# Antiaircraft JOURNAL

NOVEMBER-DECEMBER, 1949

# 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. LXXXXII NOVEMBER-DECEMBER, 1949 No. 6




*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.*

**The JOURNAL prints articles on subjects of professional and general interest to personnel of all the components of the Coast Artillery Corps in order to stimulate thought and provoke discussion. However, opinions expressed and conclusions drawn in articles are in no sense official. They do not reflect the opinions or conclusions of any official or branch of the Department of the Army.**

**The JOURNAL does not carry paid advertising. The JOURNAL pays for original articles upon publication. Manuscript should be addressed to the Editor. The JOURNAL is not responsible for manuscripts unaccompanied by return postage.**


PUBLICATION DATE: December 1, 1949.


## CONTENTS




**COLONEL W. I. BRADY, Editor**
**LIEUTENANT COLONEL RICHARD W. OWEN, Associate Editor**
**M Sgt Fred P. Presnell, Business Manager**
**Sgt Ralph N. Charleston, Cir. Mgr.**
**Sgt 1cl Fred A. Baker, Bookkeeper**

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.


# TRIAL FIRE SPOTT

## By Major James N. Olhausen, CA(

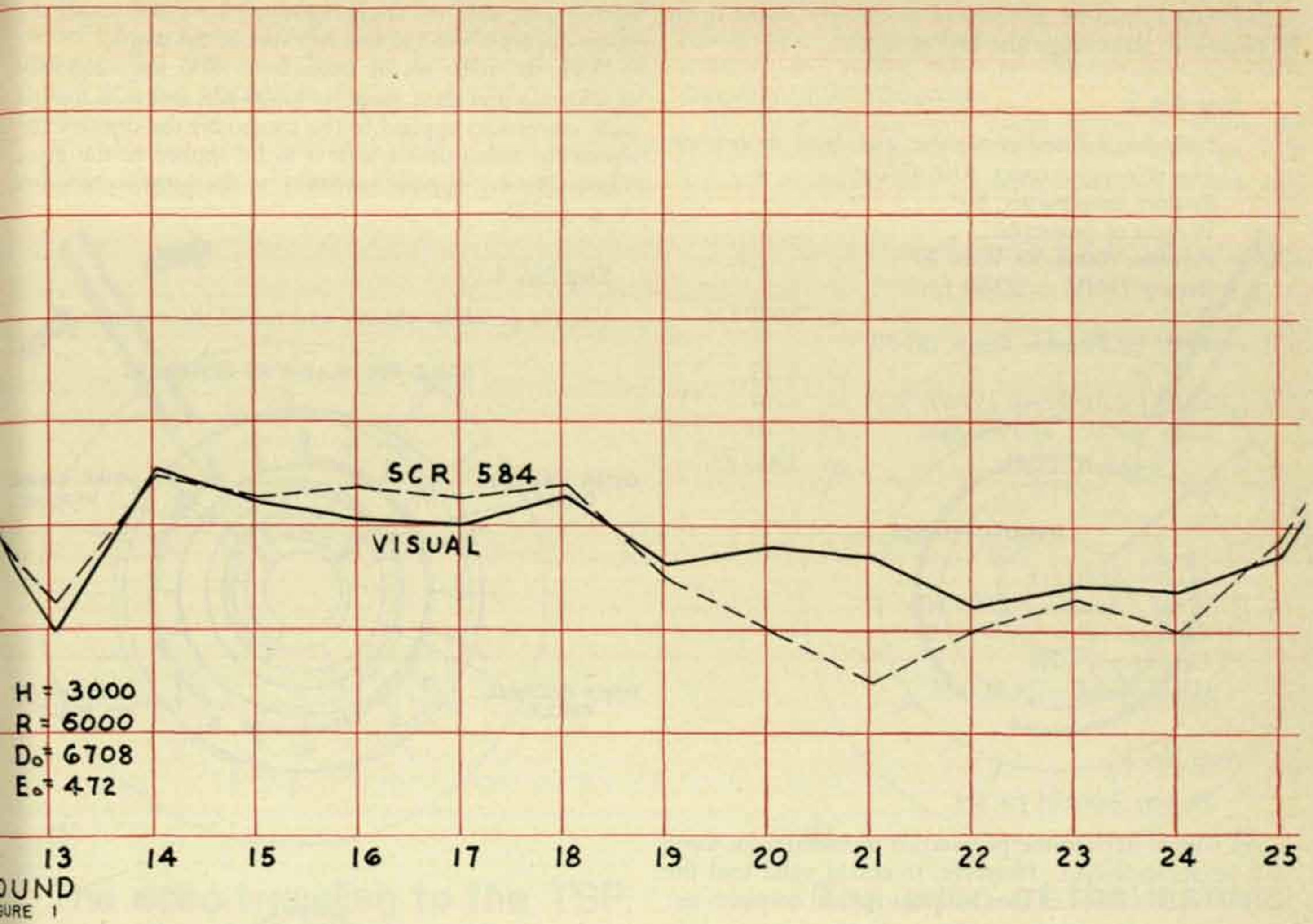
Since the standardization of the SCR 584 for AA Artillery, the AAA officer has been cognizant of the potentialities of the radar as a means of simplification of the gunnery problem. Preparation of fire is of such paramount importance to modern AAA that all efforts should be directed toward a simple method that gives maximum accuracy and minimum consumption of time. One of the greatest time consumers of this preparatory fire phase has always been calculation of pointing data prior to laying $O_1$-$O_2$ observation instruments on the TSP.

Multilateral spotting requires a surveyed base line, accurate position locations for $O_1$-$O_2$ instruments, personnel to operate those instruments and necessary communications facilities to afford control. In addition, the process of calculation of pointing data to lay all instruments on the TSP was a laborious job that often resulted in errors. For a training center situation this method has its advantages. However, a tactical position would seldom, if ever, afford the facilities or the time to lay such elaborate groundwork for preparation of fire.

In early 1944, the Antiaircraft Artillery School received a directive from Antiaircraft Command stating that tests would be conducted to determine whether or not the spotting of trial fire bursts with SCR 584 was practicable.

These tests were conducted using a limited number of rounds, fired from 90mm guns at various trial shot points. Slant range deviations from the radar were compared with those obtained from flank stations, both visual and camera.

As a result of these tests, the AAA School in its recommendation to the Antiaircraft Command concluded that:




# NG WITH RADAR

## nd Captain Francis P. LeMere, CAC

a. Slant range deviations obtained from the radar are commensurate in accuracy with those obtained from flank station, camera and visual records. (See Fig. 1.)
b. The accuracy of spotting with this instrument is primarily a matter of proper training of personnel.
c. The accuracy of the slant range deviations is independent of the magnitude of the range to the TSP.

As a result of these tests, the unilateral method of spotting was approved, but only as an auxiliary means. Multilateral spotting continued to be taught in the AAA School as the primary means of determining trial fire correction. Recent studies by the AAA School confirmed the findings of previous tests. Draft FM 44-4 (Part Two) prescribes unilateral spotting for AAA and this method is now taught as the primary means of spotting.

The following example illustrates the simplicity of the unilateral method of spotting using the SCR 584:

*Step No. 1:*
*Select TSP and construct trial shot chart.*
*TSP selected:*

*H = 5,000 yds.*
*R = 7,000 yds.*
*Selected Azimuth = 800 mils.*
*From F.T.: D = 8,602 yds; E = 632 mils.*

The trial shot chart contains: line of position, $\phi$ line and MV line. This is all that's required since corrections, in the vertical plane, will be in terms of $\phi$ and MV based upon deviations in slant range and line of sight.

*Step No. 2:*

*Calculate ballistic corrections and apply to director.*
*Met Message extract: 8102498069*
*Powder temperature: 85°*
*Weight of projectile: . .*
*Parallax: South 50, West 20*
*Battery DMV = 2,680 f/s*

| | | | |
|---|---|---|---|
| *DMV* | = | *2,680 f/s* | |
| *ΔMV for Powder Temp. (85-70) × .9* | = | *+13* | * |
| *ΔMV for Air Temp. (59-69) × .4* | = | *− 4* | ** |
| *ΔMV for Wt. of Projectile* | = | *0* | *** |
| *TOTAL DMV* | = | *2,689 f/s* | |

**Director Settings**

*MV = 2,680 f/s*
*Wind Azimuth = 1,000 mils*
*Parallax S − 50, W − 20*
*Density = −2%*
*Wind Speed = 24 M.P.H.*

*Step No. 3:*

*Prepare matériel for fire.*

All normal steps in the preparation of matériel for firing will be accomplished. However, to obtain valid trial fire deviations, it is essential that we place special emphasis on:

a. Collimation of the spotting scope on the Parabola of the radar.
b. Calibration of the range unit, if possible, on a fixed target at a known range. In lieu of this, check that the proper range is indicated when the hair line is on the left-hand edge of the main pulse (0 to −50, depending on the particular instrument).
c. The construction of an auxiliary range scale to facilitate reading of range deviations. (See Figs. 2 & 3.)

