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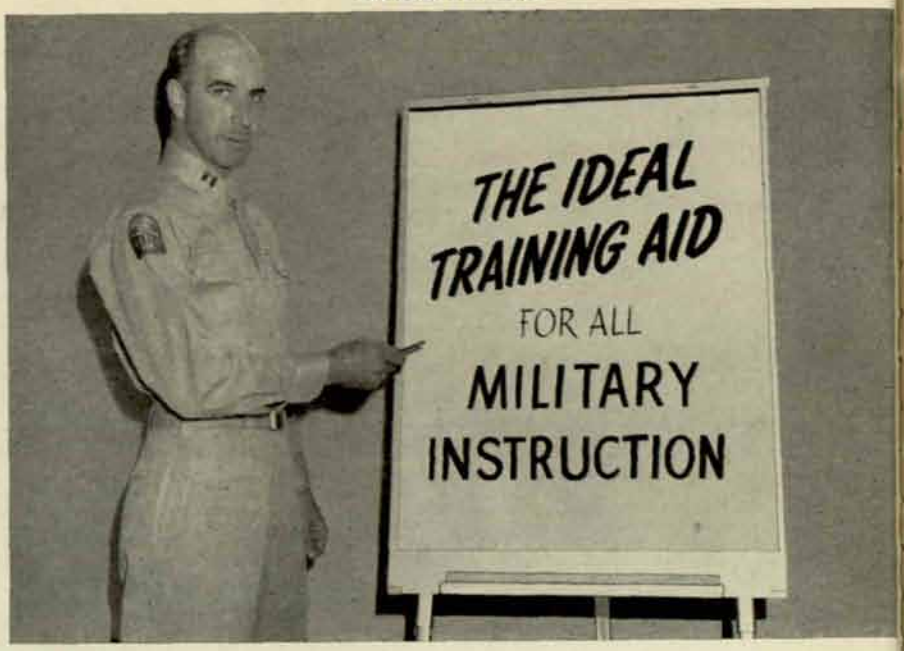

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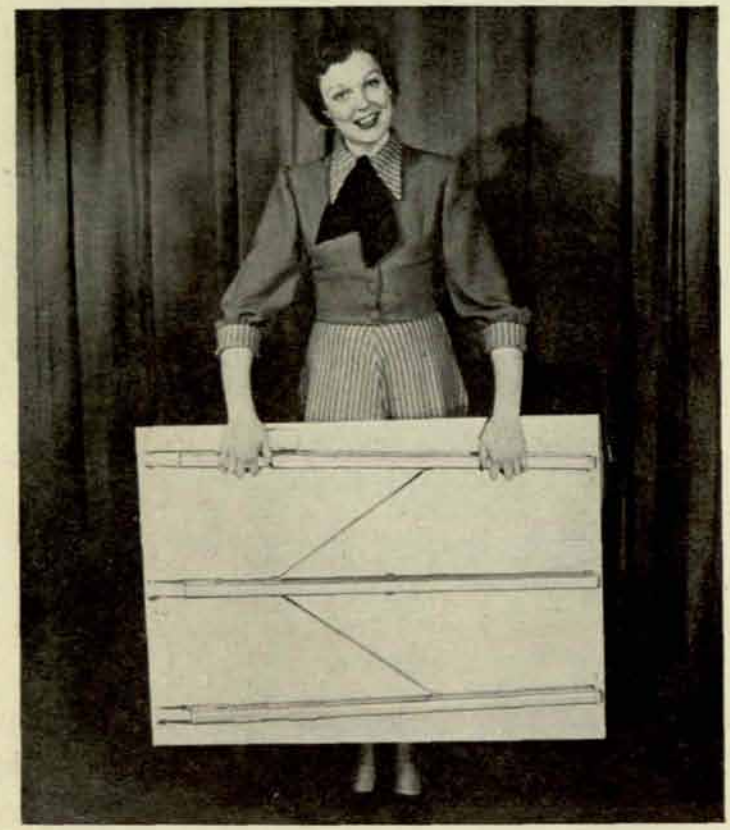

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The purpose of the Association shall be to promote the efficiency of the Coast Artillery Corps by maintaining its standards and traditions, by disseminating professional knowledge, by inspiring greater effort toward the improvement of matériel and methods of training and by fostering mutual understanding, respect and cooperation among all arms, branches and components of the Regular Army, National Guard, Organized Reserves, and Reserve Officers' Training Corps.

PUBLICATION DATE: February 1, 1950

Antiaircraft JOURNAL

Founded in 1892

Published from 1892 until 1922 as
THE JOURNAL OF THE UNITED STATES ARTILLERY
Published from 1922 until 1948 as the
COAST ARTILLERY JOURNAL

VOL. LXXXXIII JANUARY-FEBRUARY, 1950 No. 1

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Published bimonthly by the United States Coast Artillery Association. Editorial and executive offices, 631 Pennsylvania Avenue, N.W., Washington 4, D. C. Terms: $3.00 per year. Foreign subscriptions, $4.00 per year. Single copies, 75c. Entered as second-class matter at Washington, D. C.; additional entry at Richmond, Va., under the Act of March 3, 1879.

A NEW TACT

AAA GUN EMPLOYMEN

If this nation has to go to war tomorrow or at some future date, how many AAA gun units should be activated to meet our initial AAA defense requirements for the continental U. S. alone? How many additional AAA units would we need to protect our existing advanced bases?

If, in the initial phase of such assumed hostilities, you find that you are the AAA defense commander of an important area such as New York City, how many AAA gun batteries would you require to shoot down at least 50 per cent of all attacking aircraft? On the other hand, if as defense commander of the same area you have available a specified number of gun batteries, what percentage of attacking aircraft can you then expect your defense to shoot down? How good is your AAA defense?

During World War II, the means for determining accurate solutions to the above questions were not available to the antiaircraft artillery officer. At that time, and until recent date, the disposition of heavy antiaircraft artillery matériel for defense of objectives from air attack was based on two rules of thumb: the gun density and 75° rules. Such doctrine failed to provide a quantitative measurement of gun defense capabilities. Recent developments have changed all this. As a result of extensive experimental firings, a new improved tactical doctrine for employment of heavy AAA in AA defense has been evolved by the Research and Analysis Department, AAA and GM Branch, TAS, Fort Bliss, Texas.

The two basic concepts of this new doctrine are:

1. Attrition Rate.
2. Optimum Gun Ring.

Attrition Rate is the percentage of attacking aircraft which a given AA defense will destroy. The Optimum Gun Ring is the location of gun batteries about the defended area in order to maximize the effectiveness of individual firing units. The application of these concepts furnishes a sound basis for the determination of the matériel requirements for a defense, as well as the efficient siting of the matériel employed. Under these concepts, the defense layout can be designed to achieve attrition against attacking enemy aircraft at whatever rate is dictated by the importance and vulnerability of the objective. In the typical disposition, batteries are evenly spaced around the objective on the optimum gun ring. The number of batteries on this gun ring is varied according to the attrition rate desired. Permissible latitude in the displacement of batteries away from the optimum gun ring is such that the system is sufficiently flexible to assure near-maximum effectiveness over a considerable spread of conditions, or to accommodate adjustment to terrain. The principles involved have been approved for resident and extension course instruction and revision of appropriate field manuals. The details of employment, in accordance with these new concepts, now may be found in *Special Text AAA & GM-4, Employment of Heavy AAA in an AAA Defense*, published recently by AAA and GM Branch, TAS, Fort Bliss, Texas. (This text may be purchased through the School Book Department for 50 cents per copy.)

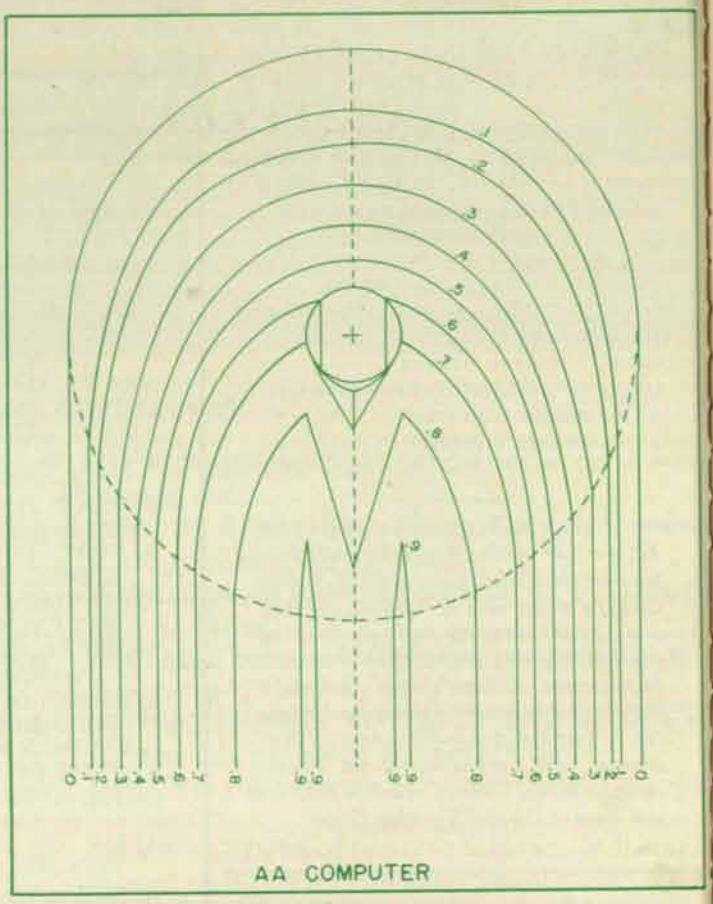


Figure 1.

The purpose of this article is to present the underlying principles and the general features of this new approach to the problem of AAA gun employment.

CAL DOCTRINE

ON A QUANTITATIVE BASIS

By Major John H. Wiggs, CAC and Captain Gordon M. Gershon, CAC

Basis For Development

In order to develop the new concepts of attrition rate and optimum gun ring, a basic unit of measurement of effectiveness of present AAA fire units had to be established. The unit of measurement which was chosen was the Single Shot Probability. Single shot probability is defined as the probability that one round fired at an aircraft will kill that aircraft. The term "kill" is distinguished from a hit in that it refers to actual destruction of a target as a direct result of antiaircraft fire, whereas, a "hit" has many connotations. To avoid ambiguities, single shot probability is based on killing the target and is determined from two independent factors, both related to the capabilities and characteristics of the fire unit. These factors are accuracy and lethality.

Accuracy data are the total firing errors of the battery to include present position, prediction and ballistic errors. These total errors are the deviations of bursts from the aircraft. Prior to the spring of 1948, accuracy data for the 90mm and the 120mm (4.7") fire units were not available. At that time, the Research and Analysis Department completed an extensive firing experiment on the Oro Grande, New Mexico, artillery range. This firing experiment was started in the fall of 1945, and over a period of three and one-half years more than 50,000 rounds of ammunition were fired at aerial targets. The entire experiment was conducted under closely controlled conditions with special precision recording and measuring equipment being used to insure accurate measurements. These raw experimental data were then processed and analyzed by statistical methods; the final result being the total firing errors expressed as standard deviations for the entire field of fire of the fire units.

Having the accuracy data available or knowing how close to the aircraft the burst will occur under various conditions, we now must be concerned with the damage potentialities of these bursting projectiles under the same conditions. This damage potential, to be more specific, is the lethality of the projectile. Accuracy deals with the probability that a burst will occur at a certain distance from the aircraft while lethality may be expressed as the probability that the aircraft will be killed by that burst. Lethality data was made available as the result of extensive experimentation conducted by civilian research agencies under contract to the Ordnance Department. The basis of the lethality experiment was the detonating of projectiles in close proximity to actual combat type aircraft and evaluating the effects of the resulting damage.

The accuracy and lethality data, as described above, when properly combined will yield single shot probability values for each type of fire unit. It is important to recognize that there is no one value of single shot probability for any particular type fire unit. Rather, single shot probabilities are dependent upon specific conditions, the more important being aircraft speed, slant range to target, type fire unit to include radar, director and guns, and type fuze. For this reason, it has been necessary to determine single shot probability values for various conditions which may be expected to occur in combat. This has been accomplished by the Research and Analysis Department. Thus, for the first time, U. S. antiaircraft gun units have been evaluated in terms of their ability to shoot down enemy aircraft.

The principal use of these values is to determine the capabilities of a particular antiaircraft fire unit against attacking aircraft. Knowing the capabilities of the individual fire units composing an antiaircraft defense, it is then possible to evaluate the over-all capabilities of the entire defense.

AA Computer

To compute manually the engagement effectiveness of each individual fire unit of a defense would be a long and tedious process and is not practical for use in the field, even in the case of a small defense. In order to facilitate the computation of engagement effectiveness of fire units and also to provide a valuable analytical tool for antiaircraft artil-

lery defense planners the AA Computer has been developed.

The AA Computer is a graphical representation of the capabilities of an antiaircraft fire unit for specified conditions of enemy air attack. Figure 1 shows the more important features of a typical AA Computer. The antiaircraft fire unit is represented by the small cross in the center of the computer. The small circle centered around the cross represents the dead area of the battery at a specific altitude of attack and the outer circle indicates the maximum horizontal range of the battery at this altitude. Therefore, the area between the inner and outer circles represents the effective field of fire and the contour lines shown within this area are graduated in terms of the effectiveness of the fire unit as it engages aircraft flying through the field of fire. Although it is not anticipated that these computers will be produced by troops in the field, the details of the method of construction can be found in TM 44-260, Flak Analysis.

With the proper AA Computer drawn to map scale it becomes a simple task to determine the total effectiveness of an individual fire unit of a defense against any aircraft attack (single or formation) being considered. It is no longer necessary to consider individual single shot probability values, as such values are incorporated into the computer in the form of effectiveness contour lines. Thus, with the AA Computer, we have a means of predicting each fire unit's ability to shoot down enemy aircraft for expected conditions of attack. With such a convenient yardstick a sound basis is available for planning the employment of our antiaircraft gun units.

Optimum Gun Ring

The first question that arises in the employment of antiaircraft is the siting of the individual fire units. Where should they be located with respect to the defended area? In general, batteries evenly spaced on a ring around the defended area produce a balanced defense, providing a minimum number of batteries are employed to insure a continuity of defense. The distance of this ring of batteries from the objective affects the over-all strength of the defense. If we go to one extreme and locate our batteries too far out from the objective, we will lose considerable over-all effectiveness; similarly, if we go to the other extreme and bring the batteries too close to the objective, we will again lose some of our over-all effectiveness. Since these two extremes are not desirable for the location of our gun ring, we must seek a ring somewhere between them in order to insure that the maximum effectiveness of our batteries can be exploited.

The next step, then, is to use the AA Computers to determine, in advance, the optimum gun ring for each set of expected attack conditions. This predetermined location of the optimum gun ring, with respect to the objective, depends upon the size of the objective, the caliber of the defending weapons and the expected conditions of attack. The procedure is to plot the objective and bomb run limits, and then with the appropriate AA Computer analyze a sequence of gun rings at varying distances from the objective until the analysis results in a maximum attrition rate for a particular gun ring. This procedure locates the optimum gun ring for one set of specified conditions and, in a

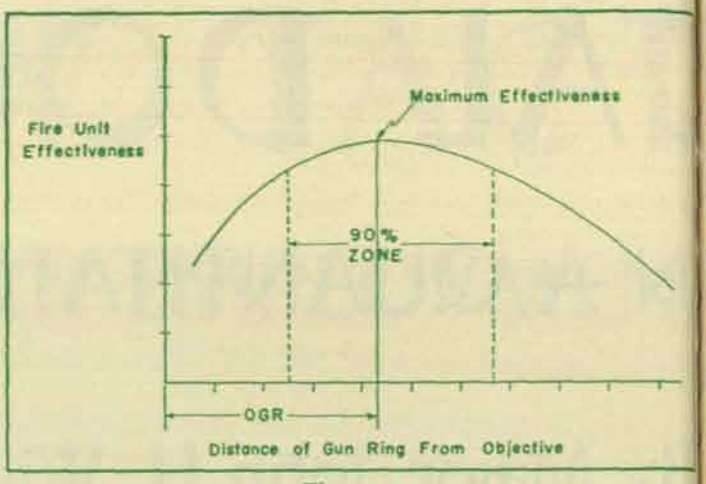


Figure 2.

like manner, the optimum gun ring is determined for any set of expected conditions. Figure 2 shows the results of graphically determining an optimum gun ring for one set of conditions. This curve represents the effectiveness of a fire unit at varying distances from the center of the objective. It should be noted that as the gun ring is moved farther from the objective, the effectiveness increases up to some maximum value and thereafter the effectiveness decreases. This point of maximum effectiveness, represented by the peak of the curve, determines the location of the optimum gun ring.

90% Zone

When terrain difficulties and other limiting factors prohibit the location of batteries on the optimum gun ring, it is desirable to establish a zone of permissible displacement. With the optimum gun ring values determined for various conditions, it is a simple matter to determine corresponding 90% zones. This 90% zone is a region on either side of the optimum gun ring wherein at least 90% of the maximum effectiveness of a battery can be exploited. Figure 2 illustrates the limits of a 90% zone with respect to one optimum gun ring. By selecting a gun ring anywhere within the 90% zone, the maximum possible effectiveness of a battery is reduced by not more than 10%. The width of the 90% zone is usually sufficient to allow the defense commander a wide latitude in emplacing his weapons.

Attrition Rate

By knowing in advance that we are going to employ our batteries on the optimum gun ring, or at least within the 90% zone, we can determine the number of batteries needed to meet the requirements for the defense, or more specifically to obtain the desired attrition rate against attacking aircraft.

Attrition rate is the unit of measurement which is employed to express the effectiveness of air defense agencies. In the AAA defense problem it is the percentage of attacking aircraft which the defense is required to destroy or which a defense is capable of destroying. The over-all air defense attrition rate results from the joint efforts of all air defense agencies to include fighter aircraft, guided missiles and AAA guns. Each of these agencies will be capable of exacting a certain portion of the over-all attrition rate

but in this article we will be concerned only with that portion contributed by AAA guns.

Before the antiaircraft defense design can be accomplished in accordance with the new concepts, the attrition rate desired for the defense must be determined. This task will usually be accomplished at high planning level and the attrition rate selected will depend on many factors. Some of the more important are:

1. Ability of the enemy to attack the objective.
2. Destructive power of enemy weapons.
3. Ability of the objective to absorb hits and recover (recuperability).
4. Importance of the objective to the war effort in terms of the availability and economical use of antiaircraft matériel.

It should be pointed out at this time that attrition rates of 100%, the destruction of all attacking aircraft, are not theoretically possible and are certainly not practical when the normal availability of AAA gun matériel is considered. An infinite number of fire units would be required to attempt an attrition rate of 100% and even then the laws of probability would not guarantee this attainment in every instance. Since we cannot hope to attain such high attrition rates, we must concern ourselves with more reasonable goals and accept the fact that in any future war, some bombs will fall on our defended areas. Very high rates should be specified only for extremely important defended areas.

Attrition Rate Nomogram

To facilitate the determination of matériel requirement, the Attrition Rate Nomogram has been developed. This device is merely a graphical solution to the mathematical equation for the determination of the matériel requirements of a defense. The general features of an Attrition Rate Nomogram are illustrated by Figure 3. Referring to this illustration, the right-hand scale represents the radius of the objective, the left-hand scale represents the attrition rate requirement for the defense, and the diagonal scale indicates units of matériel. To determine the number of batteries required for a defense, it is necessary first to choose the appropriate nomogram based on the expected conditions of attack and the type of fire units to be employed. The solution is resolved into the following steps:

1. Measure the radius of the defended area.
2. Enter Radius of Objective Scale with the radius of the defended area.
3. Connect the point of entry on the Radius of Objective Scale, with a straight line, to a point on the Attrition Rate Scale, which corresponds to the attrition rate requirements for the defense.
4. Read the number of batteries required at the intersection of the straight line and the Batteries' scale.

The answer secured by following the above procedure gives the units of matériel needed based on the attrition rate requirements and on the use of a gun ring which falls at least within the 90% zone.

Thus, we have the means of determining the matériel requirements to accomplish any assigned mission. The amount of matériel needed will depend upon how well or what degree we wish to defend a particular area. This is the basis of the attrition rate concept.

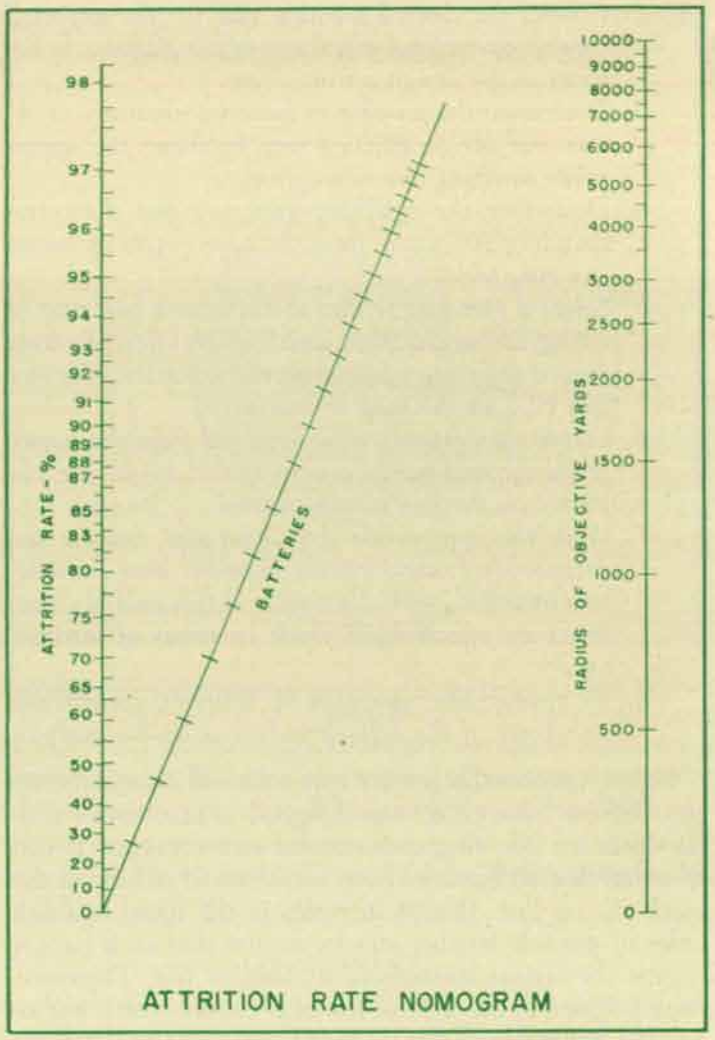


Figure 3.

Defense Design

We now have at our disposal the principal tools needed to proceed with the design of antiaircraft defenses, using a quantitative approach. These tools are the AA Computer, Optimum Gun Ring Tables and Attrition Rate Nomograms and such tools are to be furnished to antiaircraft defense designers. In the near future, these tools will be available for various speeds, altitudes, and formations of attack when employing present antiaircraft matériel.

The actual planning of a gun defense starts when the attrition rate to be imposed upon the enemy is decided either by high planning level in the case of the strategic areas within the continental United States or perhaps by lower commanders in overseas Theaters. This rate, when applied to a particular defense, is the desired attrition rate. Once the desired attrition rate and the operational efficiency for the defense have been determined, the general procedure for the design of the defense is as follows:

1. *Plot the objective, bomb release line, and possible aircraft bomb approaches every thirty degrees about the objective.*

2. *Correct the desired attrition rate for the expected combat operational efficiency of the defense to determine the design attrition rate.*
3. *Determine the number of batteries necessary to obtain the design attrition rate by using the appropriate attrition rate nomogram.*
4. *Determine the optimum gun ring and the corresponding 90% zone from the appropriate optimum gun ring table.*
5. *Select a gun ring (either the optimum gun ring or a ring within the 90% zone) which offers the least terrain difficulties for siting the batteries. Plot this gun ring on the map or overlay.*
6. *Locate the batteries, as determined from the nomogram, approximately evenly spaced about the objective on the gun ring as plotted.*
7. *With the appropriate AA Computer, analyze the defense after actual battery locations have been determined and, with the results of this analysis, construct an effectiveness clock in terms of attrition rate.*
8. *By appropriate relocation of batteries, correct any unbalance of the defense indicated by the analysis.*

Figure 4 shows the general appearance of an antiaircraft gun defense which has been designed in accordance with the optimum gun ring and attrition rate concepts. It will be noted that all batteries have been located outside of the bomb release line. Recent increases in the speed and altitudes of possible bomber attacks require that each battery engage the targets throughout its field of fire. Therefore, large portions of the field of fire of a battery which are inside the bomb release line do little to prevent bomb damage to the objective. On the other hand, the placing of the guns on the optimum gun ring allows the most effective portion of the field of fire to be presented to the attacking aircraft before bombs are released.

Figure 5 illustrates the appearance of a balanced attrition

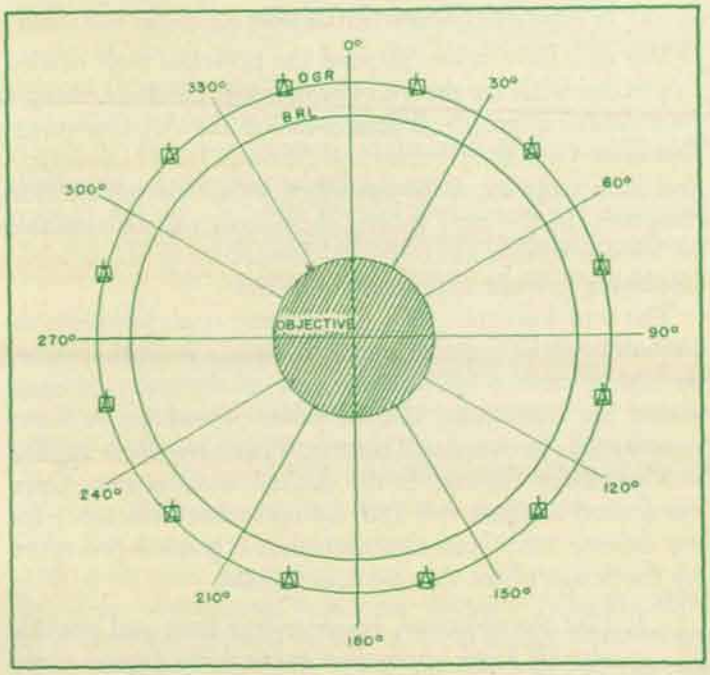


Figure 4.

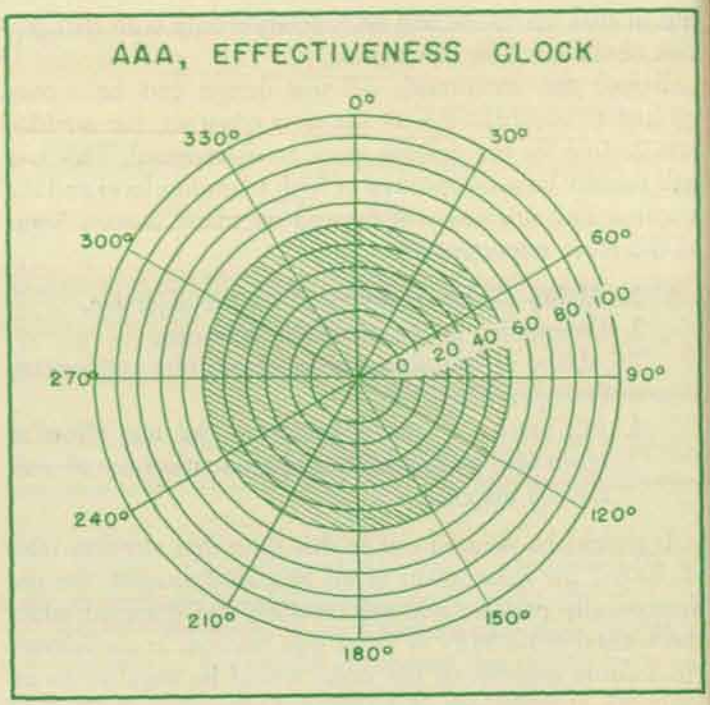


Figure 5.

rate effectiveness clock, which might have resulted from an analysis of the defense of Figure 4. This effectiveness clock is a graphical presentation of the defense capabilities against any direction of attack. An antiaircraft defense which is weak against one or more possible directions of attack is undesirable in that it invites exploitation. Such an unbalance will be quickly revealed by proper analysis with the results shown by the effectiveness clock. Figure 6 is an example of an effectiveness clock plotted for defense which is not properly balanced and would invite exploitation in the sector 30 to 90 degrees.

The general procedure for defense design, as outlined above, must be modified for certain special situations as they occur in the field. For example, strong prevailing winds at high altitudes, forced routes of approach, limitations on availability of matériel and extreme difficulties of terrain will frequently be encountered. These complications do not invalidate the principles of defense design, but merely require some adaptations and additional steps in the design procedure.

In all but extreme cases the variations in the number and positions of the batteries can be controlled in order to produce the desired effect against enemy formations within the limitations of the weapons assigned.

