

The current uproar concerning the US facilities in Australia is not expected to result in any major effect on the present operations of these sites.

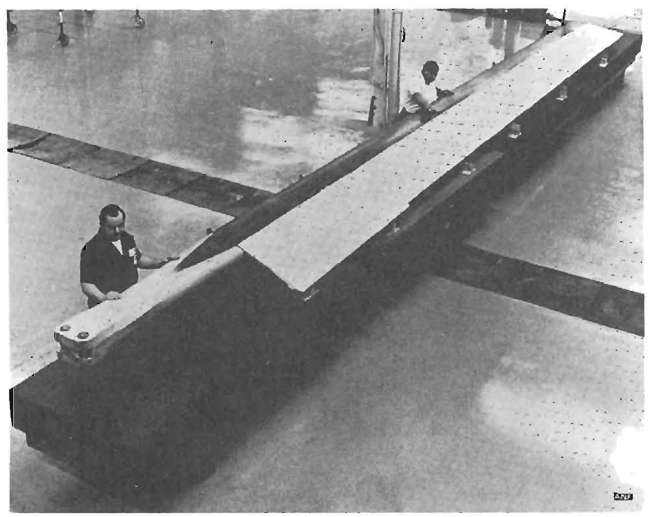
The Australian Defense Minister, Lance Barnard, did disclose that the US had agreed to allow members of the Federal Parliament to be given special access to the Pine Gap and Nurrungar stations and that the Australian people may be informed of the purpose of all military installations on Australian soil, "in due course."

Prime Minister E. G. Whitlam told a Victoria Labor Party meeting that the government did not have a mandate to remove the US bases. "We never told the people at the elections that we would disclose other people's secrets. We never told the people we would break treaties. We never got a mandate to do this," Whitlam said.

Australian Labor Party leaders in the State of Victoria have been the most vocal in their opposition to the presence of US bases in Australia and can be expected to be heard from again at election time.

Heavy Slicer

This huge blade will take a heavy slice of air when it, along with seven more just like it, lifts the Army's XCH-62 Heavy Lift Helicopter prototype (ADT, Sep 73). The 41.5-foot blade will weigh 750 pounds in its flight configuration. Boeing Vertol Company is contractor for development of the XCH-62, which will have a payload capacity up to 35 tons, several tons more than previously reported. It will be capable of transporting all logistical containers that are forecast for military/commercial use as well as a majority of the tactical equipment items in the Army inventory.



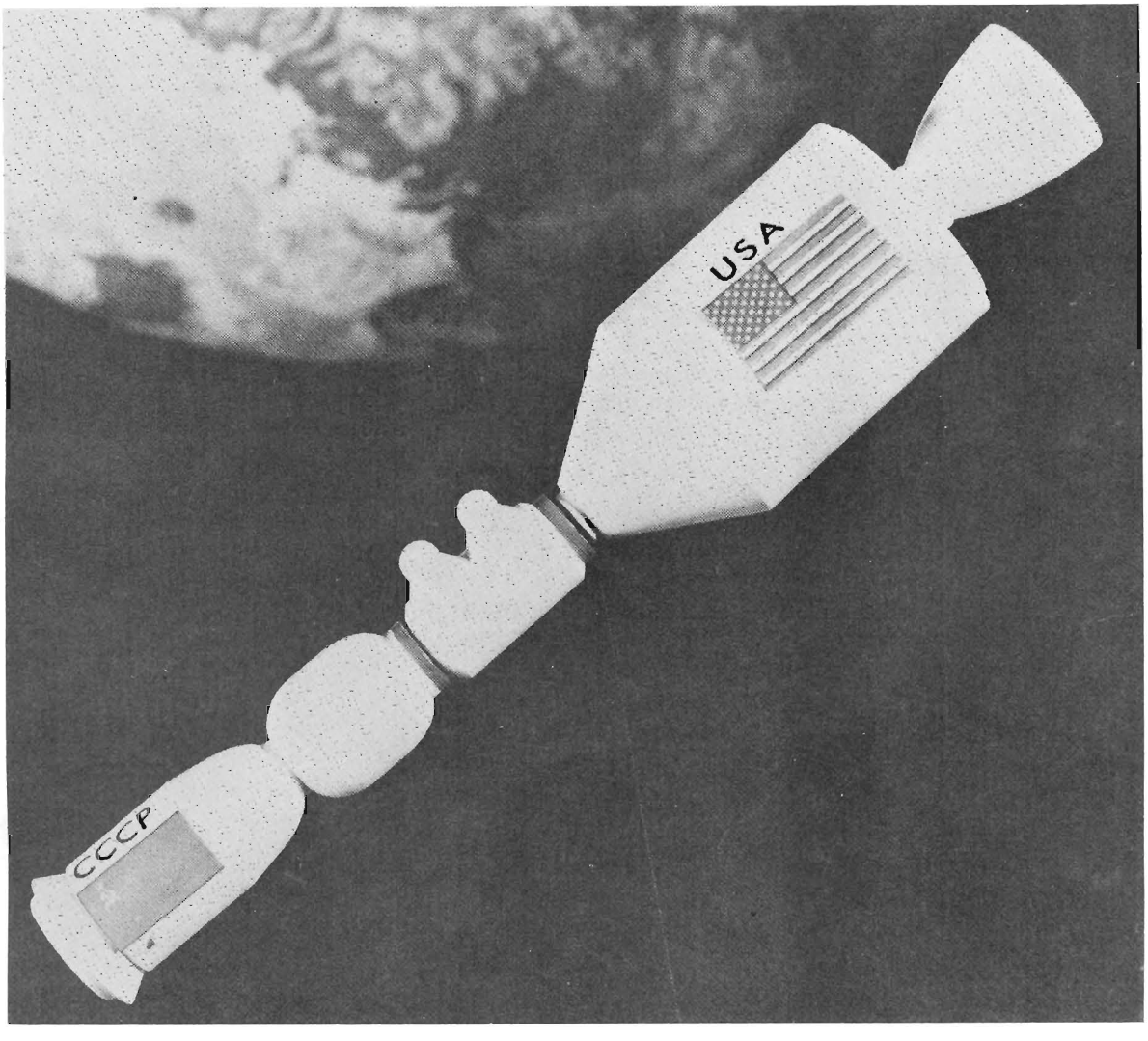
First Lance Equipment Bolsters NATO Force