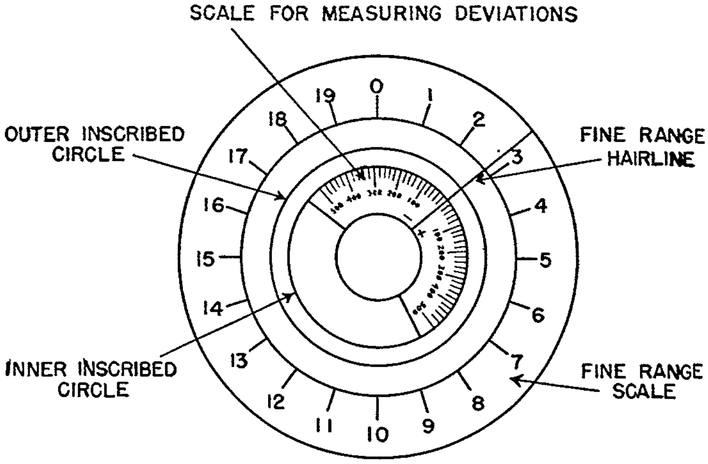
This scale may be made of any transparent material. It is calibrated to the same scale as the 2,000 yd. range scope. Attach this auxiliary scale to the movable portion of the 2,000 yd. range scope so that the "0" point is under the range tracking hair line.

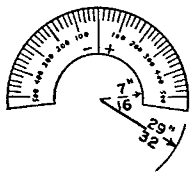
Due to the matériel limitation of the azimuth and elevation scales on the radar, the tracker and computor are used to position the antenna. Zero set the computor. Set computor selector switch to present position and all correction panel settings to director standard. Place cloud switch to "radar." Set radar control switch to "Remote." Manually position radar antenna by use of the tracker, using the computor transmitter dials as indicators. Set slant range to TSP on the range indicator of the radar. Adjust width of the narrow gate until the circle is almost closed and center this range display about the fine hair line of the scope.

With the radar set at azimuth = 800 mils, elevation = 632 mils and slant range = 8,600 yds, and with the ballistic corrections applied to the computor, the director furnishes the firing data which is to be applied to the guns. These data are applied manually to the guns in terms of A, $\phi$, and F.

Step No. 4:

Fire the problem, observe and record the deviations.



2000 Yard Range Indicator on SCR-584 showing improvised spotting scale.

Figure 2

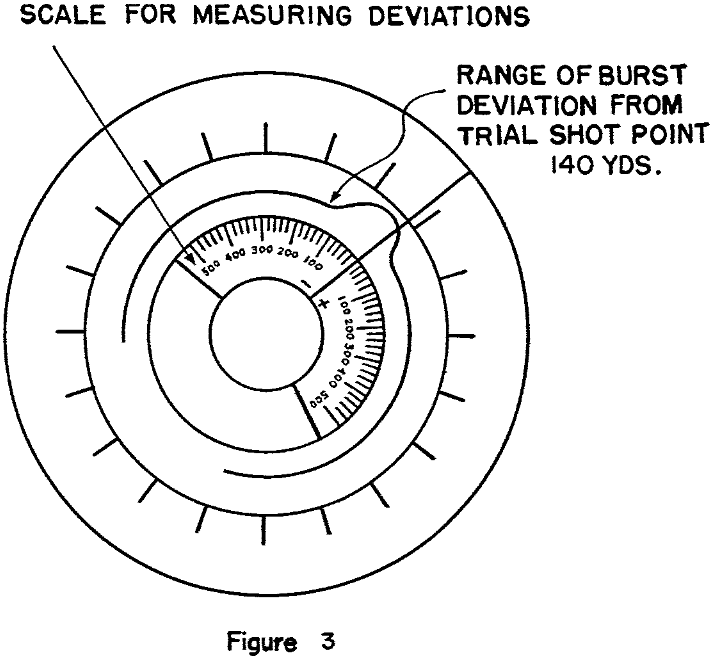


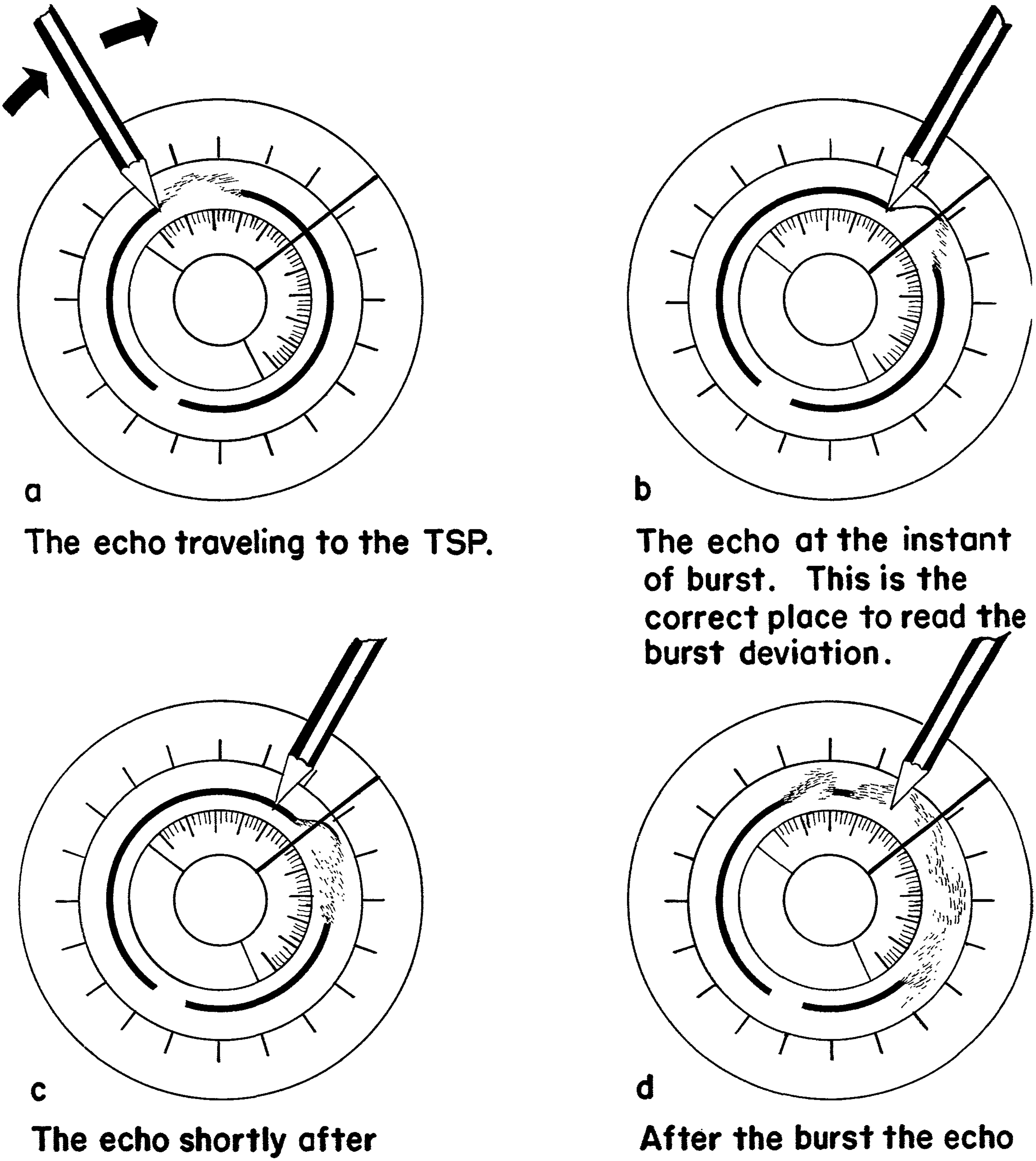

Figure 3

*See Page 4, Part 2B, 90mm AA Firing tables, for MV for Powder Temperature.
**See Page 32c, C4, 90mm AA Firing tables, for MV for Air temperature.
***See Page 32f, C4, 90mm AA Firing tables, for MV for weight of Projectile.

The azimuth and elevation deviations are obtained visually by spotting with the elbow telescope mounted on the parabola. The cross hairs in the telescope are calibrated at 5 mil intervals so that it is possible to estimate deviations to 1 mil.

The slant range deviations are obtained from the 2,000 yd. fine range scope. Figure 4 shows the shell traveling to the TSP. It appears as a hazy echo moving along the narrow gate. At the moment of burst, the echo expands instantly, and rapidly moves on. Shortly after the burst, dissipation of the echo occurs.

To determine the slant range deviations, follow the counterclockwise edge of the echo around the scope with a pencil or similar pointed, nonmetallic instrument until



a

The echo traveling to the TSP.

b

The echo at the instant of burst. This is the correct place to read the burst deviation.

c

The echo shortly after the burst.

d

After the burst the echo dissipates over the entire scope.