Operational Efficiency

As pointed out earlier, desired attrition rates must be corrected for the expected combat operational efficiency of the defense to determine design attrition rates. The question now arises, "What is meant by operational efficiency of a defense and how is it determined?" This question can best be answered by considering the operational difficulties which are encountered by antiaircraft units operating in the field under wartime conditions. Operational difficulties are those obstacles encountered during combat which prevent the maximum exploitation of defense capabilities.

Typical operational difficulties encountered during World War II were: lack of clearance to fire, insufficient early warning, rules of engagement, matériel failures, and others of which the reader is well aware. The effect of these difficulties is to reduce the efficiency of the defense below the theoretical maximum.

For the purpose of determining operational efficiency factors we classify the effects of the individual operational difficulties into two groups. Group I includes those difficulties and their frequencies of occurrence which prevent the defense from even engaging presented targets. Group II includes those difficulties and their frequencies of occurrence which prevent fire units of the defense from engaging the targets to their maximum capabilities.

A study was conducted by the Research and Analysis Department for the purpose of determining the cause and frequency of the operational difficulties which limited the effectiveness of our antiaircraft defenses during World War II (reference Technical Report No. 11, AAA OPERATIONAL DIFFICULTIES–WORLD WAR II). From these operational difficulties two efficiency factors for World War II conditions have been determined. They are the engagement and the battery operational efficiency factors.

The engagement factor is defined as the estimated percentage of attacking aircraft that a defense can be expected to engage due to the limitations imposed by operational difficulties of Group I. This means that a considerable number of aircraft are not actually engaged, even though they come within range of some portion of the defense. It follows that any attrition rate which is greater than the percentage of aircraft that is likely to be engaged by the defense is obviously impossible to attain. In other words, no attrition rate can be greater than the engagement factor.

The battery operational efficiency factor is an estimate of the percentage of maximum effectiveness that is attained during engagements by the batteries of the defense. This factor is limited by the operational difficulties of Group II.

By applying these two factors to the desired attrition rate we are able to correct for failure to engage targets at all as well as failure to fire at maximum effectiveness. The result of these corrections is the design attrition rate which is used to determine matériel requirements from the attrition rate nomogram. Since the design attrition rate is always higher than the desired attrition rate, we are, in effect, correcting for operational difficulties in advance by allocating additional batteries to the defense.

Although the efficiency factors mentioned herein are based on World War II operational difficulties, such factors may be used as a guide for the estimation or prediction of efficiency in the future. Furthermore, through the use of suitable standard AA After Action Reports in future wars, these estimates may be refined and kept current as the war progresses.

Application To Other AAA Weapons

At present, these concepts presented herein are applicable with greatest reliability to present and future conventional type heavy antiaircraft artillery. The same concepts, however, are applicable to guided missiles of the future. For AAA automatic weapons the accuracy of fire is now so dependent upon the state of training of manning personnel that these concepts can not be accurately applied. With any future improvement or refinement in the fire control methods for AAA automatic weapons, these same concepts also would be applicable to those weapons.

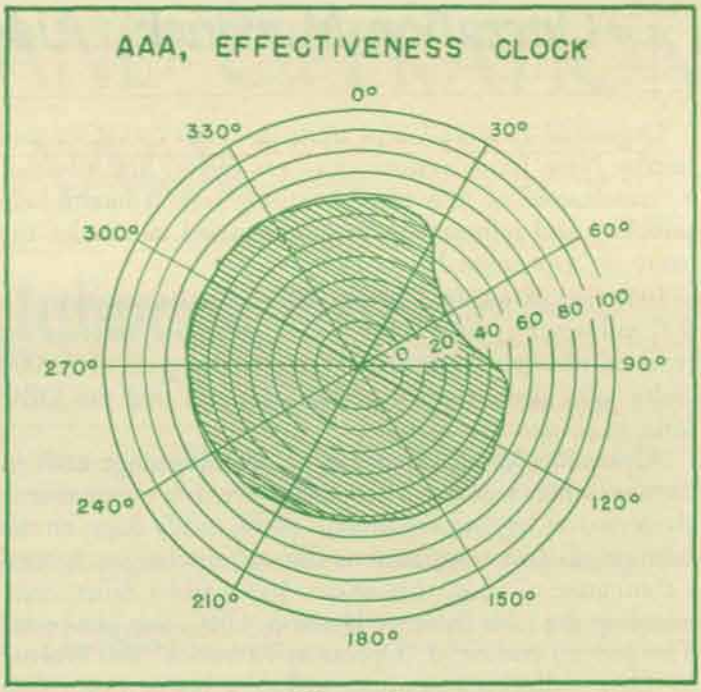


Figure 6.

Advantages

With the acceptance of this new tactical doctrine for employment of antiaircraft guns we have secured for ourselves many advantages. Some of these are:

1. *Makes available an accurate method of determining mobilization requirements and other logistical problems pertaining to antiaircraft gun units.*
2. *Provides an accurate and economical method of allocating gun units to various defenses on the basis of actual requirements.*
3. *Provides an efficient method of employing gun units about any given defense.*
4. *Furnishes a system of gun defense design that is flexible, as indicated below:*
   a. *Wide latitude of permissible displacement of selected gun ring (90% zone) from indicated optimum gun ring.*
   b. *A guide for efficient defense design for any given set of conditions.*
   c. *Easily applied to new weapons.*
5. *Furnishes the means by which the defense commander can, at all times, have an accurate, graphical picture of his defense capabilities.*

No longer do we have to guess as to the answers to the important questions cited at the beginning of this article. This new tactical doctrine provides us with the solution to all of these problems and places AAA gun employment on a sound quantitative basis.

"Operation Maverick" Aids New York's ORC Program

Organized Reserve Corps units in New York City and nearby New Jersey communities are feeling the effect of a "transfusion" of new blood resulting from a month-long publicity and information program carried out under the name of "Operation Maverick."

In terms of results, "Maverick" secured more than 1,500 enlistments, handled 3,000 requests for information received through the mails, and received reports of 33,000 "sales talks" by active Reservists who had told the ORC story to prospective recruits.

"Operation Maverick" began its planning stage early in October when a group of major Reserve unit commanders, alarmed over lagging enlistments and a steady drain on the strength of their organizations through discharges, formed a committee of which Maj. Gen. Julius Ochs Adler, commanding the 77th Infantry Division, ORC, was chairman. The general outline of "Operation Maverick" was evolved by Gen. Adler's Committee, within a policy framework approved by Maj. Gen. Lawrence C. Jaynes, Commander of the New York-New Jersey Military District.

Actual detailed work on "Operation Maverick" began with a meeting of senior unit commanders at Hunter College, New York City, on 27 October. Many of these same unit commanders, or officers selected by them, were formed into a general advisory committee which met weekly during "Operation Maverick" to report on the activity of their own units and to make suggestions or requests.

The campaign itself opened at a mass meeting in the Kingsbridge Armory, in the Bronx, which was addressed by General of The Army Dwight D. Eisenhower; Lieut. Gen. Walter Bedell Smith, First Army Commander, Gen. Adler and Gen. Whitcomb. The audience of 10,000 was composed principally of Reservists and their friends. Reporters and cameramen from The Associated Press, The United Press, The International News Service and the major New York daily newspapers covered the meeting.

In the campaign which ended its active phase just before Christmas, Gen. Whitcomb stressed the point that "Operation Maverick" was not primarily a recruiting drive, although increased enlistments in the ORC was the end-product.

It was, rather, a device by which the Army fulfilled an obligation to veterans of World War II and to non-veterans. That obligation was to inform them of the provisions of Public Law 810 under which the wartime service of veterans had already earned them a stake in retirement pay when they reached 60 years of age—but which they will not draw unless they complete at least 20 years of service.

All of "Operation Maverick's" publicity releases, every speech made by a member of the campaign's organization, pounded away at that one theme.

On the basis of actual enlistments completed, the most effective of all "Operation Maverick" devices proved to be the "R-7" card. This was a ruled form with seven spaces for the name and address of each man interviewed by an active Reservist. Each of the more than 40,000 Reservists in the New York-New Jersey Metropolitan Area received one "R-7" in his regular unit mail each week of the campaign. Each Reservist was encouraged to interview friends, neighbors and co-workers, fill out his card, and return it to "Operation Maverick" headquarters. An envelope containing Reserve Corps material was then sent to each man whose name had been turned in. In many cases Reservists went far beyond simply sending in the name of a man.

Where the "prospect" evidenced interest in enrolling in the Organized Reserve Corps, many Reservists invited them to come to the next unit training meeting and a considerable number of enlistments resulted from this direct approach alone.

By arrangement with the Air Force, Navy, Marine Corps and Coast Guard reserve organizations, the name and address of any man who evinced interest in those services rather than the Army Organized Reserve Corps was turned over to the office concerned. This "unified" feature of "Operation Maverick" was dramatically symbolized at the Kingsbridge Armory meeting by the presence on the platform of Admiral Thomas C. Kinkaid, Commander of the Eastern Sea Frontier; Rear Admiral Walter S. Delany, Commandant, Third Naval District; Maj. Gen. Brandam A. Burns, Commanding the Forty-Second Division, New York National Guard, and Brig. Gen. Clifford C. Nutt, Deputy Commander, First Air Force.

Our munitions power, the quality of our guns, our planes, our ships, our tanks, and all of our military equipment in the quantity demanded under widely differing fighting and climatic conditions all over the world was a potent factor in victory in World War II. We have been ahead of the rest of the world in munitions production. Supremacy in mass production methods is still ours and by a wide margin, but like all leaders in any race the breath of those close behind us is warm on our neck. We are still ahead; but we must continue to remain ahead.—Louis Johnson, Secretary of Defense, at the American Legion Convention, 5 November 1949.

CONSTRUCTION AND OPERATION OF AN AAOC

By Major T. P. Iuliucci, CAC

The AAOC (Antiaircraft Operations Center) is the tactical nerve center and battle headquarters of an AAA defense. Its primary function is to collect, evaluate, and disseminate intelligence. Secondary functions are: limited fire direction through withholding of fire (and possible initial assignment of targets), coordination of barrage fires, coordination for civil agencies and other services, keep the defense commander informed on the effectiveness of his defenses, maintain routine records, and disseminate meteorological messages.

Since there is no publication currently available explaining methods and practices being followed by field units in the operation of an AAOC, it is the purpose of this article to aid interested parties until an official manual is published.

The AAOC is established at the highest level of command in a defended area under the immediate responsibility of the executive officer. If that level of command is a brigade or group, setting up the AAOC falls to the AAAOD (Antiaircraft Artillery Operations Detachment). If the highest level of command is a battalion, the AAOC is established by that battalion using the little equipment it is issued for that purpose and drawing personnel from its own headquarters and batteries in the defense. When an AAOC is established at brigade or group level, the subordinate battalions (both Guns and AW) will maintain subordinate AAOC's (generally referred to as GOR's).

Now, a little about the Operations Detachment. Established under T/O&E 44-7, it is a small unit of fifty-two (52) enlisted men and four (4) officers. The senior officer, a major, is also the commanding officer. All four operations officers carry an MOS designation of 1175. However, they are required to act in other capacities, such as: supply, personnel, communications, motors and the other usual duties. The detachment is normally attached to another unit for mess and administration.

The unit is issued a plotting kit AN/TTQ-1 (Army Navy Transportable Telephone Special Equipment) to carry out its function. This kit includes relay cabinet, telephones, operations or plotting board, radios, switchboards, large tent, generators, bridge platforms, and clocks. (See figure 1) for a layout of this equipment. A gun battalion is issued a less complete kit, AN/TSA-1, which includes telephones, an operations board, and limited wire. An AW battalion is issued a similar kit, the AN/TSA-2. In actual practice it has been found helpful to modify issued equipment or replace some of it completely with items of local construction. Furthermore, the concept of AAA defense is changing so rapidly that the AAOC operations and

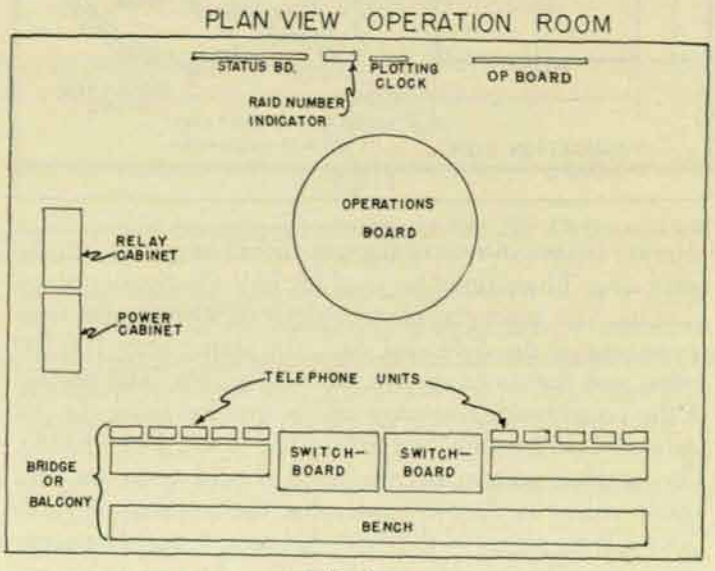


FIG. 1

equipment are undergoing constant revision and improvement. Since there is no active current field manual on this subject, a successful AAOC will lean more heavily on experienced personnel, the desires of the commander, and the ingenuity and aggressiveness of the staff and the officers of the Detachment.

The items of equipment requiring modification or replacement are as follows:

1. Operations or plotting board
2. Status board
3. OP recorder board
4. EW plot converter board
5. Target indicators
6. Raid number indicator
7. OP direction board
8. AW direction board
9. Gun direction board
10. Balcony or bridge.

OPERATIONS OR PLOTTING BOARD (See figure 2): This suggested design has been tested and found satisfactory. It is circular and made in quarters or halves of ¾" plywood with an outside maximum diameter of seventy inches. This has been found to be a satisfactory dimension to allow all plotting to be done at arm's length without the use of special extension equipment. Along and within the outer edge are three colored rings, each one inch in width. The inner ring is red, the middle ring is yellow, and the outer ring is black. Azimuth figures in hundreds of mils should be painted around the board in the middle ring, and

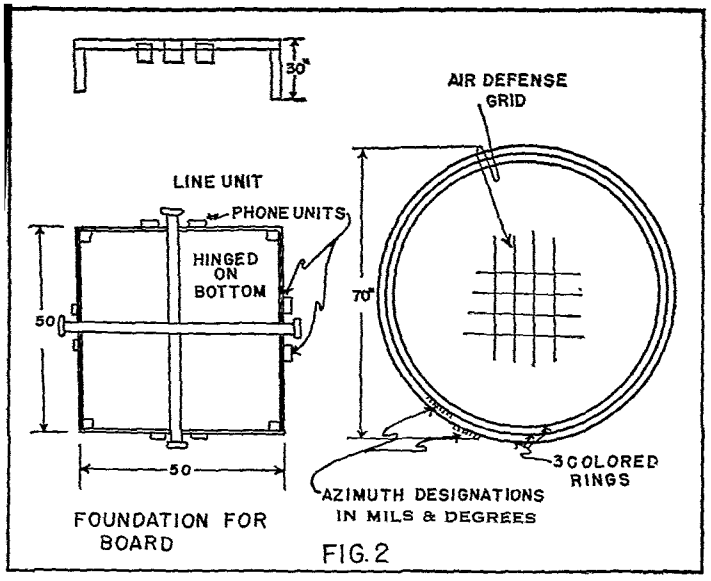


FIG. 2

azimuth figures in tens of degrees should be painted in the outer ring. These rings are used for EW (Early Warning) plotting. The inner ring covers a range of 40-100 miles from the center of the defended area, the center ring 100-200 miles, and the outer ring beyond 200 miles. The portion of the board inside the rings will be gridded using the Air Defense Grid System (See paragraphs 88-89, TM 44-225). The gridded portion of the board should cover an area whose radius is 70,000 yards plus the number of yards radar is from center of the defended area. It may be necessary or desirable to increase the radius distance to accommodate the longer-range radar AN/TPS1-B (Army Navy Transportable Radar Search) now being issued. Its range is more than one hundred miles. In that case, however, the same physical dimensions of the board should be retained but the scale should be changed. On the board should appear principal geographical features, such as: mountains, main waterways, railroads, main highways, and key installations. Contour lines are not necessary. It may also be desirable to include the primary firing sectors of the batteries in the defense.

STATUS BOARD (See figure 3): The operating status of all units in an AAA defense should be posted and kept current. With some modifications, the blackboard issued as part of the plotting kit will be adequate.

OP RECORDER BOARD (See figure 4): As an aid to the OP Plotter, information coming from the OP's (Outposts), will be recorded temporarily on this board by the OP Recorder.

EARLY WARNING PLOT CONVERTER BOARD: This small board is used by the EW Plotter to convert grid coordinates to equivalent range and azimuth for targets beyond the gridded portion of the plotting board. The Grid System should be the Air Defense Grid System. Azimuth figures in both degrees and mils should be added as was done on the plotting board. The colors on the range arm should correspond to the ring colors on the main plotting board. The converter board should represent an area with a radius of at least two hundred fifty (250) miles since it covers areas beyond the limits of the gridded portion of the plotting board (40 or 50 miles).

TARGET INDICATORS (See figure 5): Target indicators and clips (also called slip covers) will be used by the OP Plotter, EW Plotter, and Radar Plotters. These indicators and clips should be constructed of plexiglass and should be painted (on the under side only) a yellow or orange color so that black grease pencil markings will appear to their maximum advantage. Each indicator has a black cross (for unidentified targets) on the bent-up face.

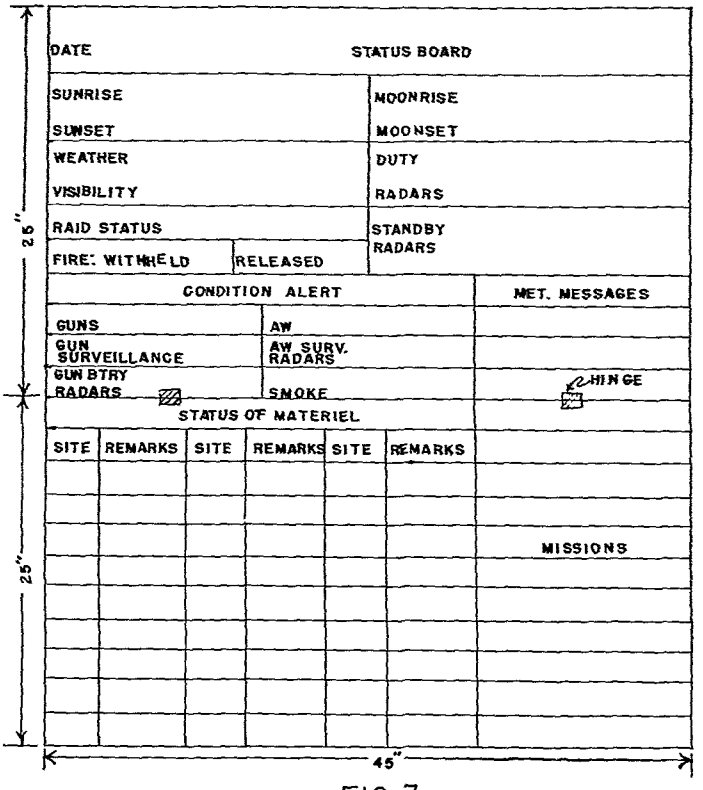


FIG. 3

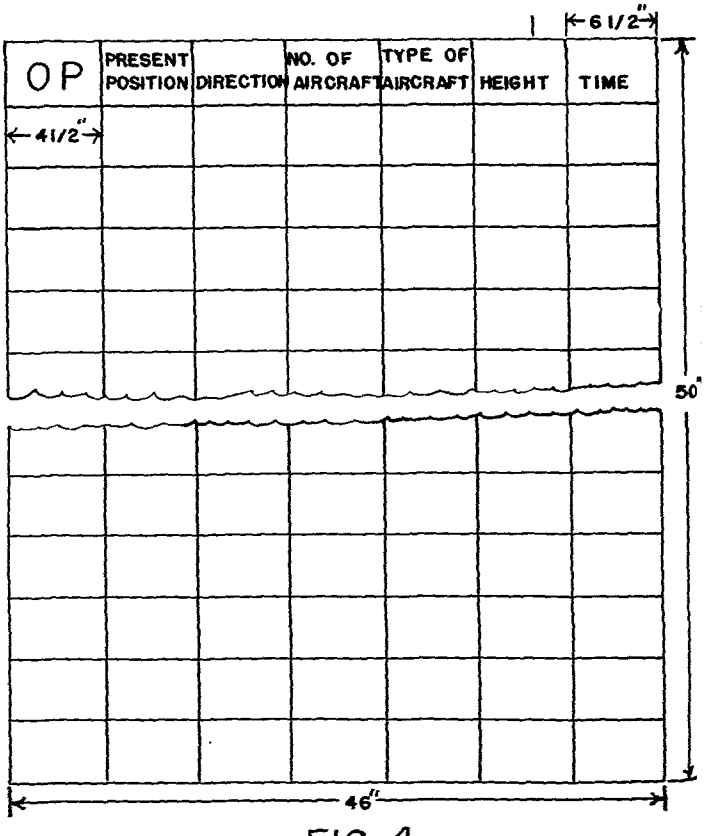


FIG. 4

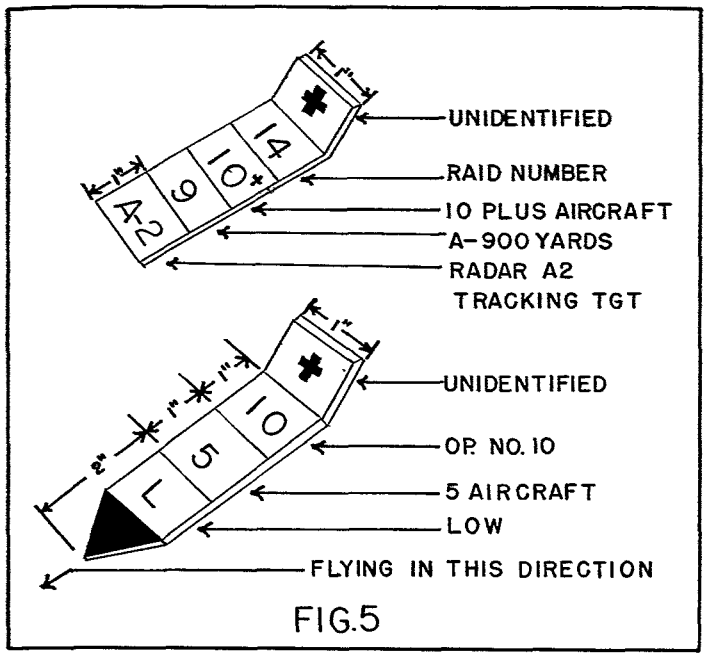


FIG.5

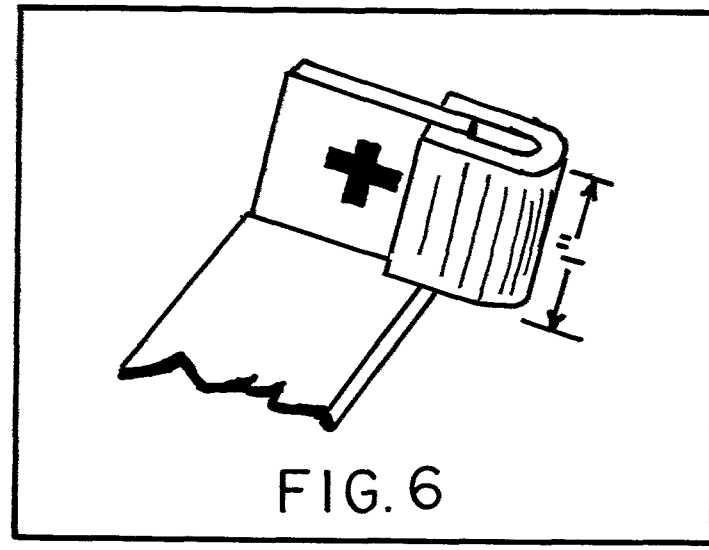


FIG. 6

The slip covers should be red for enemy, green for friendly, and black for EW targets. The following information is placed on an indicator with a grease pencil or by using a plexiglass clip:

1. Section A (bent-up face)
   a. Red clip if target is hostile
   b. Green clip for friendly target (for unidentified target showing correct IFF see figure 6)
   c. No clip (leaving black cross exposed) for unidentified target.
2. Section 1
   Target number as given by Air Force (for some EW plots only) or as shown on raid number indicator operated in AAOR by AAAIS Teller or or other designated person.
3. Section 2
   Number of aircraft.
4. Section 3
   Height of aircraft in hundreds of yards.
5. Section 4
   Black clip for an EW target or a letter of the alphabet indicating the radar tracking the target.

The OP Plotter will use an indicator with section 4 pointed and painted black. In section 1 will be shown the number of the reporting OP, in section 2 the number of aircraft, and in section three (3) the height of the aircraft as:

L (Low)—within MG range
M (Medium)—within 40mm range
H (High)—beyond AW range

The OP target indicator is placed on the board with the pointed end indicating the direction of travel of the target.

RAID NUMBER INDICATOR: In order that a numerical sequence of raids may be easily kept, an indicator is placed in the AAOC so that it may be easily read by all AAOC personnel.

OP DIRECTION BOARD: This board, composed of drawing paper between acetate and plywood backing, is used by OP personnel to locate in the Air Defense Grid coordinates targets spotted visually. The fifth division breakdown of the grid system is placed on a sheet of drawing paper 24″ x 24″. Distinguishing landmarks should be lined in. The OP will be the center of the board and the gridded portion will have a radius of fifty miles. Concentric circles around the OP as center will be inscribed using 5, 10, 15, 20, and 25 miles as the radii. These will aid the observer in locating the target in the proper grid square.

AW DIRECTION BOARD: This board is exactly like the OP Direction Board with two exceptions: One, the center of this board will be the center of the defended area, and two, range circles will not be necessary. One of these boards should be located at each fire unit.

GUN DIRECTION BOARD: This board is similar to the OP Direction Board and is used at each gun battery CP. It should be gridded to represent an area of 100 miles radius. The center of the board should be the battery CP. A circle with radius of fifty miles will be inscribed with the CP as center and on this circle will be marked the azimuth designations in hundreds of mils. This board will also have a range arm located at the center of the board and marked as shown in the diagram.

BALCONY OR BRIDGE (See figure 7): The balcony, also called a bridge, may be composed of three sections: A, B, C. Sections A and C are issued with the plotting kit. Section B is easily added by building a separate standard or by laying planks from A to C. The need for the middle section exists only when a switchboard is used.

Before plunging into the AAOC itself, let us take a look at the source and end of the information concerned, and appreciate the coordination necessary at all levels. First of all, there is usually one AAOC in a defended area, depending on the size of the area and the number of units involved. If there are two or more, one is designated as the main or senior AAOC. This main AAOC is connected directly to and located as nearly as possible to the ADCC (Air Defense Control Center). From this ADCC, as well as from our own long-range AN/TPS1-B, comes EW information to the AAOC. Adjacent AAOC's also provide additional information. At the AAOC the information is received and plotted on the plotting board by a plotter who

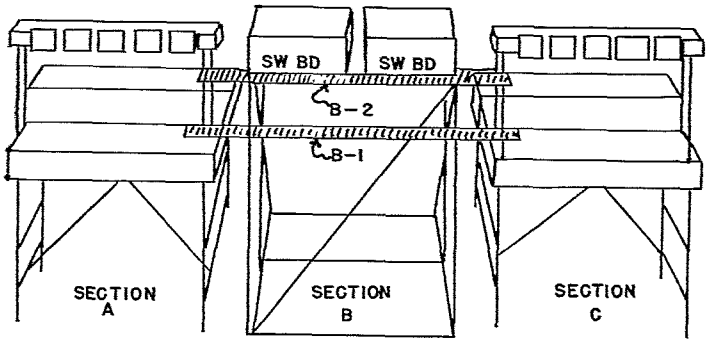


FIG.7

has a telephone connected directly to the sending agency. The AAOC assigns raid numbers for all targets except EW targets. For this purpose, each AAOC is assigned a block of numbers. The plots are evaluated by the Chief Plotter or the AAOO (Antiaircraft Artillery Operations Officer) and are told down directly to the gun batteries and AW platoons by the plotter or AAAIS Teller.

For operation of an AAOC by an AAAOD, the T/O&E does not provide for continuous 24-hour plotting. It is necessary, therefore, to organize the twenty-six operations personnel into three shifts. After some practice and experimentation, modifications may be made depending on the degree of plotting activity, number of reporting agencies, and the number and state of training of the personnel. The officers of the AAAOD also rotate the AAOO duty. A suggested breakdown of personnel and duties follows:

AAOO	1
Chief Plotter	1
EW Plotter	1
Radar Plotter	2 to 4
OP Plotter (Daylight only)	1
OP Recorder (Daylight only)	1
W (Warning) Teller	1
AAAIS Teller	1

All the plotters will take positions around the plotting board; the OP recorder at the OP blackboard; the AAOO, W Teller, AAAIS Teller and switchboard operator (when used) will be on the balcony; the Liaison Officers will be close to the balcony but not on it. All plotters will be equipped with aprons, grease pencils, target indicators, clips, arrows and rag for erasing grease pencil markings.

The AAOO is the direct representative of the AAA Defense Commander. He sees to it that a journal is maintained, evaluates plots, announces degrees of alert or readiness, and generally insures that personnel and equipment efficiently accomplish the several purposes of the AAOC.