Lance missiles will soon be on their way for use by American soldiers in Europe. Lance is a 20-foot-long missile and is the Army's only major missile system to be fielded in 1973. The first shipment of equipment needed to launch the missiles has already arrived in Europe where it will be issued to Army field artillerymen in support of North Atlantic Treaty Organization Forces (NATO). Included in the initial shipment were tracked vehicles, self-propelled launchers, and transport loaders. The Lance missile system will replace Sergeant and Honest John missile systems that have played an important role in NATO defense plans of the past.

B-52D Modifications

To extend the service life of 80 B-52D bombers beyond the mid-1970's, the Air Force will make considerable structural modifications to them. In the FY 74 budget the Air Force requested $63 million to keep the bombers in operation. In FY 73 about $47 million was spent and the total cost of correcting structural weaknesses caused by metal fatigue is about $197 million.

Two Nation Project



Models of the Soviet Union's Soyuz and the US Apollo spacecraft are shown as they would appear after docking in Earth orbit.

Navy Tests V/STOL

The CL-84 tilt wing V/STOL aircraft was recently tested by the US Navy for sea control ship suitability. The plane is a Canadair, Limited and is the second of that make to be tested. The Lycoming engines were rated at 1,500 shaft horsepower. Testing was conducted at Patuxent River, Maryland, in preparation for later testing on board the USS Guam, the Navy's interim sea control ship. Sea trials, probably on various ships, will follow tests aboard the Guam.

Space Shuttle Program

Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) officials are planning for a unified space shuttle mission. The plan will prescribe how DOD and NASA will jointly operate the system. The Air Force is the operating agency for the DOD shuttle program which will include placing payloads in orbit for the Army and the Navy.

The mission plan was completed in the fall of 1973 and will cover all details of the program from operational payload requirements to crew training. The Air Force will handle all launches of payloads from Vandenberg Air Force Base, and NASA those from Cape Canaveral.

The Department of Defense has actively participated in studies of early shuttle requirements and a reusable space transportation system. The Air Force Space and Missile Systems Office (SAMSO) in Los Angeles is coordinating shuttle payload requirements for DOD agencies. SAMSO maintains liaison with NASA program officials at Kennedy Space Center in Florida, Marshall Space Flight Center in Huntsville, Alabama, and Johnson Space Center in Houston, Texas.

The DOD space shuttle users committee, recently established at Air Force headquarters, is coordinating overall military requirements for the shuttle. The committee informs NASA of DOD mission requirements so that the system meets the total national space launch needs.

DOD and NASA have differing requirements that affect certain aspects of shuttle design and performance. Therefore, Air Force representatives have taken part in all design and contracting phases of the program. For example, air breathing engines will be used for initial horizontal flight tests with the orbiter vehicle and for later ferry flights between launch sites. The Air Force is handling procurement of these engines because it is already involved with developing engines of the same type.

DOD funding is limited at present, because NASA has full design, development, testing, and engineering responsibility for the shuttle program. DOD funds support shuttle liaison offices and mission planning. However, major funding will be needed to build a shuttle launcher and recovery site at Vandenberg Air Force Base. No firm planning date for building has been set at this time.

Basic DOD shuttle missions will include insertion of communications satellites, photoreconnaissance satellites, and surveillance payloads into orbit. With the shuttle system men will launch payloads, recover them, and then refurbish and possibly reorbit them. Present planning envisions that DOD and NASA crews will be interchangeable because they will have had the same training.

By cooperative effort DOD/NASA hope to limit program costs by minimizing duplication of effort and facilities. Orbiter vehicles will be standardized for both DOD and NASA including orbiter systems, color, and insignia. During operations it is possible that an orbiter vehicle could be used for launches from Cape Canaveral, carrying DOD and NASA payloads, and then be transferred to Vandenberg.

The recent Middle East war has focused much attention on air defense (AD) of the Army in the field. Air Defense Trends *would like very much to capitalize on this significant interest by publishing articles from the field that emphasize AD as a combat arm of the maneuver commander. Of equal interest is information concerning non-AD unit use (tactics, firing techniques) of organic small arms to provide protection against air attack. Articles of this type will serve two purposes: a means whereby all AD field commanders obtain information regarding how the "other guy" is employing his AD assets based on his situation; provide the non-AD field commander some information on AD tactics used to support his maneuver force.*

If you would like to have your own ideas on concepts regarding weapon employment, tactics, and/or techniques published, we urge you to send us your thoughts for future articles.

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 non-technical ideas that may be of value to air defense will also be considered for publication.

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