FIGURE 4

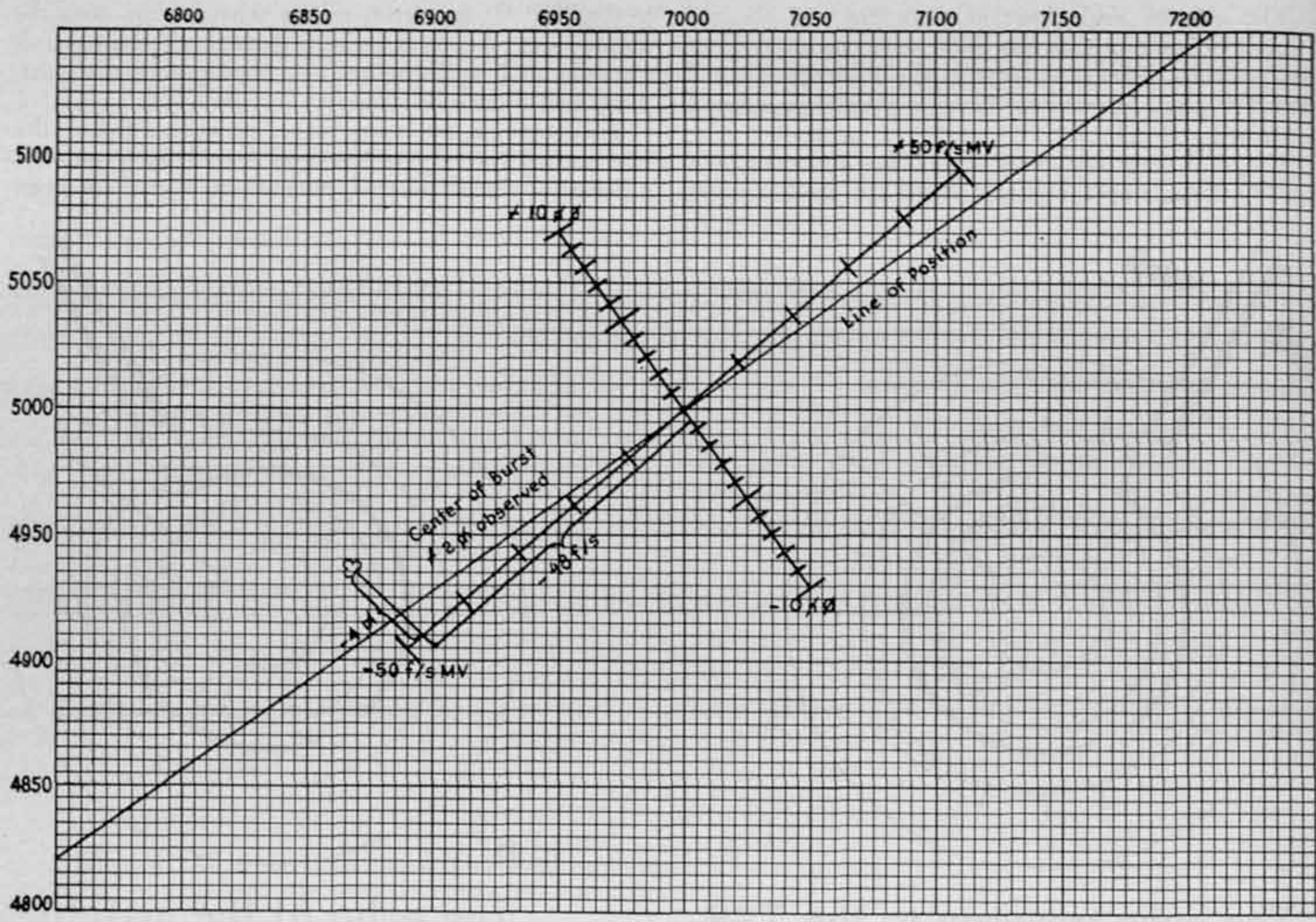



Figure 5

the instant of burst. Stop the pencil at that point and read the deviation on the auxiliary scale. This reading is the range deviation in yards from the TSP.

It is necessary that the burst be read when it first expands on the screen as the echo quickly drifts off true range. Training of the observer to mark the first point of expansion of the echo at the time of burst is essential for accurate results. The deviations for this problem are shown on AA Preparatory Form No. 7A. (Figure 6.)

Step No. 5:

Average deviations and plot CB on chart. (Figure 5.)

Bursts are plotted using arguments of vertical deviation and slant range.

Lateral deviations are obtained in the slant plane and must be converted to the horizontal. This is simplified by the formula—

$$\text{Deviations in the horizontal plane} = \frac{\text{Dev. in slant plane} \times D/1000}{R/1000}$$

Step No. 6:

Determine the trial fire corrections, and apply to the computor. (Figures 5 & 6.)

Proper training of radar operators is essential to obtain valid corrections when using the SCR 584 for trial fire spotting. Large errors may be made in the reading of the point of burst on the 2000 yard indicator unless operators have an opportunity to study the appearance of burst echos prior to conduct of fire. Current training films afford excellent aid and are available upon request through normal channels.

TRIAL FIRE WITH THE M-9.10 DIRECTOR

| SHOT NO. | $O_1$ | | | | | |
|---|---|---|---|---|---|---|
| | $t_P$ | SLANT RANGE DEV. | VERTICALS | | LATERALS | |
| | SEC. | YDS. | A | B | L | R |
| 1 | 15.6 | -140 | 3 | | 3 | |
| 2 | 15.5 | -160 | 2 | | 2 | |
| 3 | 15.5 | -130 | 1 | | 3 | |
| 4 | 15.5 | -140 | 2 | | 4 | |
| 5 | 15.6 | -130 | 2 | | 3 | |
| TOTALS | 77.7 | -700 | 10 | | 15 | |
| AVERAGE | 15.54 | -140 | 2 | | 3 | |
| CONVERTED LATERAL DEV. | | | | | 4 | |

| DATA WITH WHICH TO ENTER TRIAL SHOT CHART | |
|---|---|
| OBSERVED VERTICAL DEV. | A 2 |
| AVERAGE SLANT RANGE DEV. | -140 |

GUN NO. USED FOR TRIAL FIRE 2

RADAR RANGE OPERATOR Roe

| SUMMARY (M9.10 DIRECTOR) | dφ | M.V. | dF% | dA | dDENS% |
|---|---|---|---|---|---|
| CONSTANT OR MATERIEL CORRECTIONS | | X | | | X |
| BALLISTIC CORRECTIONS | X | | X | X | |
| TRIAL FIRE CORRECTIONS | -4 ≠ | -48 f/s | X | +4 ≠ | X |
| | | | | | |
| TOTAL FIRE FOR EFFECT CORRECTIONS | | | | | |

AAA PREPARATORY FIRE FORM NO. 7A

Figure 6

# ANTIAIRCRAFT OFFICER WITH TWELFTH A.F. (Africa)

## By Colonel Franklin K. Fagan, USAF (Formerly CAC)

*Colonel Fagan's account of his experiences as the Antiaircraft Officer of the Twelfth Air Force is a graphic account of the problems that arose in this field. The entire concept of an AAA section of an Air Force staff was one that had received little or no consideration prior to World War II.*

*Each Air Force was faced, to a greater or lesser degree, with the necessity for trained AAA personnel to advise and assist in the AAA and ground defense of airfields, the AAA defense of rear area vital installations, coordination of friendly fighters and AAA in air defense, establishment of AAA RESTRICTED AREAS, rules for engagement of enemy aircraft, and the training of Air Force personnel in small arms and improvised AAA weapons.*

*Another important phase of this type of duty called for the education of our airmen in the capabilities and limitations of antiaircraft artillery.*

*Based upon the pioneer efforts of the Air Forces engaged in England and North Africa in the early stages of the war, the need for an effective AAA staff section within Air Force major commands was clearly demonstrated. As a result of their contributions several important developments have taken place.*

*Flak intelligence and flak analysis as well as the combined air defense team has been established. Airmen have developed an acute awareness of the effectiveness of AAA and the desirability of a trained AAA staff with their higher echelons.*

*In any future war there will be an immediate need for trained personnel to serve on the AAA staffs of Air Forces. The full purposes and scope of this type of duty should be an important part of the training of AAA personnel most likely to be placed in staff assignments in higher headquarters.*

William L. Richardson,
Brigadier General, USAF.

In August of 1942 few members of the Army Air Forces or the Coast Artillery Corps realized the magnitude of the problems yet to be faced in the co-ordination of Antiaircraft Artillery with Air. It was clear that an AAA section would be required with the numbered Air Forces then organized. Brig. Gen. William L. Richardson was the AAA officer of the Eighth Air Force in England. The author was on duty with the 512th AAA Regiment at Fort Bliss, Texas, when rush orders were received to report to Headquarters Twelfth Air Force at Bolling Field, Washington.

At the time there was no opportunity to gain a clear understanding of just what an AAA officer was to do on the staff of an Air Force commander and there was literally no time to inquire had there been an authority on the subject available for questioning.

Little or no serious consideration had been given to the detailed functions of this assignment. It was learned in North Africa and the Mediterranean Theater that the staff functions and planning at the Air Force level were fully as complex as any faced by the AAA section of an Army.

Reporting to the Twelfth AF at Bolling Field, I breathlessly attempted to learn something of the requirements of the assignment. The unit, however, was then in the process of preparing for movement to Fort Dix, en route for overseas, and if anyone knew what was expected of me, certainly no one took time out to brief me. I was assigned a "staff" of one enlisted clerk and our principal duty was to prepare for an immediate overseas shipment.

A few days later and still in the dark, we sailed on the *Queen Mary* headed for Ipswich, England, and a long trek that was to make history for the AAA and its subsequent role in connection with air defense.

#### Introduction to the U.K.

Arriving at Wadasham Airdrome at Ipswich, I was informed by the British area commander that I was to take over the defense of the Airdrome to include ground and AAA. At this point we quickly learned that there were no American AAA troops available and the troops of the Twelfth AF were as far as can be imagined from being trained or ready for ground combat with anyone, much less a company or two of seasoned paratroopers of the German Luftwaffe! Most of these Air Force troops had never fired the weapon with which they were armed except for a bare half dozen rounds of what passed for "familiarization" fire. A course in rifle marksmanship was immediately instituted with the fervent hope that no ground attack would take place before we could learn to fire effectively.