The AAOO and the Chief Plotter should try to keep the number of indicators on the board to a minimum. They should also try to keep in mind the order and amount of time between the positions indicated by the arrows. Old arrows must be removed when it is established that they tie in with known flights or when sufficient time has elapsed to make it impossible to associate them with any other data. If two radars track on the same target, or a radar tracks on a target being carried by EW, the target indicators should be consolidated and the original raid number should be used.

LIAISON OFFICER: Each battalion may have a representative at the AAOR; however, one officer for guns and one for AW's is normally adequate. Under varying circumstances, it may be possible to assign both liaison duties to one officer. His duties are to insure that all battalions are operating properly as far as the AAOC is concerned, that noted deficiencies are corrected, and that battalions are kept abreast of activities and situations.

CHIEF PLOTTER: He is usually the individual immediately responsible for the training, plotting finesse, and relief of his men. Under the AAOO it is his duty to maintain proper police, and efficient operation of the AAOC. He shares with the AAOO the duty of evaluating plots.

EW PLOTTER: The Early Warning Plotter will be connected to the ADCC and/or to the AN/TPS1-B for the purpose of receiving and plotting early warning information. When the information comes as range and azimuth, he plots it directly. Then he prepares a target indicator with the information available and places it next to the arrow. For each subsequent report of the same target, the plotter will check the azimuth and range color and, if unchanged from the previous report, will do nothing further. However, if the time color code has changed since the last report, he will exchange the arrow for one of the proper color. He will not talk to the Air Force or radar except to request a line check or identification of an unidentified target. If the EW plot enters the gridded portion of the plotting board, the EW Plotter continues to plot the course until one of the surveillance radars picks it up. At that time, the EW Plotter will remove the black clip from the indicator and the radar plotter will place the code designation of the surveillance radar in section 4 of the indicator. However, the Air Force raid number will not be changed.

RADAR PLOTTER: Each Radar Plotter will be connected directly to a surveillance radar and will plot all hostile and/or unidentified targets reported by the radar. The initial report of the pickup of a new target by the radar will include the following:

1. Location in Air Defense coordinates
2. Number of aircraft
3. IFF (Identification Friend or Foe) code response, as:
   IFF clear (if correct)
   IFF unknown (if incorrect)
   No IFF (if no response)
4. Altitude in hundreds of yards.
   Example: Able three four two niner-one-IFF clear-at two zero.

Subsequent reports on the same target should include grid coordinates and any changes in the initial report. Unidentified targets later identified as friendly will be removed from the board by the Chief Plotter. The initial location of a target is insufficient to give direction of flight; therefore, the arrow will be pointed toward the center of the defense until a second plot gives us the correct direction. Since a radar on surveillance does not continuously track any one target, but reports all targets observed as it revolves in search, each plotter will be plotting the course of several targets, receiving new coordinates for each as the radar re-

volves. With more than one radar on surveillance, there may be duplicate reports on many targets. In this case, the plotter receiving the initial report will continue to plot the course of the target and other plotters may verify the plots. The Chief Plotter may add another plotter, even though it may result in two plotters being assigned to one radar. It is also feasible to have one plotter on two targets when traffic is light. Each plotter will be responsible that he does not have more than six to eight arrows on a course.

OP PLOTTER: The visual OP's are all connected by radio to this one OP Plotter and it is his duty to plot, or take other necessary action on, the information they send him. When an OP report is received, the Plotter will check targets already being plotted with data from other sources and, if it is evident that the report pertains to a target already on the board, he will add to the target indicator any new information the report may contain. If there is no target on the board to which he can tie the report, he will prepare an OP target indicator showing pertinent information indicating a new flight. OP reports must be plotted quickly because, being the results of visuals, it is evident that they are already quite close in and require immediate action. The AW firing units have radio receivers on the same frequency as the transmitters of the OP's and the reports are received by the fire units at the same time as by the AAOC. The OP OBSERVER reports the sequence to the OP Plotter. This man is generally needed during daylight hours only.

OP RECORDER: This man also is needed during daylight hours. He will display on the OP Blackboard, from the top down, all the information received from the OP's. He will further add the time of receipt of the message. Since this record is needed temporarily, if the recorder runs out of space, he may erase the information (since it has already been plotted) at the top of the board first and continue recording. The purpose of recording this is to provide visual information for the plotter in the event there are too many reports for him to remember all of the details in all the reports.

W (Warning) TELLER: He is also called a Plot Teller since it is his duty to tell over the W line to the units below the information on all hostile and unidentified targets within approximately fifty miles of the defended area center, using the following sequence:

1. 3d and 4th letter breakdown of the Air Defense Grid.
2. Four-figure grid reference
3. Target identification: hostile, friendly, X-ray (unidentified)
4. Raid number
5. Number of aircraft, followed by letters AC
6. Height in hundreds of yards
7. Example: Jig William eight five one five hostile one zero two two AC at niner.

This information is told directly to the gun batteries and to the AW platoons. From the AW platoons it is relayed to the fire units by "hot loop" wire. He must be alert to note and report each new bit of information. When so instructed by the AAOO, he will give changes in alert status, and pass on such other pertinent information as will help to give a better picture of the tactical situation.

AAAIS LIAISON TELLER: This man will tell AAAIS data to the Air Force, senior AAOC, and adjacent AAOC's. That will not include information already received from these agencies. The Teller should know with which source of data each plotter is connected so that he may know which data came from the Air Force and which came from another AAOC. When one of the surveillance radars plots a target already being carried by the Air Force, the new plot will be told to the AF. When visual reports are received, the data will be told to the AF whether or not it is associated with a plot carried by EW. When targets are removed from the board they will be told to the AF. The telling sequence follows:

1. Target number
2. Target identification
3. Letter of grid square
4. Four-figure grid reference
5. Number of aircraft, followed by AC
6. Height in hundreds of yards
7. For subsequent reports on the same target, 5 and 6 may be eliminated unless there are changes to be reported.

   Example: Target two eight IFF reporting friendly Fox two seven seven six six AC at two one.

Other personnel connected with and necessary to the operation of an AAOC are: radio operators, communication chief, radio repairman, and power plant operator.

OP OBSERVERS are antiaircraft personnel used to provide warning of the approach of fast, low-flying targets not picked up by the radar. As many OP's as possible will be established. Each AW battalion is authorized personnel and equipment to man eight OP's. With the increased speed of aircraft, it may be advisable to place these outposts in two concentric rings. The outer ring should be out about 15-20 miles. Observers on the inner ring should cover the gaps in the outer ring. On both rings, the observers should be not over six miles apart. Of course, this requirement will vary with terrain, radio reception, and enemy activity. Each OP will have a radio, a vehicle, and a direction board. The area covered by the OP's will generally overlap into two or more of the Air Defense fifth division squares. On sighting a plane, the observer will align the direction board and the plane. After estimating the distance of the plane from him in miles, with the aid of the range circles on the board, he will estimate the grid-square location of the plane. He will then determine the adjacent grid square toward which (there are eight possible) the plane is flying and make his radio report using the following sequence:

1. OP number.
2. Last letter of the Air Defense grid and two-figure grid reference of the present position.
3. Two-figure grid reference of the adjacent square toward which target is heading.
4. Number of aircraft.

5. Type of aircraft: bombers, fighters, etc.
6. Height, as: very low, medium, high.

Example: OP six two Charlie three two three three six unknown high

COMMUNICATION is the most important factor in the operation of an AAOC. Radio nets should be duplicated by wire whenever practicable. Wire nets and messengers are normally used for transmission of administrative matters. Radio equipment required by an AAAOD in excess of its authorized allowances will be furnished by the unit to which it is attached. Wire communications within the operations room are established as outlined in TM 11-448 with the following exceptions:

Radar data arriving at the AAOC goes through the relay cabinet to the plotters and to the switchboard which is connected to the plotters' station at the outpost side of the relay cabinet. The relay cabinet has permanent cross-connections installed to allow radar lines and other lines normally monitored to be sent to the switchboard. It is possible and efficiently workable to eliminate the switchboard completely if the number of incoming lines will allow it. However, the switchboard does make it easy for the AAOO or the Chief Plotter to monitor any line. Radio communications within the AAOC are installed, relayed, and remoted as noted in TM 11-448. The nets found in the AAOC are as follows:

1. AAAIS, to AF and adjacent AAOC's
2. EW & Liaison
3. W, gun and AW
4. OP
5. Radar reporting
6. Administrative

AAAIS NET: This radio net, duplicated by wire when time and situations permit, enters the AAOC through the relay cabinet and terminates at the switchboard and the AAOO telephone unit. Since only one of these circuits will be used at one time, both the wire and radio lines may be coupled at the same terminals of the relay cabinet. The duplicating wire net will be laid by either Army or AF personnel.

EW & LIAISON NET: This radio net, also duplicated by wire, provides communication from the EW Teller at the ADCC to the EW Plotter at the AAOC. Within the AAOC, this net terminates in the switchboard and in each telephone unit under the plotting board. The wire net will be laid down to the AAOC by AF communication personnel. This radio net at the AAOC is remoted through the relay cabinet.

W NET: A radio at the AAOC transmits both Gun and AW Teller information and is received by radio at each of the following: AW(M) Bn CP, Group, GOR, AW(SP) Bn CP, Gun Battery CP, AW(SP) Battery CP, AW(M) Battery CP, AW(SP) Platoon CP, AW(M) Platoon CP; at each AW(SP) fire unit by radio from Platoon CP. Then, at each AW(M) fire unit it is received by hot loop wire net from the Platoon CP.

OP NET: This net originates at the OP's, each of which is equipped with one AN/GRC-9 radio. This net terminates in the AAOC, Group, Battalion, subordinate AAOC's and GOR's, Gun and AW Battery CP's, AW Platoon CP's, and at individual fire units. In the AAOC, the net terminates in an SCR-188; in all subordinate units the net terminates in an SCR-593 or R-174. At gun Battery CP's this net may be electrically relayed by hot loop to each machine-gun position. During the hours of darkness, the OP's may change to the W frequency to keep informed of the tactical situation and to pass on information of ground attacks.

RADAR REPORTING NETS: All surveillance radars will be placed in surveillance teams of one or more radars per team, depending on the coverage desired. These radars may include: AN/TPS1-B, AN/TPL1-B, and SCR-584. The AAOC is responsible for scheduling surveillance radars. The information originated at an AN/GRC-9 at the radar and terminates in the AAOC at any one of the following: SCR-188, SCR-342 (part of SCR-399), and AN/GRC-9's.

COMMAND AND ADMINISTRATIVE NETS: These nets originate in the AAOC and pass to all subordinate units. They are wire nets only.

The National Guard enters the new year at its greatest strength of all time, better equipped and trained than ever before in its peacetime history and enjoying its greatest recognition in the more than 300 years of its existence.

Every Guardsman, from the youngest recruit to the oldest veteran, may well take pride in the achievement that has been made since reorganization was begun a few short years ago in the summer of 1946. Our progress has been steady and consistent. Not once have we failed to attain an objective that has been assigned.—MAJOR GENERAL KENNETH F. CRAMER, Chief, National Guard Bureau.

AAA In Air-Ground Teamwork

By Lieutenant Colonel C. G. Patterson, G.S.C.

On 16 November 1944 the U. S. Eighth Air Force and Royal Air Force Bomber Command, employing 2392 heavy bombers, dropped 9319 tons of bombs on targets in Germany in close support of the First and Ninth Armies. In addition, 107 medium bombers of the IX Bombardment Division, Ninth Air Force, 485 fighter bombers of the Eighth Air Force, and the fighter bombers of the IX and XXIX Tactical Air Commands, Ninth Air Force, bombed and strafed assigned targets on the Army front. This operation, referred to as Operation "Queen," was the largest scale and most successful close support effort flown by the Allied Air Forces in World War II.

In planning Operation "Queen," advantage was taken of the lessons learned from the two previous heavy bombardment efforts in conjunction with the First Army operations (capture of Cherbourg in June 1944 and the St. Lo breakthrough in July 1944). In these previous operations, front-line troops had been withdrawn 1000-1200 yards, breaking contact with enemy forces. The target area was marked with artillery smoke shells which provided sufficient indication for the first waves of bombers. However, the smoke shell markers soon were obscured by dust and target debris, the bombing became erratic, and some bombs fell within our own forward elements. While considerable damage was done to enemy strong points and the defenders dazed to such an extent that holes were opened up for our advance, the target marking system left much to be desired. Realizing that in any operation involving the employment of large numbers of medium or heavy bombers in close support of ground forces, the most difficult problem was that of marking friendly front lines, Air Force and Army staffs conducted further study in an effort to devise a marker plan that:

(1) would not be subject to obscuration by smoke and debris,
(2) would not require withdrawal of our forward elements,
(3) would assure all bombs falling on enemy territory,
(4) could be placed in operation without too much delay, and
(5) would be flexible enough to meet last minute changes in the situation.

Planning the Operation

Immediately following the move of the Ninth Army from Luxembourg on the right of the First Army to Holland on the left flank between First Army and the British 21 Army Group (22 October 1944), a preliminary planning conference was held at First Army Headquarters, attended by representatives of Twelfth Army Group, First and Ninth Armies, and IX Tactical Air Command. At this time, the AAA Marker Plan, prepared by the First Army AAA Section in coordination with the IX Tactical Air Command Staff, was presented for consideration and accepted as the basis for marking the front lines, subject of course to Eighth Air Force concurrence and further refinement based on field tests to be conducted in the First Army-IX TAC Headquarters area.

The marker plan suggested use of the following elements which were available within First Army or could be obtained on short notice:

(1) Ground marker panels (white) 50′ x 150′ to be placed on the ground as guides along the line of approach to the bombing target.
(2) 90mm AA bursts, each of which contained a red smoke pellet to mark a safe BRL.
(3) One battery of 12 AA Searchlights as a further visual indication of safe BRL.
(4) Cerise and/or orange panels which could be used to outline the front lines.
(5) VLA barrage balloons to mark a safe BRL.

Favored by excellent flying weather and visibility in late October and early November, numerous tests were conducted in the vicinity of Spa. Aircraft of the IX TAC were made available to experiment with the various suggested marking systems. Through direct radio communication with the aircraft, P-38's and P-47's were brought in at altitudes up to 20,000 feet over various panel combinations and a line of AA searchlights elevated to 85°. Pilots reported no difficulties in picking up the white guide panels or the 7′ x 36′ orange or cerise panels. However the searchlights did not prove too effective by themselves since, if the pilot was not looking directly at the right spot, he failed to see the light beam despite the intensity. As a result it was decided not to attempt to use searchlights for daylight markers.

In testing AAA bursts, single rounds were fired ahead of and 2000 feet below the approaching aircraft. Of the various rounds modified to include red, yellow, or green smoke pellets, those containing a red pellet were reported by several pilots as the most effective. The pellet did not color the entire burst, but the red smoke was reported as discernible in the burst from a position above the burst. In addition, a regular pattern fired at a prearranged time interval was determined to be effective in attracting the pilot's attention. As a result of these tests, the First Army Ordnance Officer (Colonel J. B. Medaris) undertook the modification of 1800 rounds of 90mm AAA ammunition to be held available for Operation "Queen." The modification consisted of removing sufficient explosive to permit insertion of the pellet from a red smoke grenade.

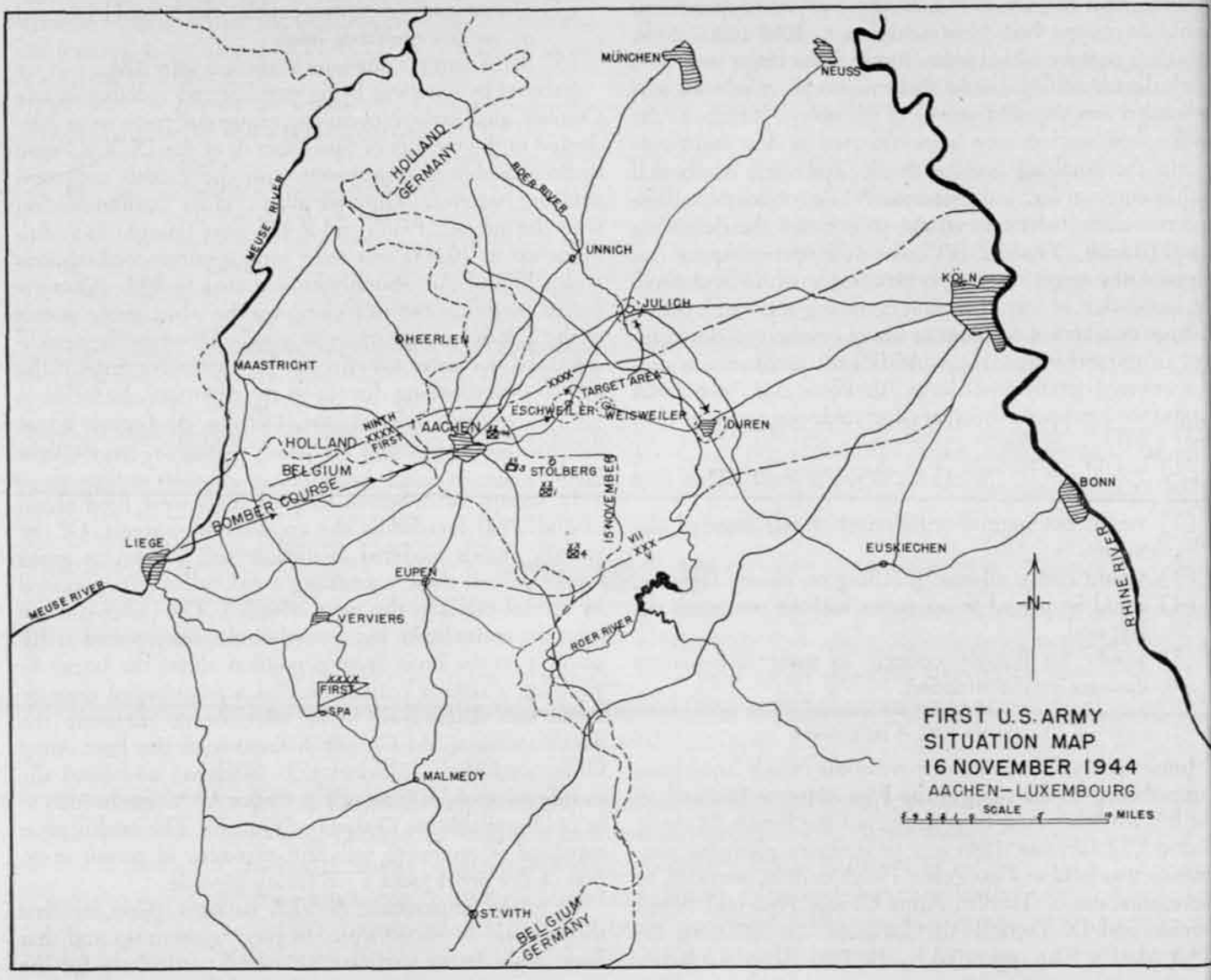
As to the employment of VLA balloons, pilots felt that there would be no difficulty in picking them up and that they might be of confirmative value, particularly for the

medium bombers and fighter bombers. Therefore, request was made through Twelfth Army Group for a flight of RAF balloons (15 balloons + 15 spares) to be made available early in November. Inasmuch as little communication equipment was available in this type unit, it was decided to utilize searchlight battery personnel and equipment to provide the communications which would be required for control of barrage balloons.

After careful ground and air staff planning of the many details involved in a large scale air-ground operation, a conference was held at Ninth Air Force Headquarters on 7 November to approve in final form the air plans for support of the First and Ninth Armies and the front-line marker plan. Two plans were discussed for execution between 11 and 16 November; one utilizing the Eighth and Ninth Air Forces and RAF Bomber Command, if weather permitted, and the other utilizing the IX Bomber Division plus IX and XXIX TAC fighter bombers, with the RAF Bomber Command bombing their assigned targets either by day or night as the weather permitted. Ten target areas were selected and assigned to various Air Force Commands (See Situation Map). Fighter bombers were assigned armed recce missions and fighter sweeps east of the Rhine River, as well as attacks on enemy headquarters and communication centers prior to the heavy bombardment. D-Day for the Army attack was to be determined by the Eighth Air Force depending on favorable weather for visual bombardment up through 13 November. Thereafter, D-Day would be determined by First Army up through 16 November, the attack to be launched with fighter bomber support only. One very important feature of the plan was the elaborate and well-timed artillery counter flak preparation to be fired just prior to and during the bombardment.

The Eighth Air Force designated a representative to finalize the detailed arrangements for the marker plan with the AAA Officer, First Army. While the ground guide panels, cerise and orange marker panels and barrage balloons would be of no value to the heavies at 20,000 feet in the event of clouds, it was agreed to put them in position. At least they would be seen by the heavy bombers if the weather was clear and the fighter bombers and mediums at lower altitudes would be certain to see them. Since the RAF Bomber Command was to penetrate deeper than the Eighth Air Force and might attack at any time from H plus 2 hours on D-Day to dawn of D plus 2 days, no arrangements were made to include them in the marker plan.

With respect to the employment of 90mm bursts as



markers, the Eighth Air Force representative requested that a straight line perpendicular to the line of flight be fired rather than attempt to place a line of bursts directly over the front lines as had been suggested originally. It was therefore agreed that a line of eight simultaneous bursts would be fired every 15 seconds along a predetermined line, bursts spaced 500 yards apart, at an altitude 2000 feet below each box of bombers. In addition, the Eighth Air Force was to furnish an SCS-51 fan marker beacon to be emplaced directly beneath the line of AAA bursts. This beacon would then provide an electronic as well as a visual safe bomb release line. The marker line was so selected that bombs released after crossing that line could not fall within friendly territory. While there was some slight apprehension that the enemy might attempt to fire a counter line of bursts to confuse our bombers, it was felt that the counter flak artillery fire and the lucrative bomber targets offered by the Eighth Air Force would account for any remaining enemy AAA fire capabilities.

Detailed Planning

All units designated to participate in the marker plan had conducted concurrent planning to the extent that the First Army letter of instruction issued on 10 November was largely a confirmation of details already worked out with units covering: the general plan, lines to be marked, equipment, communications, responsibilities, procedure, timing, and safety precautions. The 413 AAA Gun Bn. was moved from Liege to positions indicated in the sketch, and P Flight 104 RAF Balloon Command moved to bivouac in the vicinity of Aachen. Communications were installed and all units ready in operating positions prior to 1800 on 10 November. Balloon equipment was spotted under camouflage at surveyed positions, ready for inflation and ascent on short notice. AAA units designated to place ground panels reconnoitered designated sites and were prepared to display panels on short notice. After a communication check at dark on 10 November, all units were ready to implement the plan on receipt of the prescribed code word to be sent over the Air Warning Net as well as administrative and other land line communications.

Quite naturally, the success of the operation was dependent upon close coordination with participating air units, which in turn required the best possible communications. In order to assure reliable and uninterrupted communications, both radio and land lines were utilized. The sub-operations room at 109 AAA Group Headquarters had direct telephone lines to the 149 AA Operations Detachment at the IX TAC-First Army Fighter Control-AA Operations Center, while the 109 AAA Group and 413 AAA Gun Bn. both monitored the Aircraft Warning Radio Net. The 109th Group was in radio and "hot loop" telephone communication with the 413th, each fire unit of the 413th, and each balloon position.

Even though the Eighth Air Force stated that operations would be conducted at 20,000 feet, it was decided to be prepared to fire AA bursts at 2000 feet below the bombers, so as not to jeopardize the bombers in the event a last minute change in operating altitude became necessary. As events turned out this was a wise decision; some flights flew as low as 16,000 feet. Trial shot points spaced at 500-yard intervals were computed. All batteries computed all eight points at 600-foot altitude graduations from 10,200 to 19,600 feet. Gun positions were so selected as to standardize times of flight as far as possible and thus assure simultaneous bursts. Data cards were prepared for each gun, indicating data to be used in laying the guns manually.

Since the bombers operated at altitudes above sea level, and the IX TAC MEW (micro-early warning) measured altitude above ground, the 109th operations room was to convert relative altitude to altitude above sea level and indicate to fire units the true altitude of burst desired for each approaching formation. Therefore, the trial shot computations made by fire units were for true altitudes above sea level. While such a procedure may appear complicated, it was deemed safer to work in terms of the bomber altitude in order to obviate any possible misunderstandings which might result in damage to our own aircraft.

Anxious to assist the joint air-ground team to achieve even greater successes, all personnel stood by waiting for the announcement of D-Day, when they were to prove that the AAA can do more than engage enemy air and ground targets. Their confidence was warranted, for through their efforts they did assist the heavy bombers, and in so doing helped gain the confidence of the Air Force in our own AAA and to reaffirm the Army confidence in the Air Force.

D-Day

At 0120 on 16 November the Commanding General, Eighth Air Force announced that Operation "Queen" would be executed that day, with the first flight of bombers scheduled to pass over the marker line of balloons, fan marker beacon (SCS-51) and AA bursts at 1115 a.m. The heavy bomber attack was scheduled to end at 1245 p.m. AA bursts were requested at 18,000 feet since the bombers were to operate at 21,000 feet or above. Just prior to first light, all AA units were alerted to execute the plan. Headquarters, 16th AAA Group placed the distant approach marker panel, the 474th AAA AW Bn. (S/P) placed the cerise and orange panels 500 yards in rear of and parallel to the front lines, and 109th AAA Group placed the close-in approach marker panel. Barrage balloons were inflated under nets and prepared for ascent. A communications check indicated all in readiness by 0900.

The sky was an ominous grey with thick scudding clouds down to 10,000 feet early in the morning. As the hour of attack approached, the clouds, blown by a strong north-north-west wind, began to disperse over the target area and by 1115 had cleared sufficiently to provide good visual bombing conditions. The marker line area still had some clouds, as the bombers passed over—sufficient to obscure the line of barrage balloons, but not the AAA bursts which were above the clouds.

The first wave of bombers approached just after 1100, the plots being continuously relayed to the 109th and 413th. Balloons were uncovered and raised five minutes before the first wave reached the marker line. The order to fire was relayed from 109th Group twenty seconds ahead so that the first line of bursts occurred in a position below and immediately ahead of the bombers. Thereafter an eight-gun

salvo was fired every 15 seconds, with fire suspended only when there was a long interval between flights. To an observer on the ground the bursts appeared as eight balls bounced off a steel wall. The timing of bursts was perfect. By a stroke of good fortune, a strong wind was blowing from left to right along the line of bursts. As the eight bursts moved laterally along the line eight more appeared, thus providing a continuous line of smoke puffs several thousand yards long. Since different flight groups operated at different altitudes, some as low as 16,000 feet, several shifts in height of burst were necessary. It was indeed fortunate that data had been computed for alternate altitudes; otherwise the AA would have been firing through the bomber formations.

What about the balloons? The clouds prevented the heavies from seeing them, but surprising as it may seem the German artillery became suspicious and opened fire on them; that much fire power was diverted from the bombers! As soon as they opened fire, VII Corps artillery immediately took the batteries under counter-battery fire and silenced them.

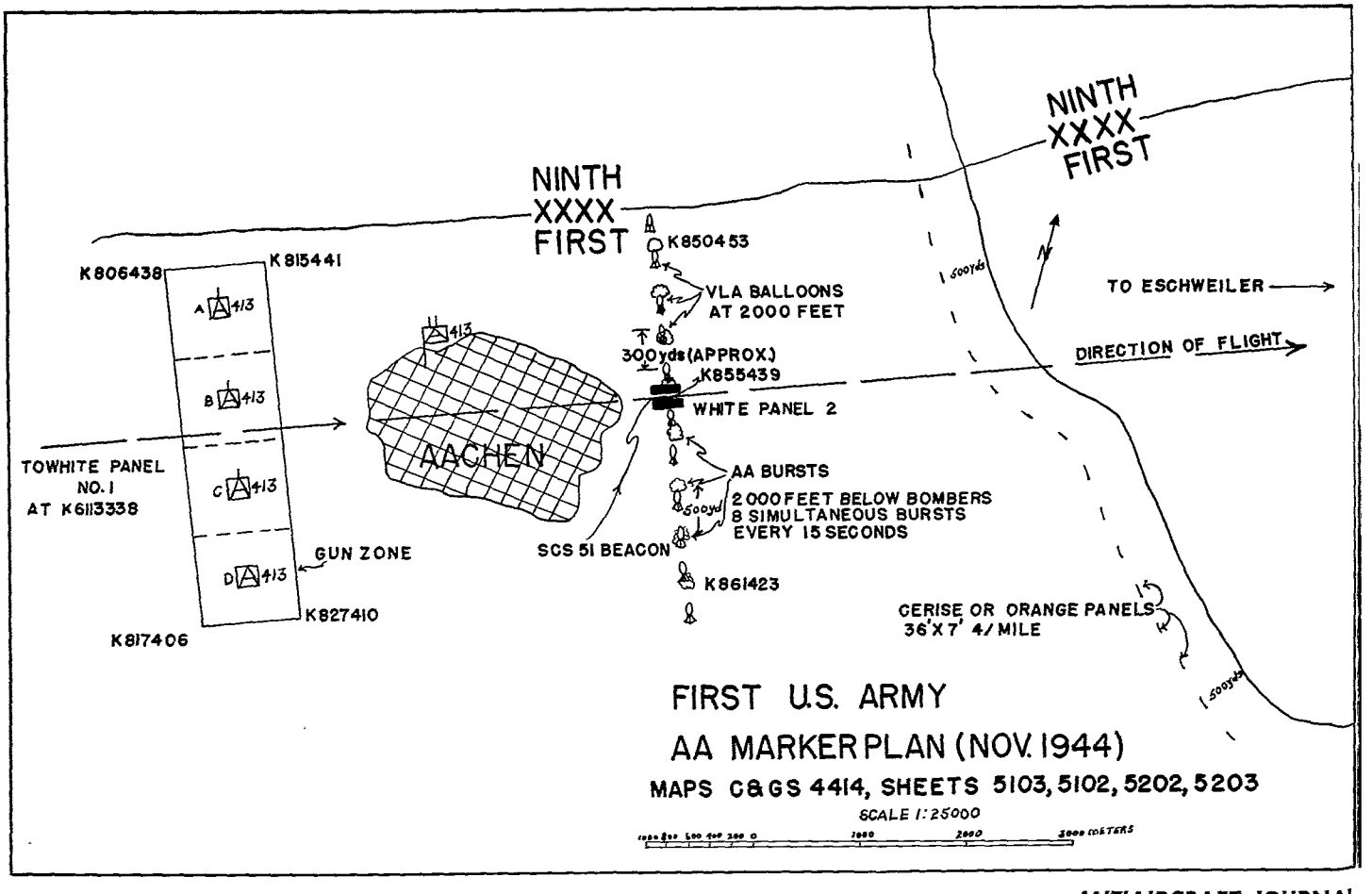
By the time the last heavy had passed the marker line, nearly two hours after the first wave, most of the balloons were casualties, 3272 rounds of 90mm had been expended —BUT, none of the bombs fell inside our lines. Due to the carefully planned and executed counter-flak fires of VII Corps artillery, including the 116th AAA Gun Bn., none of our bombers were shot down by German AAA. Immediately after the last Eighth Air Force bomber turned homeward, the RAF Bomber Command began its attack, and the VII Corps jumped off on the attack to the Roer River.