Fortunately these men learned quickly and were soon proficient with small arms.

Busied with these elementary training problems, I still was completely in ignorance of my ultimate mission as AAA officer on the Air Force Staff.

Our British friends, upon learning that we were without AAA, thoughtfully left a light battery on the airdrome until such time as we could supply our own protection!

During this period the German Air Force (GAF) made nightly raids on the town of Ipswich, eight miles from the air base. This, no doubt, gave a sense of urgency to my training program and accounted for the excellent progress made by the clerks, mechanics and signalmen in their potentially grim role as infantry.

On September 22 I was ordered to Twelfth AF Hqs at Norfolk House, London. This was the first indication the Air Force commander, Brig. Gen. Jimmy Doolittle, had given that his AAA officer should participate in a conference. The purpose of this visit was to brief the staff on the forthcoming "Operation Torch," which was to take us over the beachhead at Oran, on the functions of an AAA officer with an AF.

At this time the principal mission was the air field defenses in North Africa. During these days and nights of intricate planning for the African adventure, Brig. Gen. William L. Richardson gave valuable assistance to the solution of our many problems. Also involved in the initial preparations was Colonel Joseph Harriman, AAA officer of the II Corps which was to make the ground assault on Oran.

The days and nights in London were extremely busy for the writer and Corporal Irving Goldberg, the enlisted clerk. We two still comprised all there was of the AAA section of the Twelfth AF. No time was wasted in worrying about the ground and AAA defense of Wadasham Airdrome, the Hq of the Twelfth AF. Our problem was to work out detailed plans for the defense of the first air fields to be captured and become operational in North Africa.

#### Day and Night Planning

Armed with maps and aerial photos of the invasion areas, it was possible to distinguish air strips which we intended to use. Planning an ideal defense based upon "school" solutions was also a relatively simple matter and one that had little to do with the actualities of the situation. The sad truth was that we had no idea that sufficient AAA would be available for air field defense. We were completely in the dark as to what units of AAA might reasonably be expected or in what numbers and what types. This made planning easy!

At this point the writer discussed this problem in detail with Brig. Gen. Aaron Bradshaw, who was the AAA officer of Allied Forces, and with Col. Harriman. These two officers were most helpful, but AAA was extremely limited, with a huge priority list including forward area defense, ports and other vital areas. There was little that the AF could count upon with any degree of certainty.

During this planning phase the writer was also seriously concerned with the acquisition of a suitable staff. Qualified AAA officers were scarce. The few not assigned to units were in demand and there seemed little hope of building an experienced staff of officer and enlisted personnel to carry the work load of the AAA section.

**British AAA formed a large part of defenses in North Africa.**

Fortunately we located one AAA officer, Major Patterson, assigned to the XII Bomber Command, and he was detailed as the AAA officer to that unit. This helped a little as he took over many of the details connected with airdrome defense and assisted me in the planning of the AAA defense of the Bomber Command's airfields, keeping me informed as to contemplated moves and other matters.

Another acquisition to my staff section was Captain John Foley of Bridgeport, Connecticut. He had been my battalion adjutant at one time and was now with the 62nd CA AA Regiment in England. Indulging in the grand old game of proselyting, I arranged for Foley to join me upon arrival in Africa due to the courtesy of Colonel Evans Crowell, later Brig. Gen., who commanded the 62nd.

#### The "Seagoing" AAA

On October 22 we entrained at London for Bristol and there embarked on HMS *Mooltan* which sailed to rendezvous with the North African invasion convoy then forming in the Firth of Clyde.

Knowing that D-Day in North Africa was scheduled for November 8th, I heaved a sigh of satisfaction and settled down to a complete rest for the ocean voyage! This was not to be, however. The commanding officer of troops on board the vessel, Brig. Gen. Dunn, broke it to me, none too gently, that I was now appointed ship's gunnery officer!

After a brief conference with the ship's captain, I was startled to learn that there were just two British marines available to man the ship's guns and that I would be required to furnish the balance!

To use airman's phraseology, "There I was . . ." with no artillery troops aboard ship! We were armed with two six inch Naval guns, two three-inch AA guns, one forty mm AA gun, ten 20mm AA 33 guns and four caliber .303 Hotchkiss machine guns. All of this was British equipment which didn't make any real difference since we would have to start our gun crews from scratch anyhow and it didn't matter what brand of equipment we trained on!

It was mandatory that the guns be manned twenty-four hours each day, and the manning crews called for a strength of 174 men. I selected these men from the 815th Engineer Battalion as some of these had received some training on machine guns.

With all available fingers firmly crossed, I undertook the task of making AAA gunners out of Engineer troops.

Upon arrival at the rendezvous point, we joined the balance of the convoy and our days and nights were under heavy pressure to train the engineers in the art of gunnery. Our defense also included one barrage balloon and one rocket launcher.

The two British marines worked out splendidly. They were tireless in their efforts to train the Americans on these weapons and they themselves were detailed as gun pointers on the six-inch guns.

At 2300 hours on 26 October, the convoy commander decided to celebrate my birthday by moving down the Firth of Clyde to open sea, and thus the voyage to Africa began. Our gunners were making rapid progress and we were looking forward to indulging in considerable firing practice.

### Lots of Luck—No Targets

Because of its speed and armament, the HMS *Mooltan* had been employed as an auxiliary cruiser and was accordingly assigned to the left rear flank of the convoy, an exposed position which would call for heavy shooting in the event of enemy attacks. It also offered a broad expanse of open sea for gunnery practice, with no particular danger to the other elements of the convoy!

Considering the fact that the men had never fired AAA guns, they did remarkably well in practice. Since this was not Fort Bliss with plenty of towed target missions available and no other target that could be considered suitable, we fired several short bursts from the three-inch guns and then fired at these bursts with 20mm and 40mm automatics. This gave the crews some experience in getting "on target" and helped them to observe the characteristics of tracer fire.

Fortunately the enemy failed to attack our convoy during the entire voyage although the ship's photographer took motion pictures of our gun drills and practice shoots. The six-inch guns were fired frequently, as destroyer escorts dropped depth charges to discourage enemy submarines that may have been lurking in the offing.

The voyage passed without untoward incident and as the huge convoy steamed through the Strait of Gibraltar, each vessel closed up virtually bow to stern, so we were really in the "sitting duck" category, beautifully set up for any enemy raiders from the air or under the sea who wished to disrupt our heavily loaded shipping.

### The Beachhead

As the artillery officer aboard, my privileges were many, as were my headaches. While others were safely battened between decks at some of the most interesting points of the voyage, I had the run of the bridge with the ship's officers, where I could satisfy my curiosity at any time.

Thus it was that at 0400 hours, 8 November, I was on the bridge of the HMS *Mooltan* to witness the landings, this being H hour. French batteries fired briskly for approximately one half hour and were silenced by a landing party. At 0530 hours a smoke screen was laid on the beach by our troops and heavy firing was heard from the direction of Oran, some fifteen miles distant from our point of attack.

Our ship ran into the Gulf of Arzew at 0800 hours, anchoring and unloading immediately. We moved ashore in the first boat which landed on "Z" Beach at Saint Lew. While en route to shore in the landing craft, I assumed I could easily step on shore without so much as getting my feet wet. The British Naval commander of the small boat soon gave "the word" that "this will not be a dry landing." When I first stepped from the landing craft I found myself up to the waist in the chill November waters.

As might be expected, no one on the beach could direct us to our Twelfth AF assembly area. We finally commandeered a jeep and, after a lengthy search, located our assigned position.

First AAA units ashore were the 105th and 106th AAA AW Battalions whose initial mission was to set up AA defenses on the beach under the direction of II Corps.

On our first day in North Africa, 8 November, the armored combat team under General Lunsford E. Oliver, captured our first airdrome at Tafarouri, some ten miles from the landing beaches. We immediately dispatched Battery C, 106th AAA AW Battalion, with an escort of five heavy tanks, to the newly won airfield to establish an AAA defense.

At 1500 hours of the same day the beach was strafed by two British Spitfires. One gunner in Battery A, 106th, was wounded in the first pass. On their second approach, the beach AAA opened fire and shot them down. The two pilots, both American, survived and stated that their mission was to strafe a French battery about eight miles East of our left flank which was holding up the advance of a battalion of the 16th U. S. Infantry. Mistaking our troops for their French target, they attacked our battery.

As a result of this fiasco, any plane coming over the beach was considered by our trigger-happy ground troops as fair game for small-arms fire.

### Our First Airfield Defense

Reinforcing Battery C, Battery A, also of the 106th, was dispatched to share in the defense responsibility at our new airfield. No escort was provided for this movement as General Oliver felt that they would encounter little difficulty in making the move. He said that there were a couple of French batteries shelling the road but "they probably wouldn't hit us anyway. . . ."

Up to this time no strong resistance was experienced from the Vichy commanded French Forces. However, a regiment of about 2,000 of the French Foreign Legion which was located at Sidi bel Abbes some thirty miles south were reported marching to counterattack Tafarouri. Spearheaded by approximately twenty-five outmoded Whippet tanks, this force was dispersed far from their goal by a squadron of American flown Spitfires which strafed the Legion column and destroyed a number of their tanks.

Upon taking over the airdrome at Tafarouri, we found a 40mm French battery with a goodly supply of ammunition and a battery of fixed 90mm AAA guns complete with director and height finder plus 1400 rounds of very welcome ammunition. The battery of 90s was later moved by II Corps to the harbor of Oran where it played an important part in the defense of the African port.

The heaviest resistance was from shore elements of the French naval establishment which maintained a naval air base in the vicinity.

On 11 November the armistice was signed with the French and organized resistance ceased except for minor small arms sniping from Axis sympathizers.

At this point considerable shifting of AAA units took place. The 106th AAA AW Battalion which had set up the original defense of our first airfield was ordered to Algiers and was replaced by two batteries from the 431st and the 105th AAA AW Battalions. Another airdrome at La-Senia was being defended by the remaining units of the 105th.

### Staff Section Duties Increase

One additional duty of an AAA staff section became paramount later in November. The problem of adequate liaison between our own and Allied elements of the Army, Navy and Air Force commands developed when the first of many conferences was called to discuss matters pertaining to early warning and recognition signals. Colonel Blackburn, C.O. of the 12th Fighter Command, Colonel Harriman of II Corps and two AF communications officers with an officer representing the RAF signal branch attended the conference.

The first get-together was of great value as our mutual problems were fully aired and a general basis for complete cooperation was established.

At this time a small Luftwaffe raid came over Oran which was repulsed by antiaircraft fire from American and French batteries. As a result of this action by the French troops many of our former opponents among the French troops were "restored" to duty and took up arms against the Axis enemy.

Of the three Western, Center and Eastern task forces attacking North Africa simultaneously, the Center task force attacking Oran was making the main effort. In the East, the RAF supplied the Air elements and in the distant West at Casablanca, fresh American forces had landed from the U. S.

### Contact With Casablanca

The Twelfth AF headquarters was in ignorance of the numbers, type and strength of the AAA in the Casablanca sector.

On 26 November, the late Brig. Gen. Davidson, Engineer of the Twelfth AF, and the writer flew in a C-47 to Casablanca to determine what AAA was available and to prepare plans for the coordination of this important element of the invasion. We flew at a maximum altitude of 200 feet to avoid any possible contact with GAF fighter planes that might conceivably be based in Spanish Morocco. Fortunately no opposition was encountered.

With the Western Task Force was the 12th Air Support Command under Brig. General John K. Cannon, later Lieutenant General and commander of the Twelfth AF in Italy. The AAA officer of the Task Force was Lt. Colonel R. H. Krueger who informed us as to the number of AAA units with his Task Force. These were in considerably greater strength than the Center Task Force and appeared to be disproportionate in comparison with the greater need for AAA in the Oran area.

Unfortunately none of these AAA units could be moved to the Oran zone without concurrence of Allied Force Headquarters which had not as yet established a command post in this vicinity.

On 28 November a conference was held with Col. Harriman and Col. Blackburn to discuss the operational control over AAA in the Oran area. As a result, the XII Fighter Command assumed responsibility for this; and thus an air defense team of fighters and AAA was established.

While these details were being thrashed out, the XII Bomber Command sent a heavy raid over the Bizerte area, the Germans' principal harbor in Africa. Returning pilots reported heavy flak over the target area so the AAA section, which was still in desperate straits due to personnel limitations, was given the additional responsibility for flak intelligence of the vast enemy areas.

### More Airfields—Less AAA

At about this time several other airdromes had been made operational. Among them was Nouvion, about forty miles east of Oran. Another was Oudjda some sixty miles to the west of Oran. This gave us approximately ten airfields in the North African Theater all of which were badly in need of AAA defense and few of which could be adequately defended with the limited quantity of AAA available.

This was a continuous problem throughout the North African phase of operations. It may truly be said that there is never enough AAA in a war zone until the battle for air supremacy has been won. When this is accomplished, there is usually too much AAA with too few missions for these highly trained units.

On 30 November, the Twelfth AF Headquarters moved from the Oran area to Algiers. This placed us close to Allied Force Headquarters, making liaison with the over-all command a simple matter.

Early in December, a conference was held with General Bradshaw at Allied Force Headquarters in connection with the AAA defenses of the three airdromes in the Algiers area. At this, and numerous other conferences, many problems were solved with the assistance and splendid cooperation received from General Bradshaw.

At another conference with General Doolittle the point was brought out that none of the AAA operating with the AF was assigned to the AF and only a few of the units were specifically attached for more than a limited time. General Doolittle directed the preparation of a letter to the supreme commander, General Eisenhower, requesting the assignment of AAA units defending airfields of the Twelfth AF.

This request was not favorably considered by Allied Force Headquarters and our defense problem increased during this period when Air Force strength was being built up in the theater.

### The Usual Personnel Problem

The organization of five air commands in North Africa under the Twelfth AF made it necessary to procure additional AAA officers for staff section duties with these separate command units. A requisition was submitted for the assignment of officers from the U. S. This was never filled and at a later date, a change in the organization obviated


**Ingenious but not adequate—Lack of AAA resulted in a wide variety of innovations.**

the necessity for additional officers for this purpose.

Our staff section, with its multiplicity of duties, was still so far understaffed that many necessary functions could not be properly handled. Captain Foley, Corporal Goldberg and the writer were still the entire staff section!

On 7 December, Air Intelligence asked us to prepare a route of approach to the Bizerte area that would be relatively free from flak interference. This was our first important request for flak intelligence service and fortunately it had been anticipated. We had already collected a number of flak reports received from the interrogation of air combat crews and had carefully collected a goodly supply of aerial photos. Thus it was relatively simple to plot a route of approach for our bombers making the Bizerte run. As luck would have it, this was quite successful in reducing our bomber losses over that area. It also served to prove the value of the AAA staff section to the Twelfth AF.

During this period the harbor at Algiers was bombed nightly, giving AAA units in that area their share of action.

Our crying need for more and ever more AAA remained unfulfilled. Requests to Allied Force Headquarters and to the British High Command brought little or no result. A number of our bomber fields were completely without protection and the Luftwaffe had pressed home several successful attacks without opposition from our undefended installations.

### One Solution

Once again the cry was "Improvise" . . . this we did by gathering up twelve half-track vehicles with two machine guns each, fifty caliber .50 machine guns and four 37mm antitank guns. All of this material was procured from the Aviation Engineers, who also furnished gun crews for the weapons. These troops required little AAA training since they were familiar with their weapons and could make proper use of them. The men were taken from their normal duties where they were badly needed in airfield construction work, to provide a small measure of AAA defense in one or two vital spots.

All of our AAA problems were covered in full in a report to Brig. Gen. Gordon Seville who visited the area on an inspection tour. Our study of AAA needs which was made back in England and our actual experience to date was outlined in detail, and this report carried the recommendation that AAA units allotted to the Air Force should be assigned to the AF where control would be complete.

The report also included the known strength and composition of German AAA units in their air field defenses. How far this study was assimilated in the higher commands is unknown. Our problem remained the same and no solution was reached throughout the war in the Mediterranean Theater. Like the weather, everybody talked about it but nothing was done about it. All of the ranking AF officers with whom we discussed the desirability of having our own assigned AAA, agreed with us but to this day we have no knowledge that this problem has been fully solved.

### "Heilige Nacht"

On 23 December, General Vandenberg, Chief of Staff, Twelfth AF, directed us to prepare a study as to the amount of AAA needed for the entire North African Theater. We submitted the study with the hope that our needs miraculously would be met. Once again, apparently nothing was accomplished.

Christmas night was a busy one for AAA units. The Luftwaffe celebrated with three raids which gave our AAA a chance to put up the usual beautiful but deadly tracer streams. These frequent displays attracted many venturesome soldiers who neglected to seek shelter and resulted in some casualties from falling flak.

As a belated Christmas offering to the overloaded staff section, the "table of equipment" was increased by one battered French Matford sedan. With this acquisition, the transportation problem was partially abated. With no assigned driver, we nearly assigned the invaluable Corporal Goldberg as driver in addition to his manifold duties. Just in time we learned that Goldberg had never added driving to his list of accomplishments so Captain Foley and I doubled as chauffeur for this Frenchified version of Henry Ford's product.

### North African Tour

On 30 December, we left Algiers to make an inspection of the forward airdromes of the Twelfth AF. Troops of the British First Army halted us en route to inform us that German paratroopers had landed in the area and were supposedly at large. We continued with Tommy guns at the "ready" but encountered no opposition. We arrived in Constantine the next day at the Headquarters of the 12th Bomber Command where we discussed the situation with Major Patterson, AAA officer.

That afternoon we visited Telergma airdrome where one hundred of our heavy bombers were based. The AAA defenses of this base consisted of one French 75mm AAA battery of three guns all of which were Model 1917! They had a fairly modern director similar to our M2. Manned by French troops, the personnel appeared to be quite capable despite their antiquated equipment. The only other defense on this field consisted of twelve caliber .50 machine guns manned by Aviation Engineers. This was a typical example of the available AAA.

The airdrome at Biskra was located about one hundred and twenty-five miles to the Southeast. The defenses at this heavy bomber field consisted of Battery B, 432nd AAA AW Battalion, under the command of Captain Franklin K. Rivers. The field accommodated two groups of B-17's and this one battery defense was far from adequate. The unit had moved onto the field two nights previously and had scarcely occupied its positions when a small GAF raid came over. The battery knocked one engine out of a JU-88, forcing the crippled ship to limp toward home. An American P-38 was able to overtake the damaged ship and destroy it. Thus, Battery B was credited with half a kill before it was fully emplaced.