Results of the Attack

As a result of the air attack, the center of Duren and all of Julich were almost completely destroyed, marshalling yards were seriously damaged, and all road centers in and around these cities were rendered impassable. Similar results were obtained in Eschweiler, Heinsburg, Durwiss, Helrath and the fortified towns. At the time of the bombardment, the 47th German Infantry Division and the 12th Volksgrenadier Division, in the process of relieving the 47th, suffered very heavy casualties and were rendered nearly ineffective. Command posts and communications were destroyed or disorganized to the extent that command control was virtually impossible for several hours after the bombardment. When the VII Corps attack jumped off following the bombardment and artillery preparation, only relatively light opposition was encountered. However, extensive mine fields were encountered which tended to slow the attack and permitted the enemy to recover in part from the shock of preparatory fires. Had the weather continued clear enough for fighter bomber operations subsequent to 16 November, the advance to the Roer River would undoubtedly have been more rapid.

Value of the Marker Plan

It would be gratifying to report that the operation went exactly according to plan and that all phases were an unqualified success. The execution as far as the AA was con-



cerned left nothing to be desired except that only 1800 rounds with the red smoke pellet modification were available. Therefore the last 1198 rounds fired were regular AAA shells. Also, from reports received from the Eighth Air Force, only a few pilots reported seeing the red in the burst, but all reported observing the evenly spaced and regularly timed bursts. As previously mentioned, the balloons were not seen due to clouds, and neither were the approach marker panels. The orange and cerise front-line marker panels were effective for the fighter bombers which operated at lower altitudes.

The report from Eighth Air Force stated that only the SCS-51 fan marker beacon and the burst line of AAA were effective in marking a safe bomb release line. Bomb bays were opened over the English Channel prior to crossing the marker line but no bombs fell out during transit over the VII Corps units concentrated for the attack. In fact, all of the bombs intended for enemy targets fell beyond our front lines. Therefore from the standpoint of results attained, the operation was a success and the AA played an important part in assuring the success of the outstanding air-ground teamwork in the ETO. All AAA units and personnel carried out their assigned missions in a manner consistent with the motto—"Whatever the task."

Summary

Operation "Queen" five years ago represented the ultimate in joint air-ground operations. To the thousands of soldiers poised for the attack, which was to jump off as the last heavy dropped its bombs, it was indeed an impressive sight; wave after wave of B-17s and B-24s winging their way across a line of AAA bursts to blast enemy targets a few thousand yards away. In the distance, the rising crescendo of bomb explosions, smoke, and debris, meant that many less enemy strong points to impede the attack. The heavies, supplemented by the B-25s and B-26s and fighter bombers, were blasting the way to the Roer, en route to the Rhine, and then VE Day. The artillery counter-flak fire barked its staccato. The fighting was to be hard against a tenacious enemy—but the going would have been even more difficult and slower without the weight of the air attack.

Air and ground commanders and their staffs had gained a much better understanding of the capabilities and limitations of the two arms in advancing from Normandy into Germany. The highest degree of air-ground coordination and cooperation was evident in the outstanding success of Operation "Queen." The lessons previously learned as to the timing and placing of the air attack and marking a safe bomb release line were applied to advantage, and set a pattern for future air-ground operations.

The AA played a small but vital part in this operation. The days of preparation and planning culminated in less than two hours of participation; panels no longer required, destroyed balloons, 3272 bursts dispersed by the wind—yet the results were well worth the effort. Each burst was at the right place at the right time. There were no matériel malfunctions, misfires, or communications difficulties—a tribute to excellent equipment, unfailing preventative maintenance and the high state of training of the personnel involved. Distinctive colored bursts would have been more effective—but in their absence, field improvising solved the problem as well as it could be solved in the time and with the facilities available. Here was one more proof of the air-ground teamwork which overwhelmed Hitler's forces from Normandy to the Elbe—and the AAA was a full and proud member of that team.

AA UNITS INVOLVED

AA Section, Hq First Army
149th AA Operations Detachment
Hq & Hq Btry, 49th AAA Brigade
Hq & Hq Btry, 18th AAA Group
Hq & Hq Btry, 109th AAA Group (VII Corps)
413th AAA Gun Bn (M)
474th AAA AW Bn (SP)
Btry "C," 226th AAA Searchlight Bn
P Flight, 104th RAF Balloon Command

Our equipment situation is more favorable in other fields and, in some we excel. We still have the best artillery in the world, and we are developing some excellent antiaircraft weapons. We are completing the development of extremely accurate fire control systems for detecting and engaging high altitude aircraft traveling at near-sonic speeds for use with our heavy 120mm antiaircraft guns. And we have our new "Skysweeper," a fully automatic, high velocity, radar-directed gun for combating aircraft at lower altitudes.

The need for improved antiaircraft weapons clearly illustrates the fallacy of the belief that Army equipment does not have the same urgent need to be kept modern as does that of the Air Force and the Navy. For as the speed of aircraft increased with the introduction of jet propulsion, for example, then the weapons to combat these faster aircraft had to improve correspondingly.

General J. Lawton Collins, Chief of Staff, U.S. Army at The Society of Automotive Engineers, Detroit, 11 January 1950.

ABOUT OUR AUTHORS

Colonel Herbert C. Reuter, Ordnance, graduated from the United States Military Academy in 1920 and has been a continuous subscriber of the JOURNAL for the past thirty years. In 1937 he was detailed to the Submarine Mine Depot at Fort Monroe, Virginia. He is presently engaged in turning over the CAC's submarine mining operations to the U. S. Navy.

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Lt. Col. C. G. Patterson, GSC, was Chief of the Plans Section, Antiaircraft Command, Eastern Defense Command and First Army from December 1941 to September 1943. He was Antiaircraft Officer of the First Army in Europe, the Pacific, and the US, from December 1943 to October 1945. He is now assigned to the Research and Development Board of the National Military Establishment.

Major Harold W. Seidman entered active service as an enlisted man in November 1941. He graduated from AAA OCS Class No. 30 in October 1942 and was assigned to the 511th CA Regiment at Camp Haan, Calif. With a 6-month interval as Classification Officer, Enlisted Cadre Pool, Camp Haan, he remained on the staff of the 113th AAA Group from December 1942 to September 1945.

Dr. John D. Morgan, Jr., is a major in the Corps of Engineers, U. S. Army, holds several advanced degrees in Mining Engineering, and is the author of a book dealing with the economic mobilization of the mineral industry. He represents the National Security Resources Board on the Interdepartmental Stockpile Committee of the Munitions Board.

Major James C. J. Ballagh was a life insurance underwriter when he entered the military service in 1942 and served as Assistant Life Insurance Officer of the 3rd Service Command and as Executive Officer, War Department Life Insurance Section. Thereafter he served as Personal Affairs Officer in the Air Transport Command and Headquarters Army Air Forces successively, returning later to the Department of the Army as Chief of the Saving and Life Insurance program under the Chief of Finance. In 1949 he returned to civilian life as an associate in the Washington firm of J. D. Marsh and Associates, Estate Planners, and is currently active as Life Insurance Officer in the 2922d Finance Training Unit, ORC, Fort Myer, Virginia.

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Captain Gordon M. Gershon is Assistant Chief, Technical Studies Section, Research and Analysis Department, AA & GM Branch, TAS. He served in the Pacific for forty-four months as a Battery officer and Gun Battery Commander. He was stationed on Oahu when the Japanese attacked Pearl Harbor. Capt. Gershon received his Master of Aeronautical Engineering at NYU while studying propulsion and aerodynamics of guided missiles.

Major T. P. Iuliucci graduated from the U.S.-M.A. in 1942 and served with the 37th AAA Brigade until 1944 when he moved to the Aleutian Islands with an AAA gun battalion for thirty-four months. At Fort Bliss, Texas, he recently commanded the 165th AAA Operations Detachment. He is presently studying in the Advanced Course, The Artillery School at Fort Sill, Okla.

Lieutenant Colonel A. A. Currie, CAC (Res.) received his electrical engineering degree from the University of Pittsburgh in 1933. Ordered to active duty in 1941 as a first lieutenant, he served as an instructor at the Coast Artillery School at Fort Monroe. He served during World War II with the AAA Board (now Army Field Force Board No. 4), was a member of a joint committee sent to Europe to study the effectiveness of AAA fire control and to make recommendations for postwar development. He is presently executive officer of the 1536th Guided Missiles Battalion (Training).

Corporal Paul Hershey served in the Pacific during the late war and achieved the grade of master sergeant. After a three-year absence from the Army, he reenlisted and is now serving in Japan with the Public Information section of the 7th Infantry Division.

WHAT IS THE ROTC?

By Colonel John I. Hincke, CAC

For almost a hundred years prior to the creation of the Reserve Officers' Training Corps, military training at civilian educational institutions in the United States progressed without uniform plan through one stage and another. It had its beginning in 1819 when Captain Alden Partridge, a former superintendent of the U.S. Military Academy, founded the American Literary, Scientific and Military Academy at Northfield, Vermont. His purpose was "to fit young men for their duties as citizens and to make the students competent to take the part of their country should their services be needed to defend its honor or interests in the field." Between 1819 and the Civil War, many colleges and schools featuring military training were founded. These included Lafayette College, Virginia Military Institute, The Citadel, Kemper Military School, and others. However, it was not until the Civil War that military training was introduced as a part of the curriculum of essentially civilian institutions.

On 2 July 1862, President Lincoln signed the First Morrill Act. This act, also known as the Land Grant Act, set aside a number of acres of land in each state and territory for the benefit of colleges and universities, provided the institution agreed to give principal attention to education in agriculture and the mechanical arts, including military tactics. Representative Morrill, author of the act, best expressed its object in words as follows: "With such a system, nurtured in every state, a sufficient force would at all times be ready to support the cause of the nation and secure the wholesome respect which belongs to a people whose power is always equal to its pretensions."

The fifty-nine institutions which received grants of land under the Morrill Act and succeeding legislation became known as Land Grant colleges. Until 1923, all maintained a course in military tactics which was compulsory for male students of the first two academic years. The University of Wisconsin in 1923 made this course optional and a few other institutions followed suit. Although the Attorney General of the United States ruled in 1930 that a land grant institution fulfilled its requirements under the First Morrill Act by only offering a course in military science, most of the original land grant colleges and a great many of the non-land grant institutions still maintain military training on a compulsory basis for the first two years of their undergraduate curriculums. The question as to whether it was the intent of Congress to make instruction in military tactics mandatory has never been ruled on by the courts.

The Reserve Officers' Training Corps came into being with the passage of the National Defense Act of 3 June 1916. Units were initially established in the land grant colleges, absorbing the instruction in military science as previously conducted. Other than this, little was accomplished in the way of expansion because of the interruption in all phases of college activity during the first World War. At that time the ROTC gave way to the Students' Army Training Corps. A few ROTC units were started in 1917 and 1918, but the program did not really get under way until 1920 when 190 reserve officers were graduated. There was reasonable and steady growth, and in 1942 the 265 ROTC units graduated approximately 10,000 officers. Altogether, about 125,000 graduates entered the Officers' Reserve Corps between the two World Wars. Of these, 100,000 were on hand and immediately available at the outbreak of World War II. The ROTC program was again interrupted in 1943 for the duration of the war, during which period emphasis was placed on the Army Specialist Training Program at colleges and universities.

The postwar ROTC was activated in modest form in October 1945 and two years later produced about 700 second lieutenants, the first for the postwar period. During this time considerable difficulty was experienced in getting the program rolling. The apathy of students, due to the demobilization of the Army, and the natural let-down of interest in war activities, created an enrollment handicap. But progress was made, and in 1948 about 5000 were graduated; in 1949, about 6000. In 1950, it is expected that 10,000 second lieutenants will be added to the rolls of the Officers' Reserve Corps. Present enrollment in the Senior Division Army ROTC, consisting of units at institutions on the college level is as follows:

First year	46,396
Second year	32,261
Third year	12,087
Fourth year	10,622

Over-all enrollment, including Junior Division units in preparatory and high schools, now numbers over 150,000.

General supervision of the ROTC program is exercised by the Director of Organization and Training, Department of the Army. Execution of the program is the responsibility of the Chief, Army Field Forces, through the Commanding Generals of the numbered Armies. The Junior Division program is carried out in high schools and private military schools on the high school level, and consists of four years of elementary military training. The graduate receives nothing in the way of a commission or noncommissioned warrant in the Organized Reserves, but his training may serve to provide advanced standing in the Senior Division ROTC. All Senior Division units established at colleges, universities and other institutions on the college level, are organized into a Department of Military Science and Tactics within each such institution. The senior line officer assigned to the department is the professor. There

are now 433 Senior Division units operating in 190 institutions. These units are as follows:

Branch or Service	*Number*
Infantry	108
Field Artillery	36
Antiaircraft Artillery	29
Armored Cavalry	14
Medical Corps	49
Corps of Engineers	44
Signal Corps	37
Quartermaster Corps	26
Ordnance Department	23
Transportation Corps	22
Dental Corps	18
Corps of Military Police	9
Veterinary Corps	6
Chemical Corps	5
Pharmacy Corps	4
Army Security Agency	3

The Senior Division ROTC program of instruction is designed to form a part of the student's college curriculum with a view to producing a graduate with baccalaureate degree who has the qualities and attributes essential to his progressive and continued development as an officer of the Regular Army or the Civilian Components. This is the mission of the ROTC.

The complete four-year program is divided into the basic course, given during the first two years, and the advanced course, during the junior and senior years. The student has three hours of ROTC instruction per week during his basic course and five hours per week during the advanced course. A summer camp is conducted between the last two academic years. All advanced cadets must attend the camp.

The first year of the on-campus training is common to all units. One hour per week is devoted to close order drill and basic disciplinary instruction. During the remaining two hours each week the cadet receives theoretical classroom instruction in such subjects as map reading, hygiene and first aid, the National Defense Act, military psychology and personnel management. Also, more difficult subjects relating to the geographical foundations of national power, the military problems of the United States, and military mobilization and demobilization are covered. These subjects are considered to be basic essentials for officers of all branches.

The principal change in the postwar program over the prewar program has been the increased instruction in specialized branch subjects. Specialization now starts in the second year basic course. This change was brought about after considerable discussion and study during the early postwar years. It was felt that increased specialization in all branches of the Army made it necessary that the student who took only the basic ROTC course should have some training in the tactics and technique of one branch. Therefore, the entire second year basic course, with the exception of thirty hours drill, consists of a broad introduction to those basic subjects pertaining to the branch unit in which the student is enrolled.

Similarly, the first year of the advanced course is entirely devoted to branch subjects, plus thirty hours drill. During this year the cadet is exposed to the more advanced details of his branch. In the line units, this instruction includes drill with the weapons of the arm, the care and operation of weapons, communications, small arms and minor branch tactics. In the service units, the course includes branch organization, administrative and fiscal procedures, and branch tactics. The first year advanced course is designed to prepare the cadet for the practical training he will receive at camp during the following summer.

This camp is of six weeks duration and is conducted at an Army post suitable for training in the branch of the unit. Cadets from many institutions attend any one of the several camps. During the period of the camp, training is intensive and the cadet learns "by doing." His training is practical and includes the actual operation of the ordnance and other matériel peculiar to his branch. He fires individual weapons and participates in the firing of crew served weapons. He takes part in minor tactical problems and field exercises. In addition, he receives physical training and engages in supervised athletics. The camp schedule includes provision for the cadet's moral and religious welfare. Many varied and ample recreational opportunities are open to him. In general, the program of instruction at ROTC summer camp closely parallels that conducted at the standard Officer Candidate Schools.

During the fourth and last year of on-campus training, the instruction continues in branch tactics, techniques, and procedures. In addition, several hours are devoted to the more advanced courses common to all branches. These include military law and boards, military administration, teaching methods and psychological warfare. Thirty hours of drill are again required, but during these periods the exercise of command is emphasized and the student is trained as a cadet officer.

In addition to the theoretical and practical lessons learned by the ROTC cadet at school and at camp, his most important acquisition from this ROTC training is the development of those attributes of character which are inculcated by the basic disciplinary instruction and daily contacts with the military service. Among these are leadership, patriotism, a high sense of duty, and respect for authority. It goes without saying that the student's ROTC training contributes greatly toward making him a better citizen.

Prior to World War II, the officer strength of the Regular Army was such that nearly all of the vacancies occurring annually could be filled from graduates of the Military Academy. Although the Thomason Act provided for a "competitive tour" of about one thousand reserve second lieutenants each year, relatively few of these received Regular Army commissions. With the postwar increase in the Regular Army, it is now expected that one thousand new regular officers will be required annually. Of these, only three or four hundred will be furnished from the Military Academy. The remainder, with certain exceptions, will come from the ROTC, either as direct commissions under the Distinguished Military Graduate program or through the Competitive Tour. New emphasis is thus added to the Reserve Officers' Training Corps.

Behind The Scene With The Target Grid*

Prepared in the Department of Gunnery,

The Artillery School

By Major Robert S. Stafford, FA

PART I

A study into the background of conduct of observed fire reveals that war experience indicated the desirability of simplifying the procedure as much as possible. Primarily, it was desired that this simplification reduce the mental calculations and arithmetical computations required of the observer, yet permit him to obtain rapid and timely adjustments of fire. The result is the new observed-fire procedure using the target grid. This method has reduced the observer's problem by enabling him to fire every mission as if he were on the gun-target line. However, in reducing the observer problem, it was necessary to devise a means whereby the former mental gymnastics (namely, those caused by the observer's offset from the gun-target line) of the observer could be solved elsewhere. The target grid was devised as the means for graphically converting the observer's corrections into fire commands. The target grid is operated by the fire-direction center. Thus, the observer-fire-direction center team has become more inseparable than heretofore.

The articles on "Shooting Without Factors" which have been published previously (*Field Artillery Journal*, Sept.-Oct., 1948; Nov.-Dec., 1948; ANTIAIRCRAFT JOURNAL, Nov.-Dec., 1949), have dealt primarily with what the observer does. They have not explained in detail exactly what happens in the fire-direction center and at the battery. There are many approaches to an explanation of this matter, but generally the method of using examples excels in clarity. For this reason, this article will contain examples of fire missions. These missions will cover in detail the operation of the observation post, the fire-direction center, and the battery position.

EXAMPLE. Target, base point; mission, precision registration (no previous firing in this area). Adjustment to be conducted starting from any round in the impact area visible to the observer. The battery is in position and has been laid on a compass. Aiming posts have been set out at deflection 2800.

Observer: FIRE MISSION, AZIMUTH 420, MARK CENTER OF SECTOR, BASE POINT, PRECISION REGISTRATION, WILL ADJUST.

FDC: The S3 selects a battery to fire this precision registration. Then he supervises the determination of approximate data which will be surely safe. The first round is fired so as to come fairly close to the center of the sector of fire. After this firing data are determined and checked by the S3, they are sent to the battery in the form of fire commands. (The target grid has not yet come into the picture.)

Battery: The Battery, upon receiving the initial commands, follows them in the prescribed manner, and fires.

Observer: The observer sees the burst, measures the deviation, and estimates its position with respect to the target for range along the OT line. He decides to send RIGHT 600, ADD 400.

FDC: Meanwhile, the HCO has placed the target grid over the location on the chart used to obtain data for the initial fire commands. The target grid is then oriented on the azimuth received in the initial fire request. The first subsequent correction by the observer is now plotted by moving from the center of the target grid, RIGHT 600 (perpendicular to the arrow on the grid) and ADD 400 (parallel to and in the same direction as the arrow). The HCO uses the range-deflection fan to determine the deflection and range to the new plot. He announces, BAKER, DEFLECTION (SO MUCH), RANGE (SO MUCH). The computer announces the new deflection to the battery, and upon determining the elevation corresponding to the new range, sends it to the battery.

Battery: Now that the target grid is being used, the first change takes place in the method of receiving data at the battery. Instead of making a shift as was done when range-bracketing and deflection-bracketing procedures were employed, the gunner merely sets off a new deflection and the No. 1 sets off the elevation. The round is fired.

Observer: The observer notes the location of the burst and sends the correction DROP 200.

FDC: The HCO plots this correction on the target grid in the same manner as the first subsequent correction was plotted, and again determines the data. He announces this as DEFLECTION (SO MUCH), RANGE (SO MUCH) to the computer. The computer repeats the deflection to the battery, and upon determining the elevation corresponding to the new range, sends it to the battery.

Battery: The new data are set and the round is fired.

Observer: The observer notes the location of the burst and sends the correction ADD 100.

FDC: The HCO plots this correction on the target grid and follows the same procedure as before. The computer sends down the appropriate fire commands.

Battery: The battery fires.

Observer: The observer notes the location of the burst, and sends DROP 50, FIRE FOR EFFECT.

At this point in the fire mission, the control passes to the fire-direction center. The S3, or whoever is designated

*Reprinted from May-June and Sept.-Oct. 1949 issues of *Field Artillery Journal*.

by him, actually conducts the mission during fire for effect. During the adjustment phase of this mission, the S3 (or the person designated) has been keeping a record of the deflections fired which resulted in line shots for the observer. (Line shots give a deflection sensing, and are recognized because the observer made no correction for deviation.) The last correction sent by the observer is acted on in the usual fashion, that is, data are taken from the target grid, given to the computer, and sent to the battery. The first round in fire for effect is then fired at deflection 2850. The observer, having given fire for effect, knows that during the rest of the mission, he will merely sense the rounds. They will be sensed for range on the OT line as OVER, SHORT, or DOUBTFUL; for deviation, as LEFT, RIGHT, or LINE. The S3 will convert the sensings to the GT line.

Observer: The observer notes the first round in fire for effect and senses it SHORT, LINE. This sensing is sent to the FDC.

S3: The S3, knowing the position of the battery as well as the angle T, can readily see that, from the battery, this round is short and the deflection is right. He then looks at the record of deflections fired during adjustment and sees that the last line shot giving a deflection left in adjustment was fired at deflection 2860. This establishes an existing deflection bracket of 10 mils (first round in fire for effect fired at 2850). From the record, the round in adjustment at deflection 2860 was fired at 50 yards greater range on the OT line than the first round in fire for effect. Therefore the deflection bracket is equal to ½ S. The S3 splits this bracket progressively until deflection is correct. His commands: DEFLECTION 2855, ELEVATION 216 (the elevation at which fire for effect was entered). The computer sends this to the guns.

Battery: The battery complies with the computer's command.

Observer: The observer notes the location of the burst and senses it as DOUBTFUL, LEFT.

S3: The angle T in this case is 400 mils. The S3 senses this round by rule as SHORT, DEFLECTION DOUBTFUL. His command: 216. The computer sends this elevation to the battery.

Battery: The battery fires.

Observer: The observer senses OVER, LINE.

S3: The S3 senses this round with respect to the GT line as OVER, DEFLECTION LEFT. He will now split the existing deflection bracket (deflection 2855-2850). His command: DEFLECTION 2853, 216 (having received both overs and shorts for range at this elevation, the second group of three is fired without changing elevation). The computer sends these commands to the battery.

Battery: The battery fires.

Observer: The observer senses DOUBTFUL, RIGHT.

S3: The S3 senses this with respect to the GT line as OVER, DEFLECTION DOUBTFUL. His command: 216. The computer sends this command to the battery.

Battery: The battery fires.

Observer: OVER, RIGHT.

S3: The S3 constructs this round as being a forced OVER, DEFLECTION DOUBTFUL. His command: 216. The computer sends this command to the battery.

Battery: The battery fires.

Observer: SHORT, LINE.

S3: This round is sensed by the S3 as SHORT, DEFLECTION RIGHT. He splits the deflection bracket (deflection 2855-2853). The adjusted deflection is 2854 and the deflection is correct. The range sensings are 3 overs and 3 shorts, so the adjusted elevation is 216 (there is no change in the method of computing the adjusted elevation). The S3 sends to the observer, CEASE FIRING, END OF MISSION.

PART II

PART I gave an example of a precision registration. The two standard types of missions remaining are area percussion and area time. The example in this article is designed to explain and clarify all operations in an area percussion type of mission. Of course, the general procedure is the same as in the precision mission, but in order to delineate any minor differences, a short, but complete, example follows:

EXAMPLE: Target, infantry company in the open on fairly flat, rocky terrain; mission, neutralization. A base-point registration has been made in the target area, and the estimated observer-base point distance is 2,000 yards.

Observer: FIRE MISSION, AZIMUTH 790, FROM BASE POINT RIGHT 350, UP 10, DROP 600, INFANTRY COMPANY IN OPEN, FUZE DELAY, WILL ADJUST.

FDC: The S3 decides this target is worth the battalion and gives his fire order, including BATTALION, ABLE, FUZE DELAY, TWO VOLLEYS. The HCO orients the target grid on the OT azimuth with its center on the base point. The target is then plotted in the same manner as in a precision mission. The target pin is moved from the center of the target grid RIGHT 350 (perpendicular to the arrow on the grid) and DROP 600 (parallel to and in the opposite direction from the arrow). The HCO uses the range-deflection fan to determine the deflection and range to this plot, and announces, ABLE, DEFLECTION (SO MUCH), RANGE (SO MUCH). The Able computer announces the deflection to the battery, and upon determining the elevation corresponding to the new range, sends it to the battery. Since no special method of fire was requested, CENTER ONE ROUND is used. While the adjusting computer is giving the commands to fire the first volley in adjustment, the HCO gives data to the computers of the nonadjusting batteries. They use these data to determine fire commands for their batteries, which are then laid.

Battery: The gunners set off the deflection and the No. 1's set off the elevation. CENTER ONE ROUND is fired.

Observer: The observer notes the location of the volley and sends the correction ADD 400.

FDC: The HCO plots this correction by moving the pin from the initial plot 400 yards parallel to and in the same direction as the arrow on the grid. He determines the data, announces it, and the computer sends fire commands to the battery.

NOTE: This procedure is continued in the same manner

until the observer sends FIRE FOR EFFECT. He sends this when he sees a bracketing volley or splits a 100-yard bracket on the OT line.

Observer: The observer notes that a 100-yard bracket has been established and that the bursts are not on ricochet, and determines that his next correction will be to split this bracket and fire for effect. He sends FUZE QUICK, ADD 50. FIRE FOR EFFECT.

FDC: The HCO plots this correction by moving, from the plot of the last volley fired in adjustment, 50 yards parallel to and in the same direction as the arrow on the grid. The data are measured and announced. The computer sends the commands FUZE QUICK, DEFLECTION (announced by the HCO), BATTERY 2 ROUNDS, ELEVATION (corresponding to range announced by the HCO). While the adjusting computer (Able) is sending these commands, the HCO is reading and announcing the data for the other two batteries to the final plot of the target pin. (This procedure is, in effect, replotting every mission and is as fast as using corrections to deflection and elevation from the adjusting-battery computer.) The adjusting-battery computer now announces CORRECTIONS, FUZE QUICK. ("Corrections" now contain only changes in fuze and site.) The non-adjusting computers incorporate this into their commands for two volleys.

Battery: The batteries set off the new data and fire two volleys with fuze quick.

Observer: Seeing that the fire for effect is on the target and accomplishes the mission, the observer sends, CEASE FIRING, END OF MISSION, INFANTRY DISPERSED. (Note that the observer terminates area fire missions, while the FDC normally terminates precision missions.)