During the course of this trip we learned that Casablanca, with all of its AAA, had received one GAF raid. This was the only German air attack on the Western Task Force during the entire campaign. We had made repeated efforts to have a portion of these AAA units moved to more active sectors.

#### Forward Area Air Defense

Traveling approximately one hundred miles to the Northeast, our inspection trip took us close to Tunisia where the Headquarters of the XII Fighter Command was situated. We were informed that an enemy armored column had broken through the French lines and was headed in the same general direction which we had intended to travel to Thelepte, our foremost fighter airstrip in the combat area. Here the war was being more realistically fought than back at the Standard Oil Building in Algiers! The airstrip had been carved out of the desert and all personnel were well dug-in, being subject to bombing and strafing attacks many times daily. This was so close to the front line that enemy armor was expected momentarily. The AAA defense of this field consisted of one platoon of Battery H, 213th CA Regiment (AA). In addition there were a few engineer machine guns and small arms.

Upon return to Constantine, we learned of a raid on Biskra during which fifteen of our B-17's were heavily damaged. Once again, adequate AAA defenses could have averted such loss of expensive equipment.

#### Formation of the Combined Committee

On 19 January, we attended our first meeting with the AAA and Coast Defense Committee of Allied Force Headquarters. This group consisted of Gen. Bradshaw; a representative of the G-3 section, Allied Force Headquarters; a representative of the U. S. and British Navies; a member of the Royal Air Force; and the writer as a representative of the Twelfth AF.

This committee was formed for the purpose of allotting newly arrived AAA and Coast Defense units to ports, airfields or forward Army areas. Each committee member presented his needs, and allotments were made by Allied Force G-3.

Acting as a clearinghouse for all questions on coast and air defense, this committee accomplished much and aided considerably in the formation of policies but no change was made in the assignment of AAA units to the Air Force. We were still faced with the problem of holding the little we had and acquiring a larger share of available defensive forces.

Still another obstacle to be overcome was the shortage of truck transport. Most of the AAA units detailed to AF were semi-mobile and it was always a problem to move them expeditiously as the situation required. Thought was given to moving these units by rail but the North African railways left much to be desired.

Despite our shortages and difficulties, morale of the AAA units in the Algiers area was very high. A bright note was sounded with the information that the 209th CA Regiment (AA), commanded by Colonel J. R. Townsend, would soon be available to take over the defense of heavy bomber fields in the vicinity of Telergma. Lt. Col. A. H. Doud and and Lt. Col. Kress were the battalion commanders of this regiment.

The arrival of this new unit was the cause of much rejoicing among the AAA staff. A well trained and well led AAA outfit, they were the answer to the serious problem involved in the defense of our highly vulnerable bomber command's operational bases.

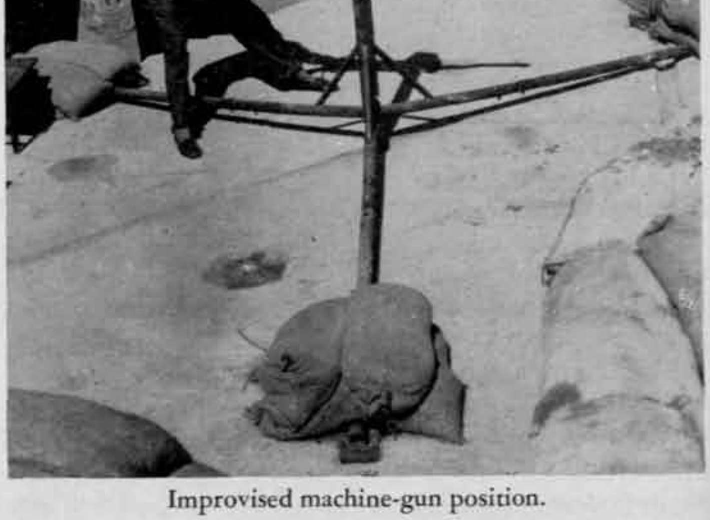
#### AAA Searchlight Unit Arrives

In the latter part of January, Colonel "Sandy" Goodman arrived in North Africa with his 4th AAA Group which consisted of three searchlight battalions. Colonel Arthur Nickelson of the Air Force Tactical School at Orlando, Florida, accompanied Colonel Goodman. These officers were to set up in North Africa the fighter-searchlight tactical concepts being taught at the School.

It was agreed that the 4th AAA Group should be assigned to the Twelfth AF and that these operations would be conducted through the AAA Staff.

As a result of many conferences with Allied Force Headquarters, the S/L units were not assigned to AF control but were attached on the same basis as other AAA units.

Allied Force Headquarters further decided that the



Improvised machine-gun position.

Gun Crews were not always properly dug-in in Sicily.

searchlights would be controlled by the British 52nd AAA Brigade which was located in the area.

On 21 February, an important change was made in the organizational picture of the AF. The Northwest African Air Forces came into being. The new command comprised the Twelfth AF and elements of the RAF operating in North Africa. The new commander was General Toohy Spaatz who had been Air Officer on the staff of General Eisenhower at Allied Force Headquarters.

This affected our status as the new designation was—AAA Section, Northwest African Air Forces. Although the work load increased, the staff remained the same.

#### Some Help Arrives

A bit of good news came on 29 February when it was learned that Brigadier General L. L. Lemnitzer was to assume command of the 34th AAA Brigade in the Telergma area where additional AAA was so badly needed.

Prior to this, two air defense wings arrived from the U. S., complete with equipment and personnel, to establish operations rooms. One each was assigned to Casablanca and Oran. All of this assistance in the area of our responsibility was extremely welcome. While no immediate increase was made in our staff section, at least a large portion of the defense requirements could be delegated to appropriate levels for efficient handling.

Still more encouraging was the arrival of the 103rd AAA AW Battalion commanded by Lt. Col. Peter Peca. This unit filled a wide open space in our defenses in the vicinity of Oran.

Another change in the high command was made when Major General R. B. Partiger of the Royal Artillery became the AAA officer at Allied Force Headquarters. This resulted in the augmentation of his staff section with additional British officers. Our AAA section remained unchanged!

On 24 February, Brig. Gen. William L. Richardson visited us during a brief stopover while he was en route from England to the U. S. A conference with him was very welcome. He helped us clear up a number of questions and gave us some excellent advice based on his own experience as AAA officer with the Eighth AF. Later he was to command the Ninth Air Defense Command in the ETO and demonstrate an excellent solution to the combined AAA and AF defense team problems.

A large part of our duties was to acquaint as many AF officers as possible with the capabilities and limitations of AAA. Too few of them had more than the vaguest notion of what could be expected of our weapons and troops.

In early April, we lectured to a group of AF intelligence officers on AAA. This amounted to as complete a schooling as could be given in the limited time. Batteries B and E of the 68th AAA Regiment gave an excellent demonstration of AAA firing and considerable interest was evidenced by the AF personnel.

On 27 April, Captain Foley, the one and only officer assistant, was ordered to the U. S. for compassionate reasons and no replacement was to appear in the immediate future.

In the middle of May it was apparent that the German Africa Corps was about washed up. General von Arneim had been captured and the ground phase of our operations had virtually ceased. German air attacks, however, kept coming and our air fields were continuously attacked by the Luftwaffe.

On 28 May, Lt. Col. Montgomery Raymond was assigned to our section. He had previously been with the Fifth Army AAA section and it is needless to say that he was welcomed with open arms.

It was during this period that the newly activated Seventh Army under General George E. Patton, began plans for the invasion of Sicily. Colonel Merle Thompson was the AAA officer for the Seventh Army in this initial planning phase. As the AF came into the picture, we had many conferences with him in the interest of coordinating our combined efforts.

Not until 7 June were we to receive additional assistance in the AAA staff section. On this date, Lt. Col. Fred Dickson and Captain George Thiesen, AAA officers, reported for duty. Colonel Dickson was immediately dispatched to indoctrinate pilots and bombardiers of the AF Training Command School in AAA. Captain Thiesen was made flak officer. At long last, an empire if you please, was being formed!

# 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—Lt. Col. Given W. Cleek, 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. Edwin T. Ashworth

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

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

## Read the criteria printed below and join the Honor Roll of Antiaircraft Journal supporters.

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.)

# Missiles For Outer Space*

## By Lieutenant Commander J. P. Field, Jr., U. S. Navy

### Introduction

Of the speculations arising from recent startling developments in guided missiles and jet propulsion one of those most appealing to the imagination is that of sending a projectile, or better still of traveling, beyond our atmosphere into outer space. A missile in outer space would certainly be a valuable research tool for exploring those regions; possible direct military applications are use as a radio station that could transmit to half the earth's surface or as a navigational aid for long range guided missiles.

Both the British and the United States government forces have announced that investigations are under way to study the projection of an earth satellite into space for unspecified military purposes. Some persons feel such suggestions to be absurdly unrealistic while others, remembering the scientific wonders wrought during the last war, feel that our scientists and engineers can simply whip out a moonship whenever the need arises. As usual, the truth lies somewhere between these extreme views. However fantastic it may sound, eventual production of missiles for outer space is now a probability.