A Visit To The 7th Infantry Division AAA Firing Range

By Corporal Paul Hershey

A visit to the Kitakai antiaircraft firing range on Chiba Bay assures you an interesting trip. You not only observe rural Japanese at work, but you rub shoulders with the common people of Japan.

The electric train which you board at Tokyo's Akibahara station is of ancient vintage—old enough to be drawing longevity pay—and without heat. It rattles and jerks, and at the end of an hour's trip deposits you in Chiba where you transfer to a steam train. You are met by a local representative of the Rail Transportation Office who dashes up the track to the last car and tells the conductor it is OK for you to travel without a ticket. Besides, he hasn't the time to make one out for you! The conductor is the soul of courtesy as he offers you his special seat. Later, when you transfer to a third train, he conducts you to your proper place after formally introducing you to the new conductor. This train is without benefit of seats or the most elementary conveniences. It is packed jam full and you squeeze yourself thin between two Japanese rustics who are evidently rice farmers.

Close quarters help to break down formal barriers, and by means of sign language assisted by a few odd pieces of chewing gum and candy you are assured that your neighbors will help you reach your destination.

At a way station transfer point your new-found friends motion you off the train and lead you to the one bound for Kitakai. A girl conductor gives your ticket another punch which now resembles a sieve. When the last ticket is punched she waves OK to the engineer. He blows a tiny shrill blast on his whistle and you're off. This amazing pony edition of the iron horse hauls four miniature coaches each seating but twelve passengers. The engine is barely head high. The train runs on a 28-inch gauge and never exceeds six miles per hour. The track is laid between the ridges separating rice paddies, and as you travel along you pass thousands of acres of rice being harvested by industrious Japanese farmers. Houses line the right of way and you seem to be traveling through the front yards of countless farmhouses all peopled by industrious folk. Way stations where an occasional stop is made are merely grass mounds.

Eventually you reach Kitakai, the end of the line, and all alight. You start down the main street looking for something that spells Army. Suddenly you are aware that one of the passengers who accepted a stick of chewing gum from you is noiselessly riding a bicycle at your side. He grins, lifts your bag to his handlebars, and pedals along in contentment, whatever your gait. You realize that chewing gum and candy never made an enemy in Japan. Now a few more fellow passengers join you. One speaks English quite well and tells you that the target practice begins at noon. You have plenty of time.

The forty-minute walk to the firing range passes quickly. The 40mm Bofors and the 37mm guns with their quadruple 50's blaze away at towed sleeve targets and tricky radio-controlled target planes. The firing demonstrates the combat readiness of the gun crews, but you have seen this all before. Your thoughts are still on your recent train trip: the courteous, smiling conductors; the friendly, jostling crowd of standees; and your most recent acquaintance—the gum-chewing cyclist.

Organizing and Training an ORC Guided Missile Battalion

By Lieutenant Colonel A. A. Currie, CAC (Res.)

In World War II, as in most major conflicts, many new and improved methods of waging war were introduced. One of the more important new weapons was the guided missile, and it is now apparent that this weapon will be employed extensively in any future conflict. With advances in the art of guided missile design, development and employment, steps must sooner or later be taken to train units of the Regular service and the civilian components in the operation of this armament.

The writer is not cognizant of current thought in the Department of the Army on what time scale may be applicable for the activation of guided missile units. However, since the early part of 1946 there has been considerable interest on the part of individual members of the Reserve Corps in the formation of ORC guided missile units. A number of such units have been formed on an informal basis, and some of these possibly have been formally activated during the past year or so.

Even with a total absence of matériel on which to train, it would seem wise to activate such units in the ORC, at least on a Class C status, and thus take advantage of the technical abilities of many Reserve officers to absorb the basic fundamentals of the guided missile art. Even though the units which are activated now may never be called into service as units, the officers so trained will form a valuable leaven for units which may be activated during any future emergency. This is the story, to date, of the organization and early training of one of these units, the 1536th Guided Missile Battalion (Training).

In the spring of 1947, First Army circulated a memorandum to ORC Unit Instructors in the New Jersey area requesting recommendations on the desirability of forming guided missile units in this area. On the basis of the replies to this memorandum, Lt. Col. T. H. Leary, Coast Artillery Unit Instructor for the North New Jersey area, prepared and circulated a questionnaire to a number of Reserve officers asking whether or not they would be interested in assignment to such a unit. In the preparation of this questionnaire, consideration was given to the qualifications which might be applicable for an officer to be assigned to a guided missile unit. It was felt that the technical complexities of guided missiles and the present state of the art made it desirable to query only those officers who were engineers or scientists by profession.

Obviously no guided missile unit is going to be officered in an emergency solely by engineers and scientists, nor would such a procedure be necessary. It is equally obvious, however, that a group of this character, familiar with the phraseology common to the engineering profession, should be able to absorb the technical fundamentals of this new art more rapidly and more evenly than would a group not so constituted. The training of the unit should, as a consequence, be appreciably accelerated.

Since this area is highly industrialized, such a restriction on the civilian profession of prospective assignees did not appear to be a critical bar to the procurement of the required number of officers. So it proved as the questionnaires were returned, and it appeared that sufficient personnel would be available to officer about two battalions. It may be noted in passing that sufficient interest was aroused by the contemplated formation of guided missile units that several officers on the inactive list requested transfer to the active reserve and assignment to one of the units; a number of these officers were so assigned and are now taking an active part in the unit training programs. Another word about the list of officers to which this questionnaire was mailed. No particular consideration was given to an officer's basic arm or service in circularizing him for this assignment. One reason for this was that well qualified officers of branches other than artillery were available and interested, and it was felt that their diversified military backgrounds would be of much value to a unit of this type. A secondary reason was that the bulk of the artillery officers in the area were already assigned to artillery units and were actively training with them.

Authorization for the organization of two battalions in the North New Jersey area was received in the spring of 1948: the 1536th, a surface to air G.M. battalion, and the 1570th, a surface to surface G. M. battalion. The nucleus of the 1536th was placed under the command of Colonel F. C. Sweeney, CAC-Res, and of the 1570th under the command of Colonel J. H. Lewis, CAC-Res. Organizational meetings of both units were held during the spring at, respectively, ORC Unit Headquarters at the Kearny Navy Yard, Kearny, N. J. and in Elizabeth, N. J. Assignment of personnel to both units was delayed until the fall of 1949, due to a requirement that all personnel had to be cleared for access to classified material prior to assignment. Even though this requirement delayed the training programs for several months, it is felt that it was desirable, since only general fundamentals can be covered in a guided missile training program without infringing on classified matter. As a consequence, no officers were assigned to either unit until the middle of October. As of the end of 1949, about 18 officers have been assigned to each unit.

In the fall of 1949, both units were reassigned to Col.

TRAINING PROGRAM

1536th GM Bn & 1570th GM Bn

Meeting Number	Lecture Subject
1949:	
	Introduction to and History of Guided Missiles
Y	Employment of AAA
	Electrical Fundamentals—I
Z	Employment of FA
	Electrical Fundamentals—II
1950, 1st Quarter:	
1	AAA Matériel The Ballistic Trajectory
2	FA Matériel Subsonic Aerodynamics
3	Electronics Fundamentals—I Supersonic Aerodynamics
4	Electronic Fundamentals—II Speed Regimes
5	Servos—I Employment of SSM
6	Servos—II Employment of SAM
1950, 2nd Quarter:	
7	Reaction Motors—I Guidance Control Systems
8	Reaction Motors—II Gyroscopes—I
9	Gyroscopes—II Radar Fundamentals—I
10	Radar Fundamentals—II Attitude Control
11	Radar Fundamentals—III Basic Autopilot
12	Electrical Computing Circuits Preset Control Systems—I
1950, 3rd Quarter:	
13	Preset Control Systems—II Rockets—I
14	Rockets—II Terrestrial Reference Systems—I
15	Terrestrial Reference Systems—II Propellants
16	Probability Theory Radio Navigation Systems—I
17	Radio Navigation Systems—II Turbo-jets
18	Celestial Navigation Systems Pulse-jets
1950, 4th Quarter:	
19	Inertial Guidance Systems—I Ram-jets
20	Inertial Guidance Systems—II Launchers—I
21	Launchers—II Command Guidance Systems—I
22	Command Guidance Systems—II Homing Systems—I
23	Homing Systems—II Beam Climbers—I
24	Beam Climbers—II Lethal Devices

Leary's office in East Orange, N. J., and it was immediately apparent that this fortunate assignment afforded the opportunity for joint training. By so doing, advantage could be taken of the experience of officers in both units, the space requirements for meetings could be eased and the unit training programs could be correlated inasmuch as the basic training in this subject is the same regardless of the tactical employment of the missile.

By last fall, a tentative TO had been designated for the units. This TO is one which was prepared some time ago by the AA&GM Branch, The Artillery School and the 1st Guided Missile Regiment at Fort Bliss. It calls for 48 line officers and 14 warrant officers, commanded by a Colonel. Although it was primarily set up for SSM units, it seems reasonably well adapted to SAM units, as well, at least until further tactical study of the employment of guided missiles indicates the need for a change in the organization. Using this TO, and with approximately eighteen officers now as-

signed, the principal battalion staff assignments have been made so that the administrative and training activities of the battalion can be handled expeditiously.

Preparation of a long term training program was initiated in November. It so happened that the Executive Officer of the 1570th and the writer had both attended the latest two-week course in guided missiles at The Antiaircraft School at Fort Bliss during the latter part of October and the early part of November. The training and the published material obtained at this course were invaluable in the preparation of the first year's training program. Incidentally, this particular course is highly recommended to any Reserve officer who may have the opportunity to apply for it. The Guided Missile Department of the School has spent much time and effort in the preparation and presentation of a concentrated course which gives the student a maximum amount of information in the time available. The training program as presently planned for 1950 is outlined in (Figure 1). It will be noted that the emphasis for this first year's training is on basic technical fundamentals. The reason for this emphasis is twofold: by the end of 1950 it is anticipated that all officers who expect to be assigned to the units will have been cleared for security and assigned, by which time it will be profitable to present information on tactics and employment, subjects which are in a state of flux; and secondly, it is the objective of this program to bring all personnel to a common level of fundamental guided missile knowledge, after which it will be feasible to investigate in more detail some of the technical aspects of the guided missile art.

An attempt has been made in laying out the program to preserve continuity of subject matter as much as possible. This has been done by scheduling all lectures on a given subject successively. At the same time it is desirable to diversify each two-hour meeting to some extent to keep interest from lagging late in the evening and, in addition, to permit an instructor in a given subject more time for preparation. This objective has been met by scheduling two different types of subject matter for each period. For instance, three lectures on radar fundamentals have been scheduled during meetings 9, 10 and 11. The first of these, however, is paired with the second lecture on gyroscopes and the other two with lectures on certain phases of guided missile control system.

The program will be presented by all officers of the two units, rather than only by those who have attended the School course. This method of presentation places quite a burden on the individuals concerned, in preparing a complete lecture or series of lectures from relatively limited sources of material—that published by the School and the JOURNAL's Guided Missile pamphlet. It is felt that the additional effort on the part of these officers is warranted for several reasons: the process of preparing a lecture invariably results in the lecturer learning more than he is able to "put across," thus raising the average level of learning in the unit; each officer partakes of more of the training program than he otherwise would, which should assist in keeping interest in the subject of guided missiles at a high level; each officer is enabled to brush up on his platform presence and delivery; and, finally, it is only fair to spread throughout the unit the extra retirement point credit awarded for preparation of a lecture.

As time goes on, the difficulty of lecture preparation will be eased by a gradual accumulation of source material. For the time being, the officers who have attended the School course will be available for help, and all officers have been requested to study the program and volunteer for those lectures which are most closely related to their civilian professions. Of course, where no volunteers present themselves, recourse must be had to the usual system of appointing a volunteer! All officers have been encouraged to keep notes on the lectures, so that by the end of 1950 those who attend regularly will have amassed a respectable volume of notes.

It is believed that the ORC guided missile battalion fills a definite niche in the civilian component structure. As mentioned earlier, units which are formed at this time may never be called to active duty in an emergency as units. The officer personnel of these units, however, can be given valuable training in the fundamentals of the art which will enable them to act in individual or cadre capacities in furnishing assistance in the training of operational units which may be formed in the future. It is also quite possible that, through the medium of individual study and group symposiums in later phases of the training program, ideas of some value on the employment of these weapons may emerge. Guided missiles are here to stay, and no opportunity should be neglected for the dissemination of knowledge on their employment, operation, capabilities and limitations throughout the armed services within reasonable security limitations.

More About Pensions and Life Insurance

By Major James C. J. Ballagh, F.D. (Res.)

Normal retirement or separation from active service in the Armed Forces brings with it the loss of the "six months' gratuity" and the service-connected death "compensation" benefits. This means a substantial drop in financial protection to the dependents of the individual concerned.

However, the widow of a man who dies after leaving the active service may qualify for a "compensation" of $75.00 per month if her husband's death is the result of a disability attributable to his wartime service or $60.00 per month if such disability were attributable to his peacetime service.

If his subsequent death is not the result of any service-connected disability, the widow may nevertheless qualify for a $42.00 monthly "pension" if her husband happened to be a veteran of World War I or a veteran of World War II and had at the time of his death some disability traceable to World War II.

The essential distinction between these words "compensation" and "pension" as used herein is whether or not a death may be attributed to active service causes regardless of when the death takes place—in or out of service.

This nonservice-connected "pension" is only payable when a widow's income from sources *other* than the Veterans Administration (including government life insurance payments) is less than $1,000 in any given calendar year or $2,500 if she has a minor child. The Veterans Administration, which is responsible for the payment of these "pensions," puts a very liberal interpretation on "outside" income when its source is commercial life insurance, and the purpose of this discussion is to further develop some advantages of this interpretation yet caution against certain disadvantages which may not be readily apparent.

Any payment in a lump sum will be considered by the Veterans Administration as income to the widow in the calendar year of the veteran's death only, and if the widow should herself elect income installments in lieu of this lump sum, these installments will not be considered as outside income until they aggregate an amount equal to the lump sum which was originally charged as income. This lump sum method is a hazardous way for a man to distribute the proceeds of his life insurance for it creates problems for his widow rather than solving them for her in advance by prescribing income, subject to her "right of withdrawal" in a lump sum in lieu of the prescribed installments. This latter method is recognized by the Veterans Administration PROVIDED the insured stipulated this right in his commercial life insurance contracts.

This is most beneficial because the advantages of income options inherent in life insurance contracts are retained for all of the insured's beneficiaries, without changing the general plan for his estate distribution. However, a marked disadvantage, under certain circumstances, may lie in opening the door to the rapid dissipation of the principal by the widow if she exercises the withdrawal right.

Thus, any possible advantage of a lump sum payment is preserved without the disadvantage of any of these funds going into a widow's estate at her death and impairing the interests of the children who were named as contingent beneficiaries—for upon the widow's subsequent death the balance of the insurance proceeds usually must be paid to her estate instead of the children, and, if the latter ever receive any of these funds, it will only be after the delays, costs and inheritance taxes that are incident to the probate of the widow's estate. Further, these funds are in this way removed from the unjust demands of the widow's creditors who might otherwise attach a lump sum payment and completely upset the plans of the insured for his family.

One point cannot be overemphasized: *These are matters with which to be concerned only upon retirement or separation from active service. It is wholly unnecessary to make such changes while remaining on active duty.* To do so would be to anticipate conditions which may never exist and prejudice a sound plan which is predicated on the eventuality of death while in the active service and subsequent benefits to dependents.

For example, consider the case of General K, a veteran of World War I, who will retire shortly with over 30 years' service. Presently his estate, composed chiefly of life insurance, is planned to be distributed under certain life annuity options which assure his widow of an adequate income if he should die while on active duty yet assure his children the continuing benefit of these options if she should predecease him or die too soon after his death to receive the full benefits. Just prior to his actual retirement, he should review the situation and consider rearranging such amounts of his commercial life insurance as may be necessary to qualify his widow for the $42.00 monthly pension, by simply adding a clause to some of his contracts providing for the "right of withdrawal at time of claim."

On the other hand, Major D is a veteran of World War II and has a service-connected disability dating back prior to July 25, 1947, for which he may be retired shortly. Since his estate consists chiefly of real estate and securities which provide income in an amount well in excess of $1,000 a year, his widow would be disqualified from the $42.00 a month "pension," by this very fact alone, in the event of his subsequent death due to causes not related to his war service. Therefore, there is little reason for rearranging Major D's carefully planned life insurance distribution and exposing any part of the life insurance proceeds to possible dissipation or unwise investment by his widow.

The preceding examples are true situations and serve to illustrate that one should take careful stock of his own particular circumstances before seeking to rearrange or disturb a well thought out plan of estate distribution by any ill-advised concern to secure a government benefit.

Courses of Instruction, AAA & GM School

Fort Bliss, Texas

RESUME OF COURSES

There are currently nine officers' courses and four enlisted courses of instruction being conducted at the AA and GM Branch, The Artillery School.

OFFICER COURSES

ARTILLERY OFFICER BASIC COURSE (10 weeks)
Purpose: To produce battery grade officers thoroughly grounded in the principles and technique of artillery. Special emphasis will be given to developing battery commanders.

ARTILLERY OFFICER ADVANCED COURSE (9 weeks at Fort Bliss, 42 weeks at Fort Sill)
Purpose: To train selected officers for command and staff positions within artillery units (battalion and higher) as well as for general staff duty with divisions.

ANTIAIRCRAFT OFFICER ASSOCIATE BASIC COURSE (13 weeks)
Purpose: To produce battery grade officers well grounded in the principles and technique of antiaircraft artillery. Special emphasis will be devoted to developing capable battery commanders. This instruction is provided primarily for officers of the Organized Reserve and National Guard in the branch. All artillery graduates of Army OCS, detailed in the Antiaircraft Artillery, will attend this course immediately after they are commissioned.

ANTIAIRCRAFT OFFICER ASSOCIATE ADVANCED COURSE (13 weeks)
Purpose: To provide comprehensive instruction in condensed form which parallels that Antiaircraft Artillery portion of the regular advanced course. This instruction is provided primarily for officers of the Organized Reserve and National Guard in the branch, and, regular officers of other branches.

GUIDED MISSILES (REGULAR) COURSE (37 weeks)
Purpose: To indoctrinate officers of all three of the services with the fundamentals, tactics, and techniques in the field of guided missiles.

GUIDED MISSILES (ASSOCIATE) COURSE (13 weeks)
Purpose: To indoctrinate officers of the ground arms with the fundamentals, tactics and technique in the field of guided missiles. This instruction is provided primarily for officers of the Organized Reserve and National Guard.

GUIDED MISSILES INDOCTRINATION COURSE (2 weeks)
Purpose: To indoctrinate officers of the Organized Reserve Corps and the National Guard, who are not on extended duty, in the reasons for the guided missile program, the direction the guided missile program is taking, the difficulties being encountered and that may be foreseen, the present state of guided missile program, the expected uses of guided missiles, the organizations required for using guided missiles and the defense against guided missiles.

RADAR ELECTRONICS COURSE (26 weeks)
Purpose: To train selected officers in radar theory, stressing fundamentals of electricity and electronics; and the operation, organizational maintenance, tactical and technical employment, and command inspections of radar sets peculiar to their respective arm. To familiarize them with the present and probably applications of electronics in the Guided Missile Field.

SENIOR AA OFFICERS' INDOCTRINATION COURSE (2 weeks)
Purpose: To refresh Group and Brigade commanders and staff officers on latest AAA trends and developments; and to improve the knowledge and technical ability of those officers with little or no experience with AAA equipment who are conducting technical instruction in AAA Battalions and smaller units of the National Guard, Organized Reserve Corps, as well as Assistant PMS&T's of AAA ROTC.

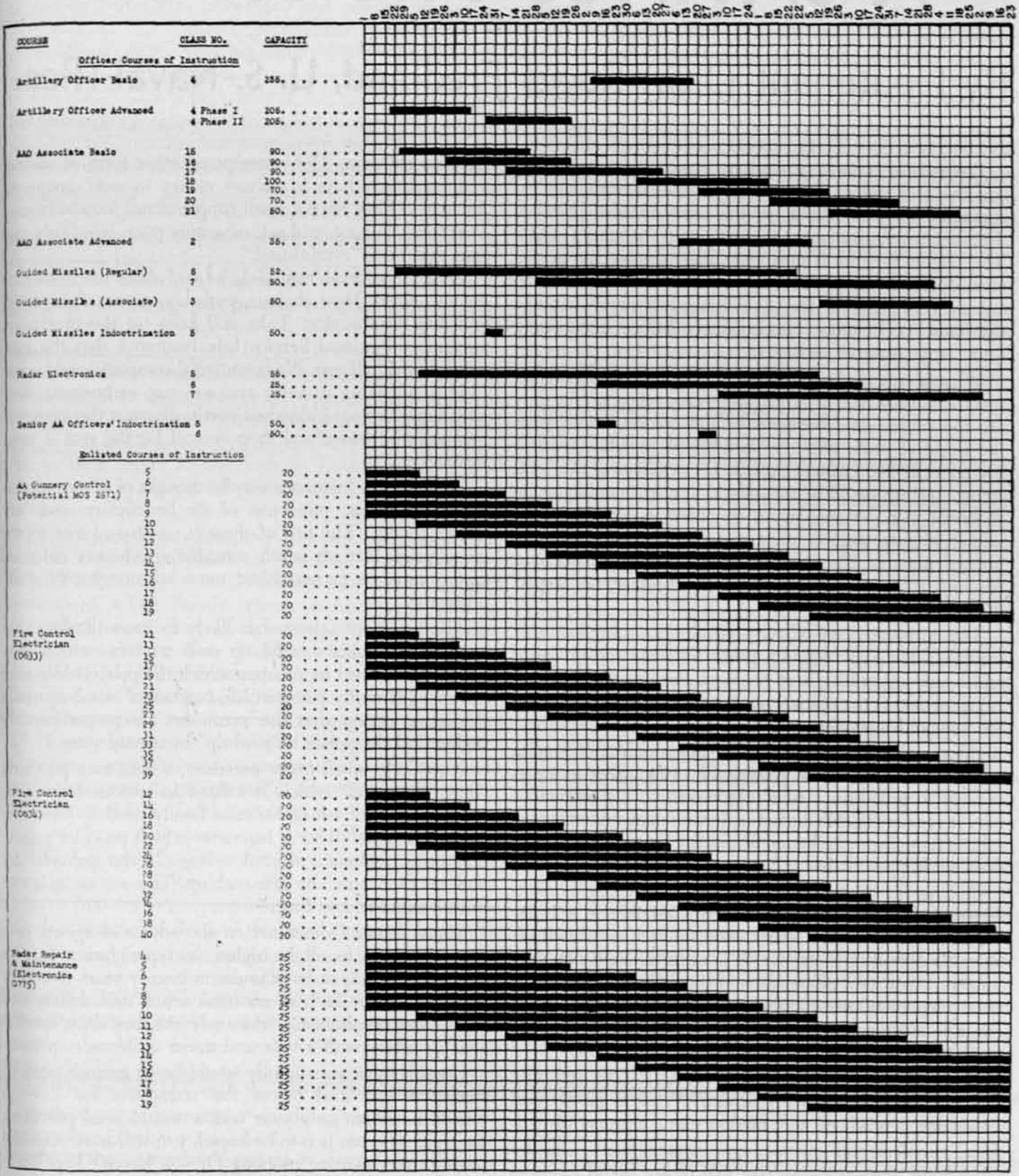
ENLISTED COURSES

ANTIAIRCRAFT ARTILLERY GUNNERY CONTROL COURSE (MOS 2671) (22 weeks)
Purpose: To train selected enlisted men in the general field operations of AAA units. Successful completion of the course will qualify enlisted men as "potential" AAA Master Gunners (MOS 2671).

FIRE CONTROL ELECTRICIAN COURSES (MOS 0633 and 0634) (Gun-23 weeks, AW-22 weeks)
Purpose: To train selected enlisted men in fire control operations of AAA units. Graduates are qualified for assignment to duty as Fire Control Electricians (MOS 0633 AW) (MOS 0634 Gun).

RADAR REPAIR AND MAINTENANCE COURSE (MOS 0775) (37 Weeks)
Purpose: To train selected enlisted men to maintain and repair AAA radar equipment. Graduates are qualified for assignment to duty as Radar Mechanic (MOS 0775).

SCHEDULE OF COURSES, AA & GM BR, TAS, 1949-1950



A SAVINGS PROGRAM*

By Lieutenant (J.G.) Roger Fredland, U. S. Naval (Res.)

Professional men in general are notorious for exercising bad business judgment in their personal investments. As compared to businessmen in the same income brackets, their estates at retirement are commonly woefully small. The reason for this is apparent: their day-by-day experience does not equip them to make wise investment decisions. Very generally they do not take the trouble to make the most perfunctory investigations before committing quite large sums of money.

What is true of doctors, lawyers, dentists, etc., in this respect is doubly true of Army and Navy officers. Not only are the professional concerns of the officer remote from the world of profit and loss; in addition the conditions of his personal life militate against his developing the local contacts which could be valuable to him in choosing an investment plan. Moving about on orders as he does, he is seldom able to stumble on a real estate bargain in a depressed market. Nor does he ordinarily have friends in banking or brokerage circles who can let him in on "a good thing in steel."

The Army or Navy officer is on all the sucker lists ever compiled. He pays premium prices for rents and uniforms and nearly everything else he buys. Perhaps the wonderful thing is that the officer ever saves anything at all, except the hope of his pension.

Admittedly no one is ever going to get rich on a Service salary. But it ought to be possible for every officer to amass enough to give him a tidy supplement to his retirement pay. It is only possible, however, for the man who will give a little thought to the matter at regular intervals. An estate does not happen. It has to be planned.

Perhaps the one indispensable item in any man's investment program is his life insurance. Certainly it is indispensable for a married officer. And, in fact, nearly all officers do carry life insurance. It is unfortunately not true, however, that most officers have a carefully planned insurance program tailored to their individual needs. Some carry too little insurance. A few carry too much. Nearly all carry too expensive types. Some insure the wrong people.

Now it is obviously not possible to say, "This and only this is a proper insurance program." What is proper and reasonable depends on age, marital status, number of children, supplemental income, and temperament. On the other hand, there are cases like that of my friend Lieutenant Commander X, who has straight life and endowment policies for fifty-odd thousands of dollars, on which the annual premiums total well over $1,500. He and his wife have no children. They attempt no other form of saving and frequently have to borrow money to meet premium due dates. They have a small supplemental income from a trust fund, but are, and act, miserably poor. It is fairly evident that he is "overinsured."

What, in general, can safely be said about life insurance for an officer? Most obvious, probably, is the oft-repeated and ever true advice: Take and keep up the maximum amount of National Service Life Insurance that the government will sell you. No commercial company could come close to matching its value and still stay in business. Second, consider your individual needs, discount the advice of insurance salesmen, and shop around for the rest of your insurance.

Ordinary life insurance may be thought of as encompassing two features: protection of the beneficiary, and "enforced saving." The first of these is worth any man's purchase price. But it's worth considering whether enforced saving can't be accomplished more advantageously some other way.

The insurance salesman is likely to stress the fact that straight life policies build up cash reserves, which may actually be cashed in, or upon which the policyholder may borrow. ("Twenty payment life insurance" is substantially the same, except that the premiums are proportionately higher and the policy is "paid up" in twenty years.)

Now for a *much lower premium,* a man may purchase "term insurance," which is written in various forms—the most practical of which for most family heads is "ten year renewable term." This is insurance which provides protection only, without enforced saving. If the policyholder outlives the "term," he gets nothing. There is no cash surrender value at any time.

Many people (sometimes on the advice of agents who naturally prefer to sell the higher-cost types) hate to buy insurance which "you have to die in twenty years to collect on," but on the basis of common sense, and dollars and cents, term insurance is definitely the best buy for the average officer with a wife and minor children to protect.

Consider that your family would be in greatest need of money if you died before the youngsters are through school. Later on, only your widow would need providing for. And later on, it is to be hoped, you will have acquired other income-earning property (if you haven't kept yourself "insurance poor").

Consider that the "cash surrender value" (and the amount you can borrow on your policy) of straight life is the difference between the cost of this type and the less expensive term insurance. If you die, the company pays off the face value of the policy only (as with any type of insurance).

*Reprinted from the December 1949 issue of *The U. S. Naval Institute Proceedings.*

The company keeps the cash surrender value in that case.

Hence, even if you can afford, or think you can afford, adequate "straight life," you'd still be better off paying for protection only (term insurance) and putting the saving in premiums into Series E government bonds. Then in event of your death, your beneficiary would have not only the face value of your policies, but also the bonds.

The value to the policyholder of the "savings" in straight life insurance is largely mythological, not only because if you die the insurance company keeps them, but also because if you have to borrow on your insurance, the insurance company charges you five or six per cent interest for the use of your own money. (As a matter of fact most commercial banks will lend you money with your insurance as collateral at 4%!)

Insurance companies also write "modified life" (with premiums increasing year by year), "decreasing life" (on which the premiums are constant, but on which the maturity value decreases year by year), which possess some features of both straight life and term insurance. Endowment insurance and annuities are types in which enforced savings is the principal feature, and protection a secondary one. Their premiums are, of course, correspondingly high. As to their value to the average insurance-buyer, this writer's advice remains, "Buy insurance for protection, not to save money."

As to where to buy insurance, the best advice is to consult an experienced insurance consultant (who does *not* himself sell insurance). His small fee is likely to be money well spent. (The Family Insurance Analysis Bureau in New York is one of many such counselling services often recommended.) In New York and Massachusetts, it is possible to buy life insurance, including term insurance, at savings banks at an attractive rate. (In New York, for example, renewable term insurance at age 35 is available at $7.75 per thousand.) The Farm Bureau Life Insurance Company, organized as a cooperative, sells term insurance and other types at exceptionally low premium rates. But as a matter of fact, the Metropolitan and many of the other big, well-known companies will write term policies.

Before leaving the subject of life insurance, it might be noted that it is unwise for an officer to carry substantial policies on his wife or minor children. The protection a family needs is against the death of the breadwinner of the family.

Let us suppose, then, that we have our "typical officer"—age 33, married, with two children, 3 and 5 years old—carrying a $10,000 National Service Life, for which he pays about $80 a year premium, and $20,000 worth of term insurance, on which he pays about $150 a year premium—a total of $230 a year. Can he afford to "save" any more than that? On the rule of thumb that we all should save at least a tenth of our gross income, it would appear that he's "able" to save considerably more. There was a time when "savings" connoted the savings bank; and when savings accounts drew 4 per cent interest, compounded semiannually, this was reasonable. Nowadays, it is foolish to keep more than a "rainy day" emergency fund in a savings account because of the very low interest return. Both because of the relatively high interest rate (2 per cent) and because of its convenience, postal savings are an especially attractive substitute for the savings bank. Every post office is your bank. No individual may deposit more than $2,500 in a postal savings account, but a married woman may carry an account in her own name.

For the typical officer, the next important type of investment to think about after insurance is Series E U. S. bonds. If these are held to maturity, they yield very nearly 3 per cent interest (which is as much as top quality industrial and rail bonds bring) with the advantage of complete liquidity. That is to say, they can be cashed in at any time without loss of value if a more attractive investment opportunity presents itself, or if an emergency makes it necessary. And for those who have trouble making themselves save, the payroll deduction plan is as satisfactory a whip-wielder as an insurance company.

For the relatively young officer, such as the one we chose to regard as typical, perhaps it would be unrealistic to suppose he can do much more saving than that already discussed, which we may tabulate as follows:

$230 per year.....Insurance Premiums
$100 per year..... Postal Savings
$225 per year.....Series E bonds
(one a month at $18.75)

For those without children, and for those older officers in a higher income bracket, common stocks offer an attraction. Like insurance, stocks are too big a subject for more than a cursory discussion here. It may be said that no amateur (officers included) can hope to make money in the long run speculating on the rise and fall of market prices. Furthermore, not many people have gotten rich because they bought heavily into an issue "recommended by a client of their brother-in-law's broker." On the other hand, if a man will give the same thought and attention to a stock purchase that he does to buying an automobile, and "buys for the long pull," he will generally get more for his money than in any other type of investment. As it happens, ever since the collapse of the bull market in 1946, most dividend-paying stock has been selling at bargain rates, with some issues paying dividends equivalent to 10 per cent on investment.

It may be asked, why, if you can get 6 to 10 per cent on stocks, should one buy government bonds paying only 2.9 per cent? Is the risk element in conservative stocks great enough to warrant that difference? The answer is that the greater risk accounts for a large part of the difference. The rest is premium for liquidity. That is, with government bonds, you know you can receive your money back, plus interest accrued, at any time. Though you can always sell stocks, you may need your capital at just the time the market is low. Hence the insistence of every investment consultant today that you put part of your savings in "governments."

Most people after reading the *Wall Street Journal* and the *Magazine of Wall Street* for a few months begin to feel they know what they are about in buying stocks. Brokers, generally speaking, are chary in proffering advice unless it's asked for. However, though brokers are far from infallible, it's well to remember that security-buying is their business, and their views are always more likely to be

correct than a layman's.

Unless an officer makes a hobby of the stock market, and is at a station where he can conveniently buy and sell at short notice, he does well to keep to conservative issues—the "blue chips," some of which have paid dividends annually for fifty years or more. Certain businesses are more or less "depression-proof" (as their performance in the early 1930's demonstrates). Other businesses are feast-or-famine propositions. In general, consumption-goods industries fluctuate in profits much less than heavy industry. Dividends on the stocks of tobacco companies, chain stores, dairies, and oil refineries tend to be relatively stable. The reverse is true of those companies manufacturing steel, automobiles, building supplies, etc. In general, it is common sense for the long term investor to prefer the first to the second.

It's fine for an investor to "get in on the ground floor of a company that's going places." How often has it been pointed out that if you'd bought $1,000 worth of General Motors in 1920, you'd be rich now, or that the original holders of one share of Coca-Cola stock have a comfortable income now from that source alone? It's well to remember too, however, how many people lost their shirts in miscellaneous motors stock of companies long since bankrupt. Some investors are going to make a good thing out of television, but it's impossible to tell now which of the many companies in the field will hit the big bonanza. (And some investors have already lost heavily on at least one company.)

Certain established industries still clearly offer growth possibilities. Chemicals are an example. This, however, is obvious to the investing public at large, and most chemical issues are (as compared to their dividend yield) relatively high-priced in today's market.

On the whole, the amateur buying for income does well to confine his purchases to established issues which have done well in the past and which will, as far as can be guessed, continue to do as well in the future. In the long run, the man who shops for a safe stock paying 6 per cent does much better than the one who buys into a new company with the hope of doubling his money in six months.

Is there an "ideal common stock" for the average small investor who, like the typical officer, has neither the time nor impulse to make himself an expert on the market? Such a stock would have complete price stability and completely steady dividend rate. And there is no such stock. A certain irreducible minimum of risk is inherent in equity investment.

There is a type of stock which does, in this writer's opinion, approach that ideal, however. I am merely echoing the opinion of experienced investment counsel when I say that one of the most attractive and safest of all common stock investments at the present time is high grade electricity and natural gas operating companies. These pay from 5½ per cent to 7½ per cent dividends, and show little fluctuation during a depression. Furthermore the electric utilities are in a period of expansion and growth which should make their stock appreciate in value.

In times of depression their industrial consumers cut down, but this is a low-rate, low-profit business anyhow. Home users of current constitute the cream of the business. And it's common knowledge that the American home is becoming more and more electrified. (Deep freezers and television and dishwashers are only the most recent electric gadgets.)

Electric utilities enjoy local monopolies and are not subjected to the hazard of "price wars." Commission control is, from the point of view of the small investor, an advantage, not a liability. It is the policy of public utilities commissions to allow a fair rate of return after taxes. Hence any sizable increase in corporation taxes would be compensated by higher utility rates.

Since a utility grows with the area it serves, common sense would dictate that there is the greatest possibility of value-appreciation in the stock of utilities serving the central and southwestern parts of the United States—those regions whose population and business are increasing most rapidly.

Brokers make available to prospective investors, on request, prospectuses, detailed financial sheets, engineers' reports—in fact, all the information they themselves have available. This, plus information gleaned from such publicly published journals as the *Magazine of Wall Street* and *Barron's*, should be a sufficient guide to the small investor. The cost of investment counselling service renders it prohibitive to any but the big-time buyer and seller of stocks. Besides which, much professional investment counselling is of no value.

There are those who, concerned over the risk element in common stocks, take naturally to the idea of the increasingly popular "investment trusts"; that is, companies which sell shares to the public, and with the proceeds buy stocks. The idea is that with expert management and wide diversification, they can "insure" against loss on specific issues. Some of these trusts have had a good record, and for a certain type of investor they undoubtedly fulfill a real need. But an individual buying as little as $5,000 worth of stock can achieve ample diversification for himself if he deals in 10- to 25-share odd lots. And the expert management of the trust naturally gets paid for its expert services.

Up to now I have deliberately omitted mention of industrial and railroad bonds, building and loan shares, preferred stocks, and state and municipal securities. The return on high grade industrial bonds and building and loan shares (2½ to 3 per cent) is not great enough to put them in competition with Series E, U. S. bonds, for the small investor. And they have an element of risk (however small) which governments do not have.

As to preferred stocks—in general it may be said that if a company is sound, the investor might as well share its profits without limitation; if it isn't sound, the investor wants no part of it, whether common stock, preferred stock, or mortgage bonds. On the other hand, certain specific issues at present selling at surprisingly low prices make it necessary to qualify this generalization.

Municipal and state bonds carry a very low rate of interest. They are bought mainly by wealthy investors interested in the fact that they are tax-exempt. They have little special appeal for the man whose income-tax liability is under $10,000.

Even this abbreviated treatment of the subject, "An Officer and His Money," would not be complete were the

subsidiary subject, "Borrowing Money," to be entirely omitted. What if, instead of seeking to find an outlet for his surplus funds, our "typical officer" is trying to buy a car costing three times what he has in a savings account?

There is an easy and obvious answer to that one. Try a bank first. Many commercial banks will lend up to two-thirds of the purchase price of a car with the car itself as security, at 4 or 5 per cent interest. If you let a finance company handle it (and a finance company will, if you allow the dealer to arrange the financing), it will cost you 10 per cent or more. This fact is often concealed from you by calculating the interest charge at, say, 6 per cent, on the full purchase price—including the $800 you have already paid "down"! As a general rule, all forms of installment buying are exorbitantly expensive.

Banks will lend money with stocks, bonds, or some types of life insurance as collateral. (Term insurance will not serve as collateral.) Some banks will make small short-term loans to depositors without collateral. Morris Plan banks will make unsecured loans at a moderate interest charge if the borrower can get co-signers for his note. And you can always get a small loan from a personal finance company if you don't object to paying 36 per cent per year (alias 3 per cent a month!).

It may seem an anomaly that when you lend money, you can get only 3 per cent interest, but when you borrow it, it can cost twelve times as much. But that, after all, is what makes saving such an attractive proposition.

General Balmer Arrives at Bliss

Brig. Gen. Jesmond D. Balmer arrived at Fort Bliss, on Monday, January 9, to assume his duties as Assistant Commandant of the Antiaircraft and Guided Missiles Branch of The Artillery School. He succeeds Brig. Gen. Chas. E. Hart, who recently left for a new assignment in Germany.

Gen. Balmer comes to his Bliss assignment from Europe, where he was Deputy American High Commissioner in Austria. In 1944, he was Military Advisor to the United Nations Foreign Mission in Paris.

Entering the Army in 1917, Gen. Balmer served with the 26th and Fourth Divisions, American Expeditionary Force, in 1918-19. He was commissioned a second lieutenant, Field Artillery in 1918 and advanced through the grades to his present rank of brigadier general in June, 1942.

In 1926 he graduated from the Field Artillery School, the Command and General Staff School, and the Army War College (in the same class with Maj. Gen. J. L. Homer, Commanding General of Fort Bliss). He is also a graduate of the Naval War College. From 1942 to 1944, he was commandant of the Field Artillery School at Fort Sill, Okla. Since 1944, he has commanded the 23rd Corps Artillery and served as Deputy Commander of the Corps.

General Balmer has been awarded the Distinguished Service Medal, Bronze Star, Legion of Merit, Commendation Ribbon, and Victory Medal, and has been honored with the Decoration of Merit by Chile and the Order of Commander from Brazil.

He is a native of Pullman, Washington, and attended the University of Washington before entering upon his military career.

Status of Training Literature

The following list of training publications now under preparation, being printed or recently published is compiled specifically for AAA personnel.

Those projects marked with a double asterisk (**) will be submitted to the Director of Organization and Training, GSUSA, for further co-ordination review and approval prior to printing. A single asterisk (*) indicates that the project is to be submitted to OCAFF for review prior to printing. Unmarked projects may be submitted through the proper channels to TAG for printing by the responsible Chief of Arm or Service concerned. New literature projects are indicated by N, Revisions by R, and Changes by C and the number of the Change.

Dates in the Status column indicate the following:

a. For two asterisks (**) projects, it is the approximate date the manuscript will be submitted to Director of Organization and Training for final review.

b. For one asterisk (*) projects, it is the approximate date the manuscript will be submitted to OCAFF for review.

c. For unmarked projects, it is the approximate date the manuscript will be forwarded to TAG approved for printing.

The average length of time required to print and distribute a manual, after its receipt in final form by TAG, is four (4) months.

Manual No.		*Title*	*Preparing Agency*	*Status*
		FIELD MANUALS		
44–1	N	Antiaircraft Artillery, Employment (Revision of 4-100)	AA&GM Br Arty Sch	Dir – O&T
44–2	R	Antiaircraft Artillery, Automatic Weapons	" "	Dir – O&T
44–4	R	Antiaircraft Artillery, Guns	" "	Dir – O&T
44–19**	N	Examination for Gunners (Old 4-19)	" "	July 50
44–26**	R	Service of the Piece, 90mm AA Gun on M1A1 mount (4-126)	" "	Indeterminate
44–27	R	Service of the Piece, 90mm AA Gun mount M2 (4-127)	AA&GM Br Arty Sch	Dir – O&T
44–28**	R	Service of the Piece, 4.7 Inch AA Gun (4-128)	" "	March 50
44–44**	R	Service of Radio Set SCR 584	" "	At Printer
44–57**	C2	Adds–Transport by Air	" "	Indeterminate
44–60**	C3	Adds–Transport by Air	" "	Indeterminate
		TECHNICAL MANUALS		
9–252*	R	40mm Gun (except self-propelled)	Cof Ord	May 50
9–372*	C2	90mm Gun & AA Mount M2	" "	OCAFF Review
9–669*	R	Gun Data, Computers, M8 Series	" "	At Printer
9–679	N	AA Fire Control System T33	" "	Indeterminate
9–1252*	R	40mm Automatic Gun	" "	OCO Review
9–1370*	R	90mm AA Gun Matériel (1370 AB)	" "	OCO Review
9–1380*	R	120mm Gun M1 & AA Mount M1	" "	Indeterminate
9–1680*	R	Periscopes, Director Sighting Telescopes & Elbow Telescope for Tk's, MC, FA & AAA	" "	OCO Review
9–1609*	N	Computing Sight M7 & M 8A1 (for 40mm AA Carriage M2)	" "	OCO Review
9–1659*	R	Directors M5A1, M5A2, M5A3	" "	OCO Review
9–1671 A&B*	R	Directors M9, M9A1, M9A2, M10	" "	OCO Review
9–1679*	N	AA Fire Control System T33	" "	OCO Review
9–1682*	N	Remote Control System M12	" "	At Printer
9–1684*	N	Local Control System M16	" "	June 50
9–1901*	R	Artillery Ammunition	" "	OCO Review
9–2604*	N	Inspection & Adjustment of Fire Control Inst.	" "	March 50
20–240*	R	Meteorology for Artillery	AFF Bd 1	Printed
20–241*	N	Meteorological Tables for Artillery	" " "	Printed
44–234**	N	AAA Service Practice	AA&GM Br, TAS	DA Review
44–260**	N	Flak Analysis	" " "	OCAFF Review

Origins of Antiaircraft Artillery

By Lieutenant Colonel Richard W. Owen, CAC

Until an assassin's bullet punctured the uneasy peace of 1914, Europe had been without a major war for almost a hundred years. The Great German General Staff was still preoccupied in studying the American Civil War and applying the lessons to a theoretical sweep over the Continent. The French army, confident of its artillery reputation, was slowly readjusting itself to the political upheavals occassioned by the Dreyfus case. Across Europe an incompetent Czar with a sickly heir and a superstitious Czarina was insecurely on the throne; a huge, poorly equipped army at his disposal. In England, George V's government was engaged in a bitter naval building program with the comelately Germans at Kiel and Hamburg.

Meanwhile, in obscure and relatively unimportant places, events were unfolding which were to shape the future of all these protagonists. Hiram Maxim had developed the automatic machine gun; Henry Ford was developing the assembly line technique of mass production of internal combustion engines; and a struggling infant aircraft industry had arrived at the "baling wire" phase of its development. Farsighted individuals in Europe's chancellories were beginning to ponder the future uneasily. The more objective members of the military were becoming more and more concerned with the future implications which these developments portended. They were, however, in the minority. The necessity for developing countermeasures to a war in the air was not yet obvious enough to bring about effective action in this highly complex field. The evolution of the science of three-dimensional artillery firing was still in an incubate stage.

When the Germans raced for the Marne during that first summer of World War I the status of antiaircraft artillery development was insignificant. The German army possessed a total of 18 artillery pieces adapted for antiaircraft firing while their Italian allies boasted of two. The French, despite their formidable reputation as artillerists, possessed two guns but no organization and no trained personnel. The British, more farsighted than the rest, had organized an antiaircraft artillery section in each of eight divisions equipped with pom poms and firing percussion and tracer shells which existing reports wryly describe as "useless and rather dangerous." Across the broad Atlantic, the U.S. was giving little or no thought to the requirements for countermeasures against military aircraft.

War in the air developed slowly. While ponderous land armies were locked in struggle, such aircraft as appeared were usually on reconnaissance missions. The feats of Richthofen's Flying Circus and the Lafayette Escadrille were still to come. Yet the problems of combating aircraft from the ground were clearly discernible. A need for a different type of gun mount required immediate solution. A speedier and more accurate method of fire control, and a system of early warning of the approach of hostile crafts were early "musts."

Meanwhile modified Field Artillery matériel provided a stop-gap solution. Field artillerymen, specially trained in the new technique, manned the equipment while Engineer troops manned available searchlights. An uncorroborated story tells how knots on a string were used to establish appropriate leads on targets!

As the airplane became more and more effective, the warring nations devoted more and more time and effort to developing effective countermeasures. Searchlights, sound locators, barrage balloons, and a more effective information service were all devised, and each innovation contrived toward the solution of the antiaircraft problem. In addition, passive measures, especially camouflage, were skillfully developed.

At the time of the armistice a great deal of progress had been made in developing matériel and technique and in training AAA personnel. The French had evolved a complete AAA organization consisting of 1500 officers and 40,000 enlisted men, together with an impressive array of matériel including some 900 guns, 600 searchlights, 500 machine guns, and 1000 barrage balloons. Even so, these measures were recognized as inadequate. All the Great Powers by this time were thoroughly alert to the necessity of further planning and development, and the years immediately following the war saw the establishment of AAA schools, intensive training of AAA units of battalion and regimental size, the development of new weapons and accompanying techniques, and the evolution of appropriate tactical doctrine.

Incisive American interest in antiaircraft artillery began with an urgent request by General Pershing to the War Department that AA units be formed for immediate service in France. As a consequence, the Secretary of War dispatched a memorandum on 1 October 1917 to the Chief of Staff which contained the following:

> *"1. The Secretary of War directs that there be organized from the regular Coast Artillery Corps the following units for service in France.*
>
> *(A) One antiaircraft battalion organized as per tables 107 and 108, Series B, Tables of Organization.*
>
> *(B) Four antiaircraft companies organized as per table 308 of Series C, Tables of Organization.*
>
> *2. One company of each of the above types will be prepared to go to France so as to arrive not later than November 1, 1917. . . . The necessary arrangements will be made by the Chief of Coast Artillery for the departure of these troops. . . ."*

Additional implementing instructions directed the Middle Atlantic Coast Artillery District at Fort Totten, N.

Y. to organize and prepare these new organizations for overseas movement. Since no AAA weapons were in existence in the United States, the troops were shipped to France for training on equipment to be provided by the Allied armies. Some of the urgency of General Pershing's request might be inferred from the War Department's instructions to organize, ship, and deliver certain of these units within a span of thirty days.

Upon their arrival, the AAA units were placed under the supervision of a Chief of AAA Service, AEF who conducted inspections and made recommendations concerning their employment to GHQ, AEF. Their training was all centralized. General Order No. 46, dated October 10, 1917, of GHQ, AEF, established The Antiaircraft School, AEF at Langres, France, Brigadier General James A. Shipton, Commandant. Instruction was given by experienced Allied instructors utilizing French and British matériel.

From this meager beginning sprouted the antiaircraft organization as it exists today. Curiously enough, however, the archives are silent upon one major consideration: no over-all responsibility for the AAA mission was specifically assigned the Coast Artillery Corps or to any other organization. Like Topsy, the AA just grew under the benevolent eye of the Chief of Coast Artillery. Not until 10 years later, on December 21, 1927 was the matter officially set down in print. General Order No. 22, War Department published on that date had this to say:

"Sec. II—Mission and composition of the Coast Artillery. . . .

1. Coast Artillery: Missions of the Coast Artillery are to attack naval vessels by means of artillery fire and submarine mines, and attack on enemy aircraft by means of fire from the ground.
Coast Artillery includes all harbor defense artillery, all railway artillery, all antiaircraft artillery, and all tractor drawn artillery especially assigned for coast defense purposes. In addition it includes such sound range units as are needed in the performance of its mission."

Nonetheless, in the absence of the above mission assignment, the responsibility of the Chief of Coast Artillery toward AA matters had long been inferred in earlier War Department official publications. For instance Training Regulations No. 10-5 dated December 23, 1921 stated:

"A. COAST ARTILLERY.—a. The artillery is charged with the service of the fixed and movable elements of the land and coast fortifications, of railroad artillery, antiaircraft artillery, and trench mortar artillery. Its primary weapons are the cannon, the antiaircraft gun, and the submarine mine. Its other weapons are auxiliary. . . . Its essential characteristic is fire power. . . ."

The Armistice found the American army with a small amount of AAA matériel on hand for training purposes. Included therein were 52 AAA trailer mounts (Model 1917) mounting the 75mm field gun (Model 1916); 120 3-inch AAA gun mounts (M-1918); and 161 3-inch AAA gun mounts (M-1917) designed for fixed positions. This equipment had been developed during the war and left much to be desired. The carriages especially were unsatisfactory. Guns were subject to excessive erosion, and extreme back lash was a continual cause of trouble.

Extensive efforts were made to improve AAA ammunition. The "S" type fuze manufactured during the war was reported to give "ordinarily fair action when time of burst was set for 10 or 12 seconds or possibly greater," but was found to be unreliable for shorter bursts. The problem called for a fuze that would give a greater degree of uniformity of action and that would not vary with day to day conditions. Particular efforts were required to prevent wide variations in fuze action at different elevations. Eventually Ordnance authorities turned to the mechanical time fuze which had been under development in the United States since 1914. Additional experiments were conducted with smokeless, flashless, and non-hygroscopic powders.

During the early 1920's machine guns for antiaircraft use were likewise the subject of study. Throughout the war the Browning cal. .30 machine gun with a variety of makeshift mounts was used. These mounts were uniformly unstable. Further tests proved that the cal. .50 machine gun was the better for AAA use, and this type gun was adopted as standard for AAA machine-gun batteries in service.

The government purchased during the war a total of 134 36-inch Mack searchlight units. These were ineffective due to limited power, excessive weight, and a lack of mobility. They were superseded by the Cadillac light which became standard for AAA use. Improvements during the early years called for the use of aluminum in the manufacture of the barrel, a 60-inch light instead of a 36-inch, and a mobile power plant.

With the coming of peace all antiaircraft units were promptly inactivated—only to be reactivated shortly thereafter. Organizationally, the battalion was not considered the appropriate tactical unit, so the regimental organization was fixed upon as the proper medium. In 1924 the reactivated AAA battalions of which there were a grand total of 6 were expanded to a regimental strength of 63 officers and 1450 enlisted men each. As conceived at the time of activation, these regiments—all carrying a numerical designation in the 60's—consisted of a suitable headquarters and two battalions. The first battalion was the gun battalion and consisted of one searchlight battery (12 lights) and three gun batteries of four 3-inch guns each. The second or automatic weapons battalion, was composed of four batteries each manning twelve cal. .50 machine guns. This organization existed until World War II when the more flexible group was instituted.

With a variety of weapons and but little approved technique that had been "shaken down," unit commanders based their training on their wartime experience. Training techniques and methods therefore varied widely. Standard text books were unavailable and translations from foreign manuals were used pending publication of suitable training regulations. Target practices were conducted by firing at shell bursts, balloons, kites, and the intersections of search light beams. In November 1922 an AA unit at Fort Monroe, Va. fired at an aerial target towed by a Navy airplane

This was described as the first real progress in developing suitable AA training. During the same year the Chief of Coast Artillery's office began publication of a series of annual AAA bulletins covering matters of interest in the development of fire control, targets, and methods of fire. These aided materially in disseminating useful information and in coordinating AAA training activities. In 1923 and 1924 training regulations appeared covering organization, training, drill, and the tactical employment of AAA. During this time rules for target practice were prescribed relating to the targets to be used, methods of computing hits, and safety precautions to be employed. Until this time very little useful data were obtained on target practice firings and the functioning of the matériel.

Our history is replete with examples of slim appropriations for the military following a war. World War I was no exception. Appropriations were pared to the bone. Alarmed by the scanty funds for AAA development, the Chief of Coast Artillery on September 8, 1924 stated "AAA is a comparatively recent development and improvements have been rapid. Extensive development work is in progress . . . but in case of war, large quantities of AA will be needed at once and no effective equipment is on hand to supply this need. I recommend that liberal appropriations be secured for intensive development of AA matériel and fire control apparatus." During the same year, he reported to the Chief of Staff "The importance with which the Chief of Coast Artillery regards this Service (AAA) is indicated by the successive increases of both commissioned and enlisted personnel made during the period (fiscal 1924) which has been marked by a decrease of Coast Artillery personnel to an authorized strength below that allotted at any time since 1901." During the same year he urged that the War Department heed his warnings. In November he wrote, "Due to the lack of any provision in War Department general mobilization plans for the protection of cities, utilities, and other important points from enemy aircraft, I feel that immediate steps should be taken to provide this protection in case of mobilization. It is expected that aircraft will be among the first if not the first agency used by the enemy in case of war with the U.S. It is encumbent, therefore, upon the War Department to make all possible preparation to combat these aircraft, not in the later stages of mobilization but at the very beginning." This warning followed closely on the heels of the following: "The War Department mobilization plan provided for nineteen regiments of AAA in the first phase, seven of which are allotted to the National Guard. There can be no disputing the fact that these nineteen regiments will be found totally inadequate during the first phase of mobilization. All should be in condition for active service within the first month of mobilization. There is need for a much larger force."

It cannot be said that the Chief of Coast Artillery was either indifferent to the realities of the situation or unaware of the requirements of the AA mission. Like a voice from the wilderness, his fateful warnings went unheeded for too many years!

In 1922 the Secretary of War in a directive to the Coast Artillery Corps and to the Air Service called for a study to determine the feasibility of combined training in coast defense. The following considerations were the basis for this directive:

a That the war with Germany did not furnish complete data on which such training could be based;

b That experiments since the war have demonstrated potentialities of the Air Service in Coast Defense;

c That experimentation in combined training should be conducted by the interested branches.

In consequence, a series of tests was undertaken in March, 1922 at Langley Field, and Fort Monroe, Va. Antiaircraft target practices against aerial targets and Air Service target practices against available coast defense installations were conducted. In addition, other tests to determine the most efficient means for the employment of the two arms were held.

Both services agreed as to the value of the tests and recommended that further and more thorough experimentation was necessary to determine the proper interrelation between the two branches.

Additional combined training was held between the Naval Air Service and the Coast Artillery during the same year. Major General F. W. Coe, Chief of the Coast Artillery Corps, subsequently thanked the Naval Air Service "who so kindly cooperated in this matter" and expressed his "highest appreciation for the very valuable assistance rendered."

Following the 1922 tests the Coast Artillery Board immediately set to work preparing a manual entitled "Action against Aircraft" for combined training of Coast Artillery and Air Service in coast defense.

In collaboration with Air Service authorities at Langley Field, Va. and other interested agencies the Board detailed the then-current concepts of antiaircraft operations. It was this manual which initially posed the difficult question relating to rules for engagement of aircraft which to date has been variously answered. In part the manual stated "Both AAA troops of the Coast Artillery Corps and the Air Service can combat the aerial forces of the enemy. Determined combat action by the aviation is the best defense against hostile aircraft and it is the role of AAA troops to assist the Air Service in such defense, or to take the entire burden of the defense during the absence of friendly planes."

As a result of its studies relating to AA mission requirements, the Board came to certain conclusions which, in light of latter day developments, are of interest. The Board concluded that "efficient listening devices, adequate searchlights and a sufficient number of guns properly placed, afford a highly effective defense against enemy bombers, if seen, and one which is relatively unassailable. Such a system is to the bomber what the shore gun is to the warship. It is doubtful whether a bombing attack would be attempted against localities so protected." Further, the Board stated, "the bomber is outmatched by AAA at all altitudes which can be reached by service bombers provided that the target can be seen."

The early antiaircraft artillerymen were faced with many perplexing problems whose scope has been briefly outlined in this paper. Despite an habitual lack of adequate

funds for development, a general state of disinterestness in their purpose and a struggle for recognition, they met with a fair measure of success during the 30's. New motor transportation, more adequate development, with funds leading to the perfection of radar, and an increased respect for the potentialities of the arm, were the fruits of their struggle which finally culminated in the marriage of electronics and acceptable armament to produce a first class weapon in the 40's. The high regard which Flak has earned for itself in battle proves beyond doubt that antiaircraft artillery has come of age, and that it now stands as an equal in that vast armory on which the safety of our country depends.