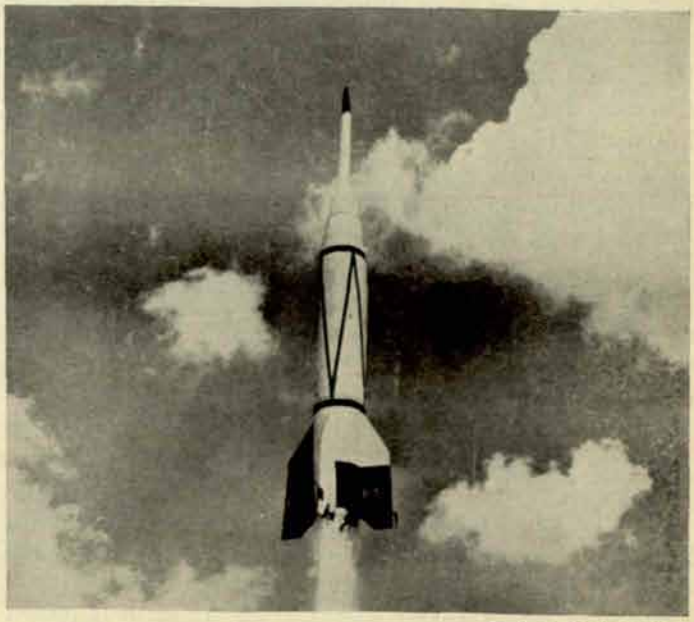
It will be constructive to examine some of the problems involved in such a venture and the available means of meeting these problems so that one can know what may reasonably be expected in this field. Because the first inescapable step in creating a machine capable of such flight is to provide it with a suitable propulsion system, let our discussion be directed to the propulsion problem alone. We thus assume that the necessary and extremely complex systems for launching, space navigation, and other controlling techniques can be solved once the power for propulsion is made available.

### Motion of Bodies in a Gravitational Field

The first step in this discussion is a brief review of some physical mechanics dealing with the motion of bodies in a gravitational field. By applying the known laws of gravitation it is possible to derive equations completely describing the motion of bodies through the space about the earth in such a way that their trajectories can easily be plotted if certain initial conditions are specified: namely, initial speed, direction of motion, and position, all with respect to the earth. These equations are relatively simple if complicating factors such as air resistance, influence of remote bodies, duration of accelerating forces, etc. are ignored; and for the purpose of the present discussion it is justifiable to ignore these effects.

Consider an ordinary artillery projectile fired at a certain muzzle velocity and elevation angle or a rocket missile having that velocity and direction at the end of burning of its propellant. Either will traverse a nearly parabolic trajectory determined by the velocity, angle of elevation and the pull of gravity.

When the range becomes great enough for the curvature of the earth's surface to be considered, the equation for the trajectory will show it to be an ellipse instead of a parabola. The angle for maximum range at any given velocity if aerodynamic drag is not considered is 45 degrees. Once this angle is set the only way to increase the range or height of flight is to increase the velocity; and as this velocity is increased the range and height will increase accordingly without limit. With a sufficient increase in velocity, the force of gravity would be unable to pull the projectile downward enough to make it fall back to earth. Its height would be so great that no air would be present to slow it down, and therefore unless it were struck by meteorites or other bodies there would be nothing to make it lose energy. Its centrifugal force would balance the pull of gravity and it would never fall or escape but would continue forever around the earth in an elliptical orbit, just as the moon does or just as the planets traverse their orbits about the sun. This is illustrated qualitatively in Figure 1. If V were made still greater the missile would escape entirely from the gravitational field of the earth and fly some other path through the space of the solar system held captive in the strong gravitational field of the massive sun. For a still greater ve-



U. S. Army photograph.

TWO-STAGE ROCKET IN FLIGHT

**This two-stage rocket fired by the U. S. Army Ordnance Department broke all records for velocity and altitude. It consists of a WAC Corporal mounted on a V-2. The final stage exceeded 5000 mph and 250 miles in altitude.**

*The statements and opinions expressed herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

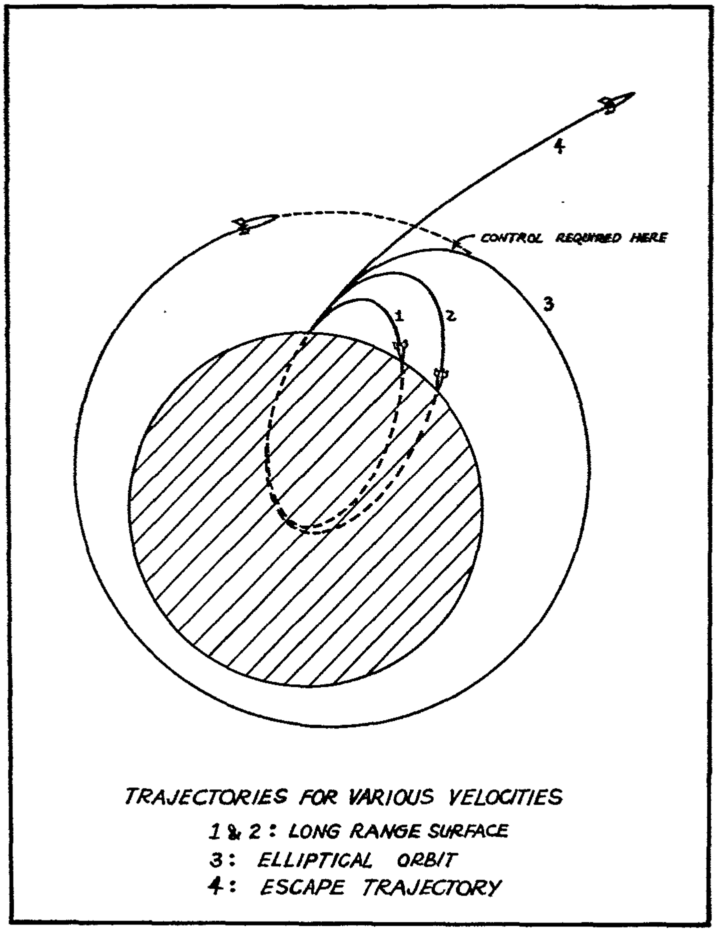



Figure 1

locity the missile would escape even from the sun and fly off into astronomical space never to return.

The exact shape of the elliptical orbit taken by a missile will be determined by its velocity and direction at the end of burning. A missile having a certain total initial energy may take any one of an infinite number of ellipses, including a circle, all of which have major axes of the same length and the center of the earth as one of the foci. The shape of the ellipse of a given energy depends upon the initial direction of motion. There is one circular orbit located at such a distance from the earth that the unvarying centrifugal force required to counterbalance the pull of the earth's gravity will be produced by a constant angular velocity equal to that of the earth's rotation—that is, its period would be 24 hours. A missile in this orbit would remain continually over one spot on the earth, assuming that it had been launched to eastward, and hence has been called a "stationary earth-satellite." Missiles moving in all other orbits, however, would have angular velocities such that they could never remain above one place on the earth's surface.

The velocities required for bodies to take such orbiting paths are very great. The "escape velocity" can be computed by reasoning that it is equal in magnitude to the velocity with which a body would strike the earth if pulled from zero velocity at an infinite distance by the earth's gravitational force. This figure is about 36,700 feet per second or 25,000 miles per hour. It means that if a body were projected vertically upward at 25,000 mph from the surface of the earth without any subsequent propulsion it would gradually be slowed by the gravitational force but would be beyond the effect of the gravitational force by the time its velocity slowed to zero. Obviously, a body under continuous propulsion could eventually pass out of the gravitational field even at very low velocities, but continuous propulsion over long periods of time is not a practicable thing to accomplish. The velocity required by a missile orbiting in a circle of a certain radius is computed by setting the centrifugal force equal to the force exerted by gravity at that distance, since it is the dynamic balance between these forces that keeps the body in its orbit. Typical data for various trajectories are given in Table I.

TABLE I

| *Trajectory* | *Velocity (mph)* | *Period* |
|---|---|---|
| *Circular orbit at 250 mi. altitude* | *19,000* | *92 min.* |
| *Circular orbit at 22,500 mi. altitude* | *22,400* | *24 hrs.* |
| *Escape from earth* | *25,000* | —— |
| *Escape from solar system** | *26,700* | —— |

The mass of the missile does not occur in these computations because both the attractive force and momentum which tends to keep the missile away from the earth once it is up to required speed are directly proportional to the missile mass. These velocities are the same for missiles of all weights.

Suppose it is desired to design a missile with circular orbit for a given purpose. The height may be fixed by the purpose of the missile. This immediately specifies the velocity that will be required as shown in the preceding paragraph. The mass of the orbiting body will also be fixed by its intended purpose; that is, it must carry a 2000-pound bomb, or 300 pounds of electronic equipment, etc. The propulsion designers would then be told to design a propulsion plant capable of accelerating that specified mass to that specified velocity at that specified height above the earth. Controls would also be essential to ensure that the missile would be traveling in the proper direction at the time the missile attained the specified distance and speed. For a circular orbit, of course, the proper direction would be radius perpendicular to a line from the center of the earth, or the "horizontal" direction if one can speak of horizontal in that remote space.

To summarize, it is seen that the propulsion problem can be reduced to that of attaining a certain velocity at a certain distance from the earth's surface. For all vertical speeds near the surface greater than about 25,000 mph the projected body will pass out of the gravitational field of the earth; for velocities between 25,000 mph and 19,000 mph the body will take one of many possible elliptical orbits about the earth; for velocities below roughly 19,000 mph, which corresponds to a circular orbit 250 miles above the surface, the missile will eventually fall to earth again because it will be low enough to be slowed down by the atmosphere; but for the higher velocities in this range the missile may go around the earth several times before dissipating sufficient energy to the atmosphere to allow it to fall back to earth.