Army to Employ Television in Reserve Training Program

The Army will present a series of eight experimental television programs designed to test television as a training medium for its Reserve Components, beginning on February 9, it was announced by General Mark W. Clark, Chief, Army Field Forces, Fort Monroe, Virginia.

General Clark is in charge of the eight-week series which will be telecast over WOIC, Washington, D. C.; WCBS-TV, New York City, and possibly other Columbia Broadcasting System affiliates, from 10:00 to 11:00 P.M. each Thursday, February 9 through March 30. Time for the test programs has been donated by the Columbia Broadcasting System.

General Clark emphasized that these are test training programs, the results of which will be studied in determining the possibility of using television as a training medium.

This will be the first Armed Forces nighttime telecast of training programs on a network. Some of the Reservists and Guardsmen constituting the audience may witness the programs in their own homes while others may be assembled at convenient locations where television receivers are available. While designed primarily for the Army audience, the programs will be of interest to the general public.

Negotiations for the programs were conducted by the Department of the Army, General Staff, through the Department of Defense. The series will originate at the television studios of the Navy Special Devices Center, Port Washington, Long Island, New York. The use of this facility was obtained through the cooperation of the Navy. At this Center the Navy has conducted considerable pioneer work in this field.

Scripts were written by the faculty of the General Staff College, Fort Leavenworth, Kansas with technical assistance of the Army Branch Schools. Programming will be under the direction of the Office of the Chief Signal Officer, Department of the Army.

General J. Lawton Collins, Army Chief of Staff, will open the series with an introduction to the February 9 program. General Clark will then outline the series and explain its purpose.

Training vehicle of the programs will be a map problem depicting the operation of an Infantry Division supported by the Air Force in realistic combat situation. Each program will develop a new phase of the map maneuver and will constitute a distinct lesson in organization or employment of the Division.

Narrators for the exercise will be regular instructors at the Army schools. Films of actual combat actions will be used to portray certain situations confronting the Infantry Division.

To test the success of the experiment, the Army will obtain audience reaction from supervised Reserve groups which will witness the programs in various locations. Questions to be asked before and after the presentations will determine individual reactions to the programs. The questions on the first two one-hour training programs will be general, concerning the officers' over-all impression of their effectiveness. The last six quizzes will be of a technical nature designed to test the individual grasp of the presented lesson. A second means of testing the results will be through voluntary comments by individuals of the Reserve and National Guard.

The programs will be aimed at interesting the average video audience and giving a picture of typical training which the Army offers its Reserve components.

A New Concept in Company Administration*

By Captain Maurice W. Kendall, Infantry

Since expansion of the Army from its prewar strength, thousands of officers have had the privilege of serving as company commanders. That it is a privilege, no conscientious officer will deny—yet many of these officers will privately admit that they eventually reached the conclusion they were not commanders in the real sense of the word, but administrators presiding over a maze of paperwork and the minutiae of company housekeeping. "Hell, I know I'm responsible for this sort of thing," they say with an almost universal sameness, "but for God's sake give me somebody to take care of the *details*."

Somebody to take care of the details. Well, what about the company executive officer—what's he for? What about the first sergeant and the company clerk—can't they do it? And what about those platoon leaders—they make good bond officers, insurance officers, supply officers, mess officers, investigators, agent finance officers, personal affairs officers, letter writers, decorators, and chart makers.

The answer, of course, is that these people *have* been taking care of it, with the active and frequently manual participation of the company commander. In theory the system is supposed to work, and obviously it does work after a fashion; we administered and trained an army of 8,000,000 and the end result was victory everywhere.

There are some competent men, though, who believe that the old way of doing things is not good, who have the audacious opinion that we may possibly, just possibly, have trained an army in spite of it. What good purpose is served, they want to know, by inflicting upon the company commander and his officers the detailed management of a multitude of administrative tasks, with the almost inevitable result that they have little time for creative thought.

Little time for creative thought. Perhaps this is the one thing we can clearly and truthfully delineate as bad. Little time to think. Too often mediocrity in training is the fault of time-consuming administration. What company officer has not angrily found himself ill-prepared to instruct his men because he *simply did not have the time to plan?*

What would seem to be needed, then is someone to manage—actively manage—the many-faceted administrative affairs of a company so that the commander and his officers may allocate a larger share of their time and thought to the tactical operations of the unit.

The prayers of company commanders appear to be answered in Department of the Army Circular No. 25, 1949, which announces the establishment of the unit administrative career warrant officer, who becomes the principal administrative assistant to the company commander with authority to sign routine documents in the name of that officer. This warrant officer may be assigned such additional duties as the commander desires—mess officer, supply officer, and so forth—and is the company liaison with the battalion or regimental personnel officer. Department of the Army Circular No. 79, 1949, authorizes the inclusion of the unit administrative career warrant officer in those T/O & Es affected by the change—that is, all company size units of the infantry division and those units of similar size in the other combat arms. At this time, however, actual reorganization of these units can be accomplished only by specific authority of the Department of the Army. First must come the screening, selection, and procurement of persons qualified to fill these positions, this to be followed by a period of intensive training to further qualify them for the important posts they are to hold.

And what, the reader may immediately inquire, becomes of the first sergeant? Is he relegated to the junk pile, his usefulness over? Is he divested of his powers? The answer is neither. The first sergeant will now appear more frequently on the training field, where he can come to know the actual abilities of the men. No longer will his estimate of them be based on orderly room contact only, often a misleading thing when recommending promotion. He will become a "strawboss" in fact as well as name, and as such will retain responsibility for certain status reports—the morning report, the sick book, and the duty roster. But he is no longer charged with running the orderly room, and his relations with the warrant officer—and of the warrant officer to him—are intended to be mutually cooperative and not a matter of "who ranks who around here."

And the company executive officer? That individual is freed almost entirely of administrative detail. Like the first sergeant he will become a familar sight on the training field. He becomes an *executive* in the true meaning of the word, relaying the commander's orders, devising ways to carry them out, and seeing that they are done.

As for the platoon leaders, they are now responsible only for their platoons. Certainly there is no objection, if a commander decides to broaden their administrative experience, to assigning them additional duties. But obviously such tasks can now be coordinated in such a way that they do not interfere with the platoon leader's primary responsibility.

No, the company commander has not shed one iota of responsibility. If under this system his administration goes sour, the fault is still his in the eyes of his superiors. What he *has* shed, though, are those long unprofitable hours spent in close examination of *detail*. He must still concern himself with administration but he is free of the spadework—the warrant officer is his administrative technician.

Very clearly indeed this warrant officer is going to have to know his business—his qualifications must range from a thorough knowledge of Army clerical, personnel, and

*Reprinted with permission from the October 1949 issue of *Infantry School Quarterly*.

administrative procedures, including a grasp of the regulations governing accountability, responsibility, and supply—to a sound comprehension of the Army Food Service Program as applicable to company messes. As stated before, a screening process followed by a period of intensive schooling will provide men of the highest qualifications for these positions.

This new system has been tested and found good. The Infantry Center, by direction of the Department of the Army, conducted the experiment. The following facts and statistics, greatly condensed and high-lighted here, are based on the board report of that experiment:

1. Company commanders who formerly spent an average of 22 hours per week on administration were able to reduce that time to 8 hours.

2. Executive officers were relieved of all company-level administrative duties.

3. First Sergeants who previously spent an average of 24 hours per week at administrative tasks were able to reduce this time to 10 hours, most of it being given to the preparation of morning reports, sick reports, duty rosters, and passes.

4. Company mess officers who spent approximately 8 hours weekly on mess supervision were returned to full-time duty with their platoons, the warrant officer relieving them. Company supply officers who spent 12 hours per week on supply were likewise relieved by the warrant officer and returned to their platoons.

5. The general opinion of the board is that all aspects of company administration and operations are materially improved by the inclusion of a warrant officer in the tables of organization.

This is a new concept in company administration, and there are, of course, some points which bear checking on. One of these is the attitude of the first sergeants. In the tests at the Infantry Center the following report was made with respect to this point: "The first sergeants of the units engaged in the tests did not feel that there had been any infringement of their prerogatives. Neither they nor their company commanders felt that the assignment of the warrant officers had conflicted or interfered with their professional relationship." This we can find highly understandable, since the first sergeant is no longer figuratively a prisoner of the orderly room.

One more bonanza: The company clerk, that stranger who inhabited the regimental personnel office, will return to the company for full clerical duty and will additionally perform the tasks of the mail orderly, a cancelled position.

Summary

This new concept of company administration is logical, and from preliminary tests it is practical. Its advantages are manifest and manifold. Its ultimate success, however, as does success in any company endeavor, depends on the company commander himself. He must not view the arrival of his unit administration career warrant officer as the signal to forget administrative responsibility.

All of these programs, designed for the prevention of war, will demand more attention than we have previously given them in peacetime. But they do not demand—and your military leaders have never sought—undue participation by the military in civilian affairs.

Instead, we in the military seek greater participation by civilians in military affairs. For the complexity of modern war has made the military more dependent than ever before on civilian scientific and industrial genius.

Here has always been the true strength of our democracy.

General J. Lawton Collins, Chief of Staff,
U.S. Army at The Society of Automotive
Engineers, Detroit, 11 January 1950.

STOCKPILING: A MAJOR ELEMENT OF NATIONAL SECURITY

By Dr. John D. Morgan, Jr.*

Stockpiling of strategic and critical materials offers one of the most effective forms of insurance that can be provided to meet the threat of a future total war. Most mineral raw materials require several steps (as illustrated in Figure 1) to prepare them for use. The vulnerability to attack of such processing, which in many industries involves extensive use of the transportation net, is readily apparent. Moreover, in modern total war, time is a major strategic factor. Consequently, stockpiling a material in a form as close as possible to the ultimate fabricated state represents "canned" manpower, transportation, power, processing, and time—all stored against an emergency—thus insuring that needed materials can be used most efficiently with a minimum of delay.

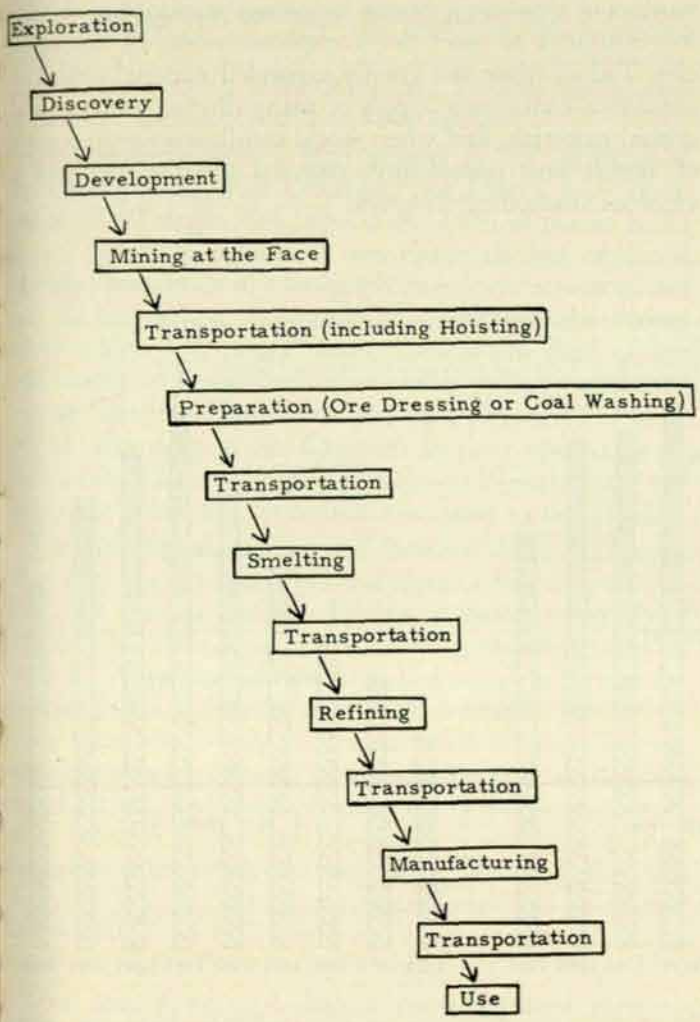


Figure 1. Steps common to preparing most mineral raw materials for use.

It is regrettable that our pre-World-War-II stockpiling program was an outstanding example of "too little and too late." The prewar estimates of requirements were in many cases much too low, while the amounts of material on hand in the stockpile at the time of Pearl Harbor were in almost all cases far smaller than the estimated requirements. The failure of our pre-World-War-II stockpiling program can be attributed to several causes. One was inability to visualize the tremendous needs for matériel in modern war; another was the lack of sufficient funds to buy what was desired; and a third cause was the creation by the war of unsettled conditions in Europe and Asia which made importing needed materials very difficult and hazardous. Our pre-World-War-II stockpiling program likewise emphasized that a contract calling for the delivery of material was one thing, while material actually on hand in a stockpile within the continental limits of the United States was something entirely different.

Some people may believe that stockpiles are unnecessary since domestic production might possibly be expanded to meet our needs. The record of World War II shows that we could not count on domestic production for all of our needs of several common metals, to say nothing of rarer products that must of necessity come from foreign lands. Table I indicates the fraction of our total new supplies of major metals that had to be supplied from imports during the three major war years. There are many important strategic and critical materials for which the United States is dependent upon distant and dangerous sources. Considering that sinkings of vessels exceeded new construction until well into 1943, it is obvious that in the future those products that come to us from abroad must be stockpiled well in

TABLE I.

Portion of Total U. S. Supply of Major Metals Obtained From Imports During the War Years 1942, 1943, and 1944.

0% to 25% Imported	*25% to 50% Imported*	*50% to 75% Imported*	*75% to 100% Imported*
Aluminum	Arsenic	Antimony	Beryllium
Bauxite	Copper	Gold	Chromite
Cadmium	Ilmenite	Manganese	Cobalt
Iron Ore	Lead	Platinum	Columbium
Lithium	Mercury	Rutile	Nickel
Magnesium	Iridium	Silver	Palladium
Molybdenum	Vanadium	Tin	Radium
Selenium	Zinc	Tungsten	Tantalum

*National Security Resources Board, Washington 25, D. C. The opinions expressed by the author do not necessarily reflect official views.

advance of actual hostilities. Figure 2 provides a graphical comparison of our dependence on imports for a substantial portion of our total supplies of the major nonferrous metals, copper, lead, and zinc during the war. This figure likewise demonstrates that domestic mining of these materials reached a peak in the early years of the war and then declined steadily. Consequently, in a future total war, domestic mining after the war has started cannot be counted on to produce all of our needs. Therefore, the importance of stockpiling such common materials as copper, lead, and zinc is recognized.

In the case of such large volume items as iron ore, coal, and petroleum, it is possible that the best place to maintain stockpiles would be in their natural resting place in the ground. In such instances our stockpiles should take the form of well-defined, easily exploitable deposits on which the necessary development work has been done, and where adequate machinery and manpower could be obtained on short notice. Since industry stocks of even such a common item as coal do not normally exceed sixty days' supply, the need for consideration of this problem should be readily apparent.

It is anticipated that, in a future war, our total supplies of strategic and critical materials will be obtained approximately one-third from domestic production, one-third from imports from protected sources, and one-third from stockpiles (when complete). As of the end of the calendar year 1949, about 30% of the desired stockpile goal was on hand. Table 2, below, summarizes the situation:

Table 2. The Status of the Post-World-War-II Stockpile Program as of December 31, 1949.

Material on hand from prewar stockpiles and transfers of war surpluses	$512,000,000 (14%)
Material on hand from postwar purchases and ECA activities	$637,000,000 (17%)
Material financed under current appropriations and programmed for future delivery	$879,000,000 (23%)
Value of total stockpile goals	$3,773,000,000

The economic soundness of stockpiling was known even in Biblical times, when food was stored during the seven fat years for the seven lean years that were expected to follow. In modern times few thinking people question the wisdom of depositing money in savings accounts or of buying insurance to meet the unexpected needs of emergencies. Today, when our greatly expanded national economy requires a continuing supply of many diverse strategic and critical materials, and when world conditions are in a state of unrest and uncertainty, national security requires a vigorous stockpiling program.

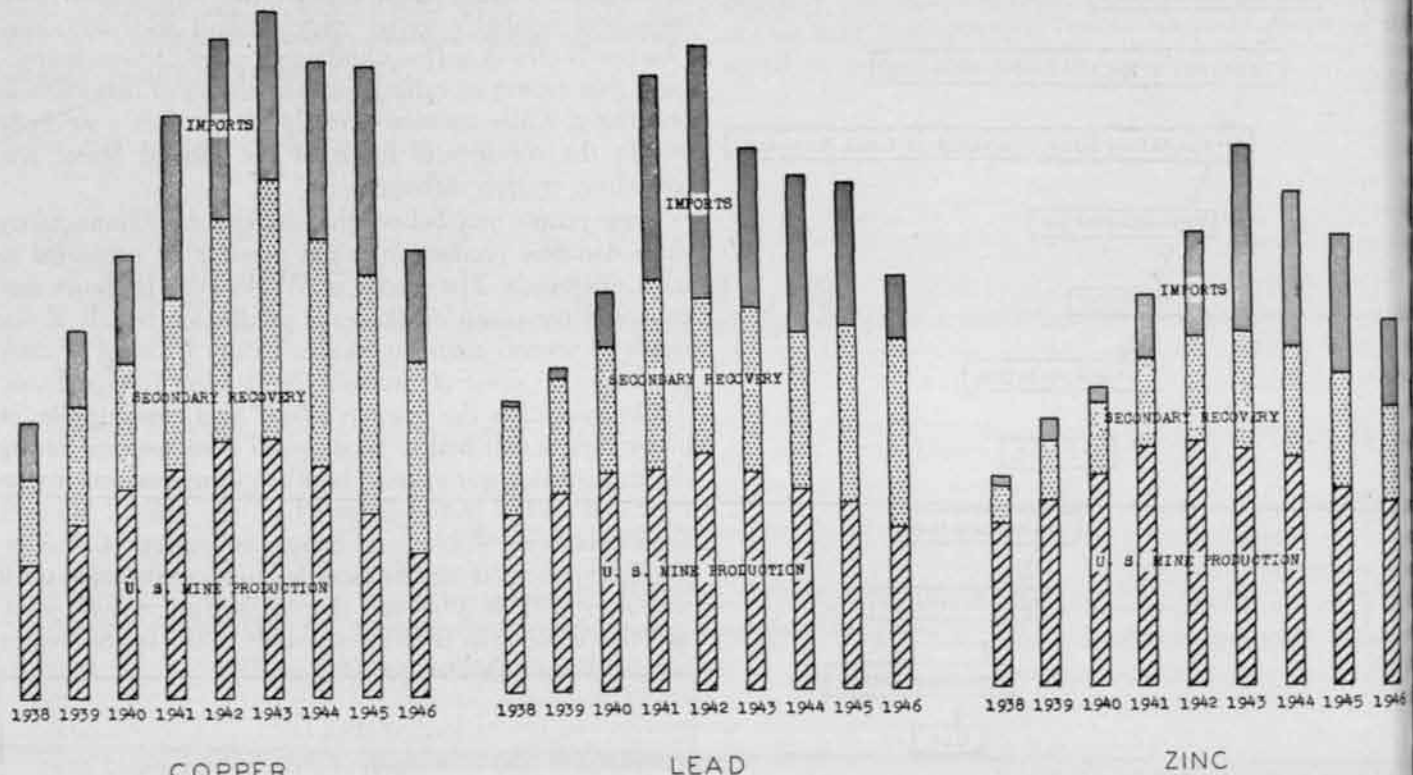


Figure 2. A comparison of domestic mine production, secondary recovery, and imports as sources of copper, lead, and zinc in World War II. (A different vertical scale has been used for each metal.)

THE ATTACK ON PLOESTI*

By Dr. Albert F. Simpson, Air Force Historian

Ploesti

In the midst of the Sicilian campaign, on 1 August 1943, Mediterranean-based heavy bombers executed one of the outstanding air operations of World War II. This was the low-level B-24 attack on the Ploesti oil refineries in Rumania—the first large-scale, minimum-altitude attack by Army Air Forces (AFF) heavy bombers upon a strongly defended target and the longest major bombing mission, in terms of distance from base to target, undertaken up to that time.

The mission was not perfectly executed—but it heavily damaged the objective and as an example of brilliant conception, painstaking preparation, and heroism during execution, the operation had few if any equals.

Oil had been given a high priority in the planning of the Combined Bomber Offensive, but Ploesti, most inviting of all oil targets, lay beyond the reach of planes based in the United Kingdom. It was estimated that crude oil provided two-thirds of Germany's petroleum resources and that 60 per cent of her crude oil came from the Ploesti fields—which was to say, approximately one-third of her total supply of liquid fuel. These fields, with an estimated annual capacity of 9 million tons, were considered to be of special advantage to the Germans in their operations on the Eastern Front, and thus an attack on Ploesti offered the means for rendering immediate assistance to the USSR.

The Russians themselves had bombed the fields several times in the summer of 1941 and again in September 1942, but with limited success. Within a month after Pearl Harbor, the Americans were studying the feasibility of bombing Ploesti, and AFF planes had struck at it from the Middle East in an ineffective attack as early as June 1942. Since then, the Ninth Air Force had been heavily committed to other operations in the attempt to drive Rommel out of Africa, and the heavies of the Twelfth Air Force, based between Algiers and Constantine, were too far from the target. Only with the impending defeat of the Axis forces in Tunisia had circumstances combined to suggest the possibility of a mass attack on Ploesti from North Africa bases.

Soon after dawn on 1 August, the 177 planes, carrying 1,725 Americans and 1 Englishman, took off under the command of Brigadier General Uzal G. Ent. The 376th led the formation, followed (in order) by the 93d, 98th, 44th, and 389th. The route passed the island of Corfu, then swung northeastward across the mountains of Albania and Yugoslavia. Before the formation reached the Danube near Lom in Bulgaria, towering cumulus clouds destroyed its unity. Integrity might have been restored by the use of radio but this would have sacrificed the great advantage of surprise; consequently, the two lead groups reached the target somewhat earlier than the others, which cost the groups the advantage of delivering simultaneous blows and sent the following units over the target after the defenses had been alerted.

The first initial point (IP) was Pitesti, some 65 miles from Ploesti. There the 389th left the formation and proceeded to its target at Campina. There, too, all planes dropped to the minimum level of approximately 500 feet. Halfway between Pitesti and the final IP at Floresti, 13 miles northwest of Ploesti, the commander of the leading 376th mistook the town of Targoviste for Floresti and turned southeast. Followed by the 93rd, the 376th flew to the outskirts of Bucharest before realizing that a mistake had been made. Unfortunately, Bucharest was the headquarters of Rumanian defenses, which were promptly alerted.

The Attack

The 376th and 93d now turned northward toward Ploesti. Near the city they ran into such severe fire from ground defenses that the 376th turned east and then north in an attempt to reach its target from a less heavily defended direction. When a group reached a point northeast of Ploesti and in the vicinity of its target (Romana Americana), it met such intense AA fire that General Ent directed the planes to attack any target of opportunity which presented itself. Most of the Group's bombs fell in the general target area but only those from six planes led by Major Norman C. Appold, which flew directly into Ploesti and emerged covered with soot, were unloaded on an assigned target, the Concordia Vega.

When the 93d reached the outskirts of Ploesti, it did not turn east with 376th but, instead, flew straight against the targets on the south side of the city. In spite of heavy flak and enemy fighters, the group, going in at altitudes of from 100 to 300 feet and losing 11 planes over the target, did a good job on the Astra Romana, Unirea Orion, and Columbia Aquila refineries. Unfortunately, these were targets assigned to the 98th and 44th Groups.

Meanwhile, the 98th and 44th, commanded by Colonels John R. Kane and Leon W. Johnson, arrived at the correct IP just after the 93d had finished its run. They found the defenses thoroughly alerted. Equally bad, they had to fly through fires and the explosions of delayed action bombs left by the 93d. The two groups would have been justified in turning back; instead, they drove straight against their targets through intense flak, explosions, flames, and dense black smoke which concealed balloon cables and towering chimneys. B-24s went down like tenpins, but the targets were hit hard and accurately. As the two groups

*Reprinted, with permission, from the January 1950 issue of the *Military Review*.

left Ploesti, they were jumped by enemy fighters, and on the way home were attacked by every kind of plane from Me-109s to unidentified biplanes, the last attacks coming after the Liberators were over the Adriatic. The 98th claimed 33 enemy planes destroyed, but it lost 21 over the target and on the return trip; the 44th claimed 13 victories but lost 11 planes.

The less experienced 389th, led by Colonel Jack Wood, had some trouble in getting into the right valley for its run against Campina, but it reached the target area with all the aircraft that had been dispatched and completely destroyed its objective. Its losses were the lightest of any of the four groups which actually attacked selected targets.

The bombers could not follow closely the flight plan for the return home from Ploesti because the groups had bombed at different times and in some instances had left the target accompanied by enemy fighters. No attempt was made to resume route formation as a unified force; each group, or part of a group, followed its own course, although the 98th and 44th remained together and most of the sound planes of all the groups followed the prescribed route to Berkovista, Corfu, Tocra, and Bengasi. Planes in distress generally made for Turkey or the nearest Allied fields on Malta, Sicily, or Cyprus. The final count showed that 92 planes reached Bengasi, 19 landed at other Allied fields, 7 landed in Turkey, and 3 crashed at sea.

Results

The Ploesti mission fell short of expectations and entailed heavy losses. Final reports showed that 54 planes had been lost, 41 of them in action. Lost, too—dead, prisoners, missing, or interned—were 532 airmen. On the credit side stood some very accurate bombing and a high degree of damage to the refineries—damage which might have been greater had not many bombs failed to explode. An estimated 42 per cent of Ploesti's total refining capacity was destroyed. Possibly 40 per cent of the cracking capacity was knocked out for a period of from 4 to 6 months, and the production of lubricating oils was considered reduced. But though the over-all damage was heavy, it was not decisive. The Germans made up for lost refining capacity by activating idle units at Ploesti and by speedy repairs to damaged plants.

The hope for virtually complete destruction of the selected targets with results enduring for a long period of time had been defeated by errors of execution. No plan had been made for following through with other attacks. Until late spring of 1944, Ploesti went untouched as tactical operations and strategic targets considered to be of greater priority than oil claimed the attention of the Mediterranean-based heavies.

A Summary of Historical Information Pertaining to Controlled Submarine Mining

By Colonel H. C. Reuter, ORD

A complete documented history of controlled submarine mining covering all phases of its development by all nations has never been compiled. This fact is understandable since controlled mines are defensive weapons designed primarily for protection of the most valuable vessels in our most important home ports. Therefore, all information pertaining to this weapon has normally been shrouded in secrecy. In many cases this secrecy was inspired to prevent knowledge to both enemy and home forces of the limitations, inadequacy or inefficiency of a particular mine defense. No documented account of the sinking or crippling of any submarine by controlled submarine mines is available. Neither is there available any record of successful passage of a submarine through an effective, modern, controlled mine field. The threat and unknown possibilities for destruction by controlled mines, which completely cover all entrances to a harbor, have to this date caused naval craft of all types to avoid these fields. The threat of encountering mines has thus far been a large factor in deterring submarine and surface fleets from penetrating harbors with impunity. More detailed analysis of past controlled mine performance may result in more aggressive and possibly successful penetration of harbors in the future. On the other hand, technical changes in controlled mines and other underwater ordnance make the risk of detection and destruction of submarines even greater than it was during World War II.

A brief summary of historical steps in the development and use of controlled submarine mines with a bibliography of known source material is furnished as a starting point for interested personnel.

(The complete text of Colonel Reuter's study is under a "restricted" classification and is on file in the office of the Antiaircraft Journal. It is listed here as a historical reference.)

Antiaircraft At Avranches

By Major Harold W. Seidman, CAC and Major C. C. Sorensen, CAC

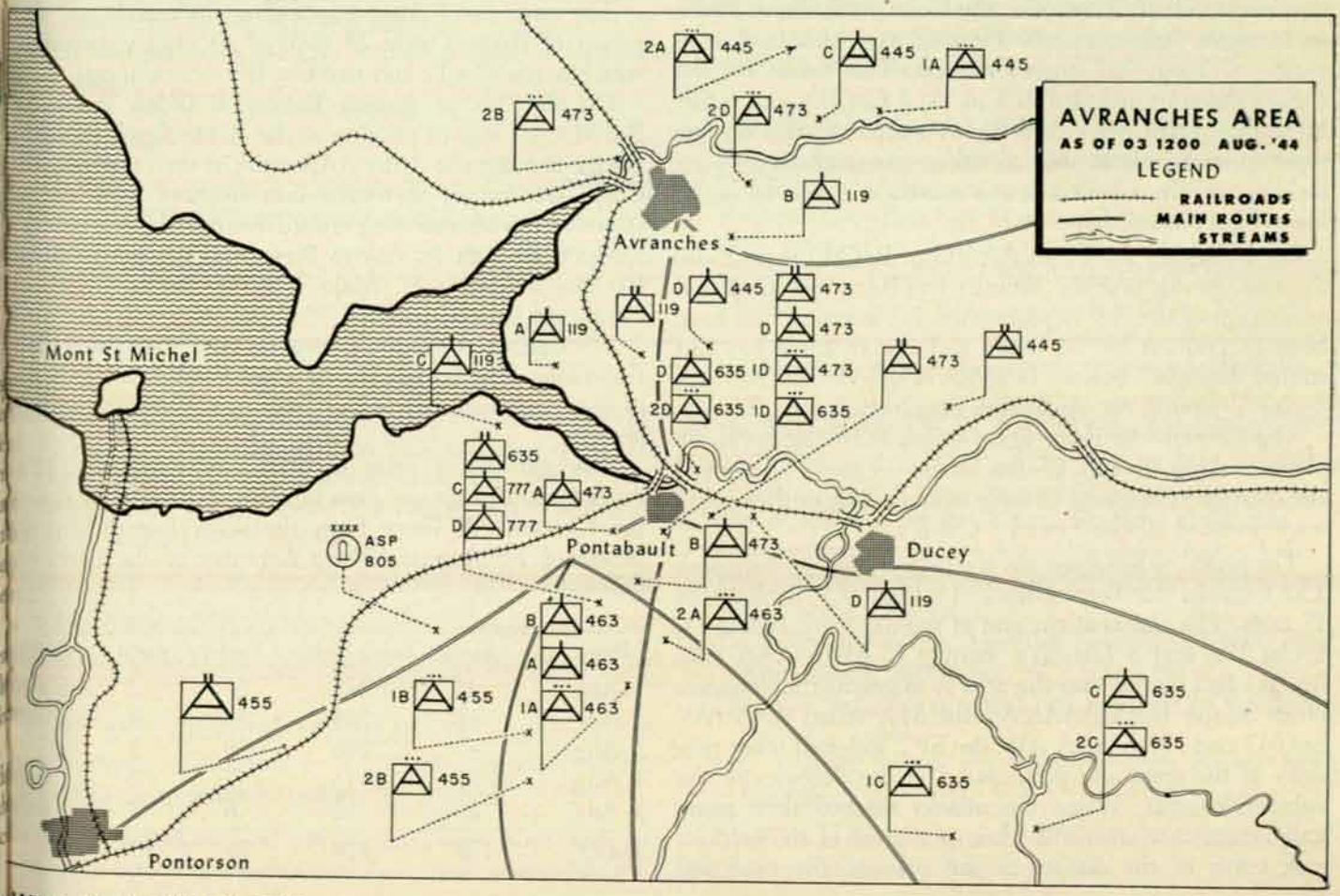
With the breakthrough of the VIII Corps into the Brittany Peninsula, the vital role of keeping the routes of communication open in the Avranches area fell to the Antiaircraft Artillery. The vulnerable points in the area consisted of the Avranches-Pontaubault Bridge, the bridge on the Sartilly-Avranches Road, the bridge on the La Haye Pesnel-Avranches Road, and the Ducey Dam. The destruction of any of the bridges would have halted the flow of men and matériel to the spearheads racing into Brittany and the rest of France. The destruction of the Ducey Dam would have halted operations for an estimated period of six days, the time necessary for the water to recede.

During the Battle of Normandy, from the time the 113th AAA Group became operational on 30 June 1944, to the 24th of July 1944, the German Air Force was active only as a reconnaissance unit. Occasional strafing and bombing attacks were made but these were usually of a harassing nature, and did not seem to follow any plan. Attacking planes flying within range of the antiaircraft units of the VIII Corps were engaged, and a majority were destroyed.

D-Day, H-Hour for the breakthrough operation for VIII Corps was postponed from 24 July to 25 July and again to 26 July. On the 26th of July, VIII Corps jumped off, and on the 28th of July Lessay and Perriers were occupied. The 473rd AAA AW Bn(SP) was used in a hedgerow mission to blast a path for the Infantry.

With the breaking out of the armor the race was on. Coutances was captured on the 29th, Brehal on the 30th, and Avranches and Granville on the 31st. With a complete knowledge of the Corps plans for the Brittany Campaign, and the knowledge that the Third Army was coiled and ready to break out of the Cotentin Peninsula, a detailed reconnaissance revealed the approaching bottleneck in the Avranches-Pontaubault area. Immediate steps were taken to protect the bridges and dam in this area. Liaison trips were made to the various battalions apprising them of the situation. The 489th and 777th AAA AW Bns(SP), attached to the 4th and 6th Armored Divisions respectively, were requested to leave a battery each at the vital structures involved, with the understanding that they would be relieved by the 473rd AAA AW Bn(SP) as soon as it could be moved forward.

At the time of the taking of Avranches no front line was established. Large pockets of Germans were cut off by the speed of the armored thrusts, and these groups hid by day



and tried to make their way back toward the enemy areas at night.

On 30 July Battery A 489th AAA AW Bn(SP) set up an antiaircraft defense of the bridges north of Avranches. The battery found itself engaged by German infantry and artillery, but maintained the AAA defense of the bridges.

On 31 July the 777th AAA AW Bn(SP), on passing through Pontaubault, left Battery A at the bridge. The Division Commander ordered an armored infantry platoon to stay with the battery to protect it against snipers and patrols.

On the morning of 1 August the 4th Armored Division crossed the Avranches-Pontaubault Bridge and Battery D of the 489th AAA AW Bn(SP) was deployed around the bridge. At about 1500 hours on the 1st, Battery A 473rd AAA AW Bn(Sp) arrived at the Avranches-Pontaubault Bridge. The 2nd platoons of Battery B and Battery D 473rd AAA AW Bn(SP) set up the defenses around the two bridges north of Avranches.

The German Air Force as yet had not flown any daylight sorties of any strength in the VIII Corps sector. However, during the late afternoon of the 1st August the attacks started, with the German Air Force strafing convoys and road junctions. All antiaircraft units, including some moving in convoys, gave a good account of themselves. East of Sartilly the 455th AAA AW Bn(M) accounted for two Cat I's with M51 fire. The 445th AAA AW Bn(M) also en route accounted for one Cat I with one round of 40mm ammunition which was fired from the wheels. No damage was sustained in the area.

On the night of 1 August, as the 489th and 777th Bns prepared to rejoin their units, the German Air Force struck in strength. Approximately 45 raids were sustained, consisting of about 237 enemy aircraft. The claims for the night's shooting included 27 Cat I's, 2 Cat II's, and 3 Cat III's. The 473rd AAA AW Bn(SP) reported that on two separate occasions, as soon as firing was suspended on attacking aircraft, a halftrack was moved to a near-by building to blast out snipers.

On 2 August, the 119th AAA Gun Bn(M) moved into the area. At this time the Infantry was being motorized and an excerpt of the S-3 Report of the 119th states, "we have been in position for 12 hours and the Infantry has just started through." Battery D 635th AAA AW Bn(M) was deployed around the Avranches-Pontaubault Bridge.

The German Air Force again struck in the area with 98 planes making 38 raids. Claims for enemy aircraft destroyed and damaged continued to come in and a tally of the night's work revealed 20 Cat I's and 3 Cat II's.

The period of 3 August saw the largest raids of the period. The German Air Force launched a total of 296 planes in 47 raids. The claims at the end of the day were 19 Cat I's, 5 Cat II's, and 3 Cat III's. Battery C 635th AAA AW Bn(M) had moved into the area to augment the defenses. Units of the 455th AAA AW Bn(M), 463rd AAA AW Bn(M) and 777th AAA AW Bn(SP), assigned other missions in the area, also participated in the defenses of the vulnerable areas. When the attacks reached their peak, traffic came to a standstill while personnel of the vehicles took cover in the ditches at the sides of the road and watched the pyrotechnic display highlighted by the occasional flash of an exploding plane. Nine of the Cat I claims awarded for the entire period were for unknown planes as the planes exploded when hit and only bits were recovered.

By this time the majority of the VIII Corps and many other elements of Third Army had cleared the vital area, but the Avranches-Pontaubault Bridge and the road net involved, proved to be the only supply route for the expanding Brittany Campaign and the Third Army push to the south and east. During the period of the raids, traffic continued to flow down this main artery.

Army antiaircraft units started to move into the area to relieve the Corps units. At about 2300 hours of the 4th August, operational control passed from VIII Corps Antiaircraft to Third Army Antiaircraft. However, to insure that an abrupt change would not leave the area undefended, all batteries of the 635th AAA AW Bn(M) remained in position until relieved. As the Army AAA units arrived, positions occupied by the 473rd AAA AW Bn(SP) and the 119th AAA Gun Bn(M) were taken over. The 119th and 473rd moved out for Rennes, and were joined by the 128th AAA Gun Bn(M). The 128th was attacked while in convoy and accounted for at least five of the enemy planes.

Upon arrival at Rennes, the Gun Bns completed their reconnaissance and then learned that the Infantry had not yet taken the city. The 473rd entered the city and started to cover the bridges over the canal. As the infantry came into that part of Rennes to occupy it, they found these antiaircraft guns on the spot to provide protection.

The totals for 4 August including the march and occupation of Rennes were 25 raids of 45 enemy aircraft, of which seven Cat I's and two Cat II's were claimed.

On the 5th of August Battery B 635th AAA AW Bn(M) was still in position at the Avranches-Pontaubault Bridge to assist the Army AAA units in their defense. VIII Corps was racing westward into Brittany with the 4th Armored Division moving toward Vannes, the 6th Armored Division well on its way to Brest, and the 83rd Infantry Division attacking St. Malo. The 8th Infantry Division completed the occupation of Rennes.

Throughout the entire period no vital areas were hit by the enemy. The bridges stayed intact insuring a steady flow of men and materials to the units that continued to forge ahead.

The antiaircraft units of VIII Corps and the 11th AAA Group made the most of the opportunity of driving the German Air Force from the skies. For the five-day period of 1-5 August 1944 a summary of the operations follows:

Date	Raids	Enemy Planes	Cat I	Cat II	Cat III
1 Aug	45	237	27	2	3
2 Aug	38	98	20	3	0
3 Aug	47	296	19	5	3
4 Aug	25	45	7	2	0
5 Aug	20	52	6	1	0
Totals	175	728	79	13	6

The following units were attached to the 113th AAA Group during the period:

Hq & Hq Btry 113th AAA Group
Col Charles M. Wolff, 0-12424
119th AAA Gun Bn(M)
Lt Col Earl L. Mickelson, 0-174267
128th AAA Gun Bn(M)
Lt Col J. R. M. Alston, 0-196850 (deceased)
455th AAA AW Bn(M)
Lt Col Charles H. Sargent, Jr., 0-127021
473rd AAA AW Bn(SP)
Lt Col James R. Gifford, 0-21964
635th AAA AW Bn(M)
Lt Col Alfred J. Wangeman, 0-285649
445th AAA AW Bn(M)—8th Inf Div
Lt Col Kenneth G. Degraw, 0-216508
453rd AAA AW Bn(M)—83rd Inf Div
Lt Col George W. Trousdale, 0-189048
463rd AAA AW Bn(M)—79th Inf Div
Lt Col Robin H. McCormick, 0-346836
489th AAA AW Bn(SP)—4th Armd Div
Lt Col Allen M. Murphy, 0-171183
537th AAA AW Bn(M)—90th Inf Div
Lt Col Beo W. Recer, 0-240535
777th AAA AW Bn(SP)—6th Armd Div
Lt Col Joseph H. Twyman, 0-18116

Signal Corps Training Films

16mm with sound—All unclassified.

Film Bulletin

FB 231—Rocket Instrumentation; 15 minutes. This film explains the various methods and instruments used to track and record speed, distance and flight of rockets. This recorded information is used for improved rocket design and development.

Training Film

TF 44-1524—40mm Twin Gun Motor Carriage M 19; 17 minutes. The film concentrates on the characteristics and operation of the gun and mount, in two major parts: mechanical functions of the piece and the duties of crew members. Wide use is made of slow motion, split screen and freeze frame.

Armed Forces Screen Report

AFSR 108—The Reserve Team; 20 minutes—This film traces the role of the citizen soldier throughout the Nation's history. It cites today's need for a reserve force capable of rapid mobilization and expansion.

No. 219—V-2 Rocket—Assembling and Launching (White Sands, New Mexico). 20 minutes.

No. M1286—Defense of Antwerp Against the V-1. 20 minutes.

TF 1-3785, GUIDED MISSILES—Orientation of past developments showing V-1, V-2 (Peenemunde), surface to air and air to ground missiles. 27 minutes.

No. 219 and M1286 are Signal Corps films and TF 1-3785 is an Air Force film.

These films are furnished to Reserve, National Guard and Regular Army units and organizations upon request. Requests for the three films should be submitted to the Central Film Library at the Headquarters of the Army in which the organization or individual is located. Letters should be addressed to the Commanding General of the Army, Attention: Signal Officer. The following list shows the addresses of the Armies:

First Army—Governors Island, New York 4, New York.
Second Army—Fort Meade, Maryland.
Third Army—Atlanta 3, Georgia.
Fourth Army—Fort Sam Houston, Texas.
Fifth Army—Fort Sheridan, Illinois.
Sixth Army—Presidio of San Francisco, California.
Military District of Washington—Fort Myer, Virginia.

In the event the guided missile film is not available at an Army Central Film Library, it may be obtained from one of the following Air Force Control Film Libraries:

Hq. Air Matériel Area, Olmsted Field, Middletown, Pa.
Hq. Mobile Air Matériel Area, Brookley Field, Ala.
Hq. Ogden Air Matériel Area, Hill Field, Ogden, Utah.
Hq. Oklahoma City Air Matériel Area, Tinker Field, Oklahoma City, Okla.
Hq. Sacramento Air Matériel Area, McClellan Field, Sacramento, California.
Hq. San Antonio Air Matériel Area, Kelly Field, San Antonio, Texas.
Hq. Warner Robins Air Matériel Area, Robins Field, Georgia.

Letters should be addressed to the Public Relations Officer at one of the Air Matériel Areas.

HONOR ROLL

****88th Antiaircraft Airborne Battalion**
16 April 1949—Lt. Col. Page E. Smith

****11th Antiaircraft AW Battalion (SP)**
12 May 1949—Lt. Col. Roy A. Tate

****228th Antiaircraft Artillery Group**
8 July 1949—Colonel David W. Bethea, Jr., S.C.N.G.

****107th Antiaircraft Artillery AW Battalion (M)**
8 July 1949—Lt. Col. Thomas H. Pope, Jr., S.C.N.G.

****260th Antiaircraft Artillery Gun Battalion (M)**
28 July 1949—Major Archie C. Watson, Jr., D.C.N.G.

****305th Antiaircraft Artillery Group**
25 August 1949—Colonel John S. Mayer, N.Y.O.R.C.

****21st Antiaircraft Artillery AW Battalion (SP)**
14 October 1949—Major John F. Reagan

****59th Antiaircraft Artillery Battalion (SP)**
14 October 1949—Lt. Col. Landon A. Witt

****69th Antiaircraft Artillery Gun Battalion (Mbl)**
14 October 1949—Lt. Col. Alfred Virag

****19th AAA Group**
21 December 1949—Colonel George R. Carey

39th AAA AW Battalion (Mbl)
12 January 1950—Lt. Col. Edworth T. Ashley

4th AAA AW Battalion
12 January 1950—Ernest A. Bush

****503rd AAA Operations Detachment**
12 January 1950—Captain Peter E. Sweers, Jr.

***75th AAA Gun Battalion**
12 January 1950—Lt. Col. Francis Gregory

***713th Antiaircraft Artillery Gun Battalion (M)**
8 July 1949—Major W. B. Pollard, Jr., S.C.N.G.

***101st AAA Gun Battalion (M)**
19 December 1949—Lt. Col. Henry J. Ellis, Ga. N.G.

***40th AAA Brigade**
16 January 1950—Colonel Morris C. Handwerk

***62nd AAA AW Battalion (SP)**
16 January 1950—Lt. Col. Arthur F. Schaefer

678th Antiaircraft Artillery AW Battalion (M)
8 July 1949—Lt. Col. M. T. Sullivan, S.C.N.G.

226th AAA Group
18 January 1950—Colonel John D. Sides, Ala. N.G.

The List Grows!

1. To qualify for a listing on the JOURNAL Honor Roll, units must submit the names of subscribers and total number of officers assigned to the unit on date of application.
2. Battalions with 80% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than 20 officers.
3. Brigades and groups with 90% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than seven officers.
4. Units will remain on the Honor Roll for one year even though they fall below the 80% requirement during the year.
5. Lists of subscribers and statement of number of assigned officers must be submitted annually by units in order to remain on the Honor Roll.
6. Battalions with 90% of officers subscribing will qualify for one star placed after the unit's designation on the Honor Roll. Battalions with 100% subscribers will qualify for two stars.
7. Groups and brigades cannot qualify for one star but may qualify for two stars by having 100% subscribers.

(Units of all components will be listed together in the order of their percentages, beginning with the unit with the highest percentage.)

(Each unit listed on the Honor Roll will be given a one-year complimentary subscription to the JOURNAL.)

(Name of unit commander and date unit initially qualified for the Honor Roll will be listed with the designation of the unit.)

News and Comment

Annual Financial Report

In accordance with the constitution of the Coast Artillery Association, the following annual statements of the Association and JOURNAL are published for the information of all Association members and subscribers.

ANTIAIRCRAFT JOURNAL
BALANCE SHEET–DECEMBER 31, 1949
ASSETS

CURRENT ASSETS:		
Cash on deposit		$ 1,277.29
Petty cash fund		25.00
Accounts receivable:		
Merchandise accounts	$ 1,983.73	
Subscriptions	270.00	
Armed Forces Talks	1,080.00	
	$ 3,333.73	
Less reserve for bad debts	384.20	2,949.53
Inventory of books		244.55
TOTAL CURRENT ASSETS		$ 4,496.37
FIXED ASSETS:		
Office furniture and equipment	$ 8,233.16	
Less reserve for depreciation	7,306.07	927.09
DEFERRED CHARGES AND OTHER ASSETS:		
Inventory of office supplies	$ 929.90	
Deposits with U. S. Government Printing Office	68.31	
Deposit for copyright	24.00	1,022.21
TOTAL ASSETS		$ 6,445.67

LIABILITIES AND NET WORTH

CURRENT LIABILITIES:		
Accounts payable		$ 23.07
Credit balance, accounts receivable		231.00
District of Columbia sales tax		15.41
TOTAL CURRENT LIABILITIES		$ 269.48
DEFERRED INCOME		6,441.16
NET WORTH:		
Surplus balance, January 1, 1949	$ 3,335.49	
Deduct, net loss for the year ended December 31, 1949	3,600.46	
Balance, December 31, 1949		— 264.97
TOTAL LIABILITIES AND NET WORTH		$ 6,445.67

UNITED STATES COAST ARTILLERY ASSOCIATION
BALANCE SHEET AS AT DECEMBER 31, 1949
ASSETS

Cash in bank		$ 1,954.32
Matured interest due on U. S. Government Bonds		290.00
Investments:		
U. S. Government bonds	$68,728.13	
Common stock	160.00	68,888.13
TOTAL ASSETS		$71,132.45

NET WORTH

Surplus balance, January 1, 1949	$70,830.53
Add:	
Excess of receipts over expenditures	301.92
SURPLUS BALANCE, DECEMBER 31, 1949	$71,132.45

ELECTRONIC NAVIGATION. By Lt. Col. L. M. Orman. Published jointly by Weems System of Navigation, Annapolis, Md. and Pan American Navigation Service, North Hollywood, Calif. at $4.50. 222 Pages; 67 Illustrations.

Colonel Orman is known to the readers of the AA JOURNAL for his articles on radar. As a matter of fact, it was these articles that gave birth to this book. A publisher liked his approach to a technical subject in a nontechnical manner and asked him to tackle the application of radar and similiar devices to the field of navigation. The book is the result.

"Electronic Navigation" is written for the user of radar, loran and many of the other new postwar electronic aids to navigation. Written entirely without mathematical formulae or those troublesome circuit diagrams that are of interest only to the designer or repairman this book should help the user of radar sets to get the maximum benefit from an expensive gadget.

Subjects covered are radar, loran, decca, gee, consol and such auxiliary radar devices as corner reflectors, beacons, remote indicators, chart comparison units, radar charts, and radar prediction devices. Although written primarily for the mariner an attempt is made to analyze the latest trends in airborne electronic devices.

Of interest to the prospective purchaser of sets is an appendix which lists available radar and loran with a statement of their principal feature.

The large Glossary of terms and the appendix of questions and answers should make the book extremely useful as a textbook.

Revised Guided Missile Glossary Issued by Department of Defense

The second issue of the "Glossary of Guided Missile Terms" was released by the Committee on Guided Missiles of the Research and Development Board, Department of Defense.

The glossary, first published in September 1948, includes definitions of terms and words now in general usage which have a different meaning when applied to the guided missile field.

The glossary and the revision were prepared by a subcommittee of the Committee on Guided Missiles of which Dr. C. M. Hudson, Ordnance Department of the Army, is chairman and Lieutenant Colonel J. A. White, Army Secretary of the Committee on Guided Missiles, is secretary.

Defining terms from "acceleration lateral" to "zoom," the glossary describes the word "hunting" in guided missile parlance as "a condition of instability resulting from overcorrection by a control device and resultant fluctuation in the quantity intended to be kept constant."

COAST ARTILLERY ORDERS

DA and AF Special Orders Covering November 1 through December 31, 1949. Promotions and Demotions not included.

Colonels

Barager, Kenneth M., to Third Army, Camp Stewart, Ga.
Featherston, John H., to Hq MDW, Wash, DC.
Flagg, K. P., to 1123d ASU Office of the Sr A Instr ORC, Hartford, Conn.
Goff, J. L., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Jacobs, J. P., to Second Army, Ft. Miles, Del.
Martin, M. J., to Hq Fifth Army, Chicago, Ill.
Phillips, T. R., to Hq Second Army, Ft Meade, Md.
Shumate, J. P., to First A 1106th ASU HD of Boston, Ft Banks, Mass.
Wolfe, W. J., to Second Army, Ft Meade, Md.
Wortman, V. W., to Second Army 2306th ASU Ohio Mil Dist, Dayton, Ohio.

Lieutenant Colonels

Ackert, T. W., to 31st AAA Brig, Ft Lewis, Wash.
Alba, B. M., to First A 1225th ASU HD of New York, Ft Tilden, NY.
Barber, J. T., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Button, R. E., to OS of D, Wash, DC.
Buynoski, A. S., to Stu Det Armed Forces Staff College, Norfolk, Va.
Defrees, J. L., to AA and GM Br Arty Sch, Ft Bliss, Tex.
DeRosa, John J., to US Army Pacific, Ft Shafter, TH.
Gilman, S. I., to Stu Det Armed Forces Staff College, Norfolk, Va.
Hendrick, Edward W., to OC of S, Wash, DC.
Liwski, F. A., to Stu Det Armed Forces Staff College, Norfolk, Va.
McGoldrick, F. M., to Stu Det Armed Forces Staff College, Norfolk, Va.
Mahoney, William C., to 3355th ASU Florida NG Instr State Arsenal, St. Augustine, Fla.
Moore, J. C., to Stu Det Armed Forces Staff College, Norfolk, Va.
Rehkop, R. G., to 1243d ASU Office of the Sr A Instr ORC, Kearny, NJ.
Schermacher, A. W., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Skinrood, N. A., to Stu Det Armed Forces Staff College, Norfolk, Va.
Sommer, A., AAA and GM Cen, Ft Bliss, Tex.
Tall, C. H., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Thompson, M. H., to Army Members Joint Tech Planning Committee, USAF, Wash, DC.
Weld, S. L., to 31st AAA Brig, Ft Lewis, Wash.
Wilson, Daniel M., to OARMA, Taipai, Taiwan, Formosa.
Wolfe, Y. H., to Stu Det Armed Forces Staff College, Norfolk, Va.

Majors

Barton, J. V., to 31st AAA Brig, Ft Lewis, Wash.
Boggs, K. L., to Hq First Army, Governors Island, NY.
Daugherty, L. S., to Stu Det Armed Forces Staff College, Norfolk, Va.
Douglas, M. B., 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Freshwater, H. J., to Armed Forces Sp Wpns Project, Sandia Base, Los Alamos, N Mex.
Gillespie, J. J., to Stu Det Third Army, Air Univ, Maxwell AFB, Ala.
Hilton, E. H., to Fifth A 5302d ASU USA and USAF Southern Rctg Dist, St Louis, Mo.
Huston, R. M., to Stu Det CIC Cen, Cp Holabird, Md.
Knox, W. H., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Nagel, J. R., to 6601st ASU Calif NG Instr Gp, National City, Calif.
Reeves, C. W., to Stu Det Third A, Air Univ, Maxwell AFB, Ala.
Reinbothe, A. H., to Fifth A 5405th ASU USA and USAF RCTG, Grand Rapids, Mich.
Williams, D. B., Hq Fourth A, Ft Sam Houston, Tex.
Winstead, E. D., to First A 1204th ASU NY NJ Mil Dist, Ft Totten, NY.

Captains

Brown, E. S., to Ft Eustis, Va.
Cargill, W., to First A 1104th ASU HD of Portland, Ft Williams, Me.
Chilton, C. E., to First A 1104th ASU HD of Portland, Ft Williams, Me.
Clark, R. H., to Stu Det CIC Cen, Cp Holabird, Md.
Cushing, L. W., to 319th FA Bn 82d Abn Div, Ft Bragg, NC.
Dalton, M. A., to 11th Abn Div, Cp Campbell, Ky.
Destefanis, V., to 1272d ASU Office of the Sr A Instr for NG, New York, NY.
Diggs, R. A., to 2421st ASU ROTC Morgan State College, Baltimore, Md.
Edwards, D. W., to 319th Abn FA Bn 82d Abn Div, Ft Bragg, NC.
Fico, G. J., to 60th AAA Bn, Ft Ord, Calif.
Hampton, W. D., to Fifth Army, Cp Carson, Colo.
Kemper, G. E., to Stu Det Arty, Ft Sill, Okla.
King, C. A., to 502d AAA Gun Bn, Ft Ord, Calif.
King, R. C., to 1123d ASU Office of the Sr A Instr, ORC, Hartford, Conn.
Mockbee, J., to Hq & Hq Btry 19th AAA Gp, Ft Meade, Md.
Mumford, H. F., to 4052d ASU AAA and GM Cen, Ft Bliss, Tex.
Seward, D. G., to 518th AAA Gun Bn, Ft Lewis, Wash.
Stolz, A. A., to 1129th ASU Hq NH Mil Dist, Manchester, NH.
Trice, W. A., to 4th AAA AW Bn, Ft Meade, Md.
Tuliszewski, V. J., to Stu Det Lang Sch, Monterey, Calif.
Williams, R. W., to 113th CIC Det Fifth A, Kansas City, Mo.
Wright, T. W., to 3239th ASU ROTC, Agricultural & Tech College, of NC, Greensboro, NC.

First Lieutenants

Bronnenberg, E. M., to 11th Abn Div, Cp Campbell, Ky.
Brooks, A. C., to 78th AAA Gun Bn, Ft Lewis, Wash.
Brown, V. C., to Stu Det QM Sch, Cp Lee, Va.
Devine, J. A., to Stu Det Arty Sch, Ft Sill, Okla.
Hirschberg, T. V., to 75th AAA Gun Bn, Ft Meade, Md.
Hoyt, K. D., to Stu Det QM Sch, Cp Lee, Va.
Hunter, E. H., to 80th Abn AA Bn, Ft Bragg, NC.
Ingham, H. L., to 502d AAA Gun Bn, Ft Ord, Calif.
Jackson, L. S., to 115th CIC Det Sixth A, Ft MacArthur, Calif.
Johnson, W. A., to Stu Det Arty, Ft Sill, Okla.
Jones, T. H., to 2d Armd Div, Cp Hood, Tex.
Keehn, S., to Stu Det Army Lang Sch, Monterey, Calif.
Kenney, W. J., to First A 1362d ASU, Ft Totten, NY.
McGinty, H. Q., to Stu Det AA & GM Br, The Arty Sch, Ft Bliss, Tex.
Orzechowski, E. A., to Public Info Div DA, Wash, DC.
Reif, F. W., to 7th Inf Regt, Ft Devens, Mass.
Serpe, A. D., to Stu Det Arty, Ft Sill, Okla.
Troxell, J. W., to Sixth A 6404th ASU USA and USAF Rctg Main Sta, Butte, Mont.
Week, L. J., to Stu Det Arty, Ft Sill, Okla.
Williams, C. L., to Stu Det AA and GM Arty Sch, Ft Bliss, Tex.

"If a person consistently echoes the party line, he probably is a communist. If he consistently agrees with every shift and change in the communist press, he probably is a communist.

"If he consistently supports Soviet policies, he probably is a communist. If a person consistently does ALL of these three things, he IS a communist."—AFPS.

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Birth Announcements

(1 card type)

50 cards with new plate	$7.65
100 cards with new plate	9.00
50 additional sets	3.15

(2 card type—ribbon tied)

50 cards with new plate	$10.80
100 cards with new plate	13.50
50 additional sets	4.50

Wedding Announcements or Invitations

50 sets (7 lines only)	$21.60
50 sets (9 lines only)	23.40
100 sets (7 lines only)	$23.40
100 sets (9 lines only)	25.20
additional sets of 50	$3.60

Reception or At Home Cards

50 sets (4 lines only)	$8.10
100 sets (4 lines only)	$9.00
additional sets of 50	$1.80

All prices include envelopes when appropriate.
Quotations will be forwarded on request for any social engraving not listed here.

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