*When fired tangential to the earth's orbit so that the earth's velocity of 67,000 mph can be utilized.

How does one go about producing a missile capable of such velocities? It is the consensus of all investigators that velocities of such magnitude can never be attained by simple gun-fired projectiles. The only possibility seems to be with rockets, but it is not simply done. Take a look at the V-2 missile which is not only large and powerful but represents a very advanced design. It is 46 ft. long, 5½ ft. in diameter and weighs nearly 14 tons when fully loaded and fueled. It ordinarily attains a maximum range of something over two hundred miles and maximum height of about 50 miles. Its maximum speed is approximately 4000 mph. This is only 16% of the escape velocity and 23% of the velocity required for a circular orbit at 250 miles altitude. How is one to get the tremendous additional velocity required? Obviously it can be done only by a major effort of development.

The velocity attainable by a rocket at the end of burning is given by the equation

$$\textit{rocket velocity} = \textit{jet velocity} \times \textit{logarithm} \left\{ \frac{\textit{total launching weight}}{\textit{empty weight}} \right\}$$

*or, as it more commonly appears in the literature,*

$$\textit{rocket velocity} = \textit{jet velocity} \times \textit{logarithm} \left\{ \frac{\textit{weight of propellant}}{\textit{empty weight}} + 1 \right\}$$

These equations neglect two very important factors: the effect of gravity and the effect of drag, both of which for our problem tend to decrease the attainable velocity. But these can be taken care of when necessary by adding terms to the above equations. The second form given here is the more convenient for discussing how to go about attaining a higher velocity rocket.

It is clear from inspection of this relation that the only way to attain a higher velocity is to make one or both of the two factors on the right side of the equation larger—that is, the jet velocity or the ratio of fuel weight to structural weight, or both, must be increased. Before discussing how this can be done it will be interesting to point out one thing revealed by these equations. When the logarithmic factor equals *one* the rocket will attain a velocity equal to its jet velocity. Under this condition the jet gases will be at rest in space after the rocket passes by. When the logarithmic factor exceeds one the rocket will attain a velocity higher than the jet velocity. Under this condition the jet gases would have forward motion through space after being exhausted. If this seems unreasonable stop for a moment to remember that Newton's second law states that the force is equal to the rate of *change* of momentum and it will be clear how this is possible. This is not only possible but, in fact, will be required for an orbiting missile.

The velocity at end of burning is the maximum velocity a rocket will ordinarily reach. For instance, if a velocity of 19,000 mph were required for an orbiting missile at 250 miles altitude the best motor design might require that a higher velocity be produced at a lower burn-out point, say 150 miles altitude, and that the missile be slowed by gravity during the remainder of its un-powered flight. This would require production of a higher velocity than the stated 19,000 mph.

Now to see how the factors on the right-hand side of the equation can be made larger. The jet velocity is a very important quantity because the relation shows the rocket velocity to be directly proportional to it. It is theoretically determined by many factors including the fuel combination, the combustion chamber pressure, the nozzle configuration, and others; but in practice other design limitations so restrict the choice of values for these variables that the fuel combination becomes the wholly predominant factor for most purposes. Choice of a fuel combination effectively determines the jet velocity.

No detailed discussion of fuel characteristics will be given here. Such a discussion is found in Mr. Willy Ley's articles, "Rockets and Their Fuels."* The highest jet velocity that can be hoped for among the ordinary chemical fuels is theoretically 12,700 mph from liquid hydrogen and liquid ozone, a combination that has not yet been successfully employed. The density of these components is so low even in liquid form that the value of the propellent mass ratio is unavoidably decreased from that obtainable with denser fuels. This is because the engineer has to design larger and therefore heavier tanks to hold a given mass of this fuel combination than would be required to hold the same mass of a denser substance.

The ratio of propellent weight to empty weight, call it propellent mass ratio for simplicity, will be high if the design engineer can contrive somehow to store a large amount of fuel in a very light rocket structure. But this is difficult to do. The degree of success will depend primarily upon the chemical and physical characteristics of the fuel, the magnitude of the acceleration which the rocket will experience, and the ingenuity of the design engineer. It is advantageous to accelerate rapidly to avoid loss through expending fuel merely to offset the effect of gravity over a long period of time; but too rapid acceleration requires heavier structures to withstand the strain and may lead to danger from air friction.

The propellent mass ratio for the V-2 is about 0.70. For the WAC Corporal it is 0.54. Even if one made the unlikely assumption that this ratio could be brought up by utmost design skill to 0.85 in a rocket powered by the liquid hydrogen-liquid ozone combination the maximum velocity would be 7800 mph. As difficult of attainment as this would be in actuality, it is still far short of the goal we seek.

To make a long story short it seems extremely difficult to attain velocities high enough for orbiting missiles with rockets such as we have discussed. This is because it is necessary for the fuel burned during the last part of the burning stage to be wasted in accelerating a heavy mass of structure, such as large empty fuel tanks, fins, etc., that is no longer necessary for the operation of the rocket.

A way to avoid this situation which limits so severely the attainable velocity, and therefore the range and altitude of a simple rocket is to design its structure so that the unnecessary parts can be dropped off as soon as they are

*Coast Artillery Journal, Nov.-Dec., 1947, Jan.-Feb., 1948.

no longer needed. Such a rocket has been called a "step-rocket" or a "multistage rocket."

The tremendous advantage so obtained becomes clear when it is noted that each step will be able to add the same increment of velocity to the final stage that that step would ordinarily be able to attain if launched alone from zero velocity. For example, the V-2 reached about 4000 mph. Suppose that, instead of a 2000-pound warhead, a rocket of the same weight capable of attaining 4000 mph alone from rest were mounted on the nose of the V-2 and arranged so that it would be detached and fired at the precise instant the V-2 ceased to burn.

Upon launching, the V-2 would accelerate the combination to 4000 mph and then fall away while the second rocket would accelerate, unencumbered by the heavy V-2, to another 4000 mph velocity, reaching in this way a final velocity of 8000 mph. The speed of the final stage thus becomes the sum of the speeds of the individual stages if fired alone. Almost exactly this procedure was used by the Ordnance Department, U. S. Army, in February 1949, when a WAC Corporal was launched from a V-2, except that the weights and speeds were not those used in the example above. By this method the second stage was made to go "over 5000 mph" and reach an altitude "over 250 miles." This is the first known use of a multiplestage liquid fuel rocket, and the altitude and velocity broke all previous records by far.

One can easily see that by increasing the number of stages, the terminal velocity of the final stage can be brought to an extremely high value. In fact, the equations show that mathematically there is no limit whatever to the velocity attainable by this method if the number of stages is made great enough or the mass of the final stage is made small enough. Practically speaking there will be limits set by cost, weight, usefulness, etc. Without going into great detail some of the facts about step-rockets that have been revealed by scientists making careful analyses are listed below.

*(a) A single-stage rocket is more desirable than a multistage unless final velocities comparable to or larger than the rocket exhaust velocity are required. This is because the single-stage rocket does not need multiple pumps, tanks, motors, etc. For higher velocity requirements step-rockets become desirable. The higher the final velocity desired, the more steps are needed.*

*(b) For multiplestage rockets the best arrangement is for each stage to share equally in producing the final velocity.*

*(c) The weights of similar stages should be such that the weight of the payload is to the weight of the final stage as the weight of the final stage is to the weight of the next-to-final stage—and so forth through all the stages.*

*(d) For a given specified performance, the total launching weight of a combination is proportional to the payload carried even though the payload may seem almost insignificant compared to the total weight. If a total launching weight of 20,000 pounds is required to deliver a 100-pound payload, then a total launching weight of 40,000 pounds will be required to deliver a 200-pound payload.*

*(e) Other design factors being held constant, the number of stages required is proportional to the velocity, and the total launching weight varies exponentially with the velocity. This means that if a three-stage rocket weighing 1000 pounds is required to produce a final velocity of 15,000 mph, then a six-stage rocket weighing 1,000,000 pounds will be required to produce a final velocity of 30,000 mph.*

Computations have been made to see how big and how heavy would be the rockets required for certain missions. In making such estimates, apparently negligible changes in the assumptions regarding structural design possibilities and jet velocities attainable may change the whole conclusion reached. Therefore, if any faith is to be put into the finding of such an investigation only the estimates of widely experienced men of the most mature scientific judgment can be safely used. Even these men do not always arrive at exactly the same findings. Dr. Francis H. Clauser[1] of the Johns Hopkins University has published a paper, a summary of which appeared in the ANTIAIRCRAFT JOURNAL,* in which he computes on the most optimistic assumptions he considers reasonably sound that 100,000 pounds is the weight required for a missile to reach the escape velocity carrying a 100-pound payload. Seifert, Mills, and Summerfield,[2] associated with the Jet Propulsion Laboratory of California Institute of Technology, describe computations leading to a weight of only 49,500 pounds and a length of 72 feet for the same mission. Both designs envision use of a liquid oxygen-liquid hydrogen fuel system. Clauser's rocket would be a four-stage system with initial acceleration of 2 g's, while the other would use five stages and have an average acceleration of 5 g's for each stage. The divergence in final answers given by these authorities in the field is the result of different assumptions concerning the propellent mass ratio, the acceptable accelerations, etc.

Seifert, Mills, and Summerfield, also computed weights for other missions. For an earth satellite at 200 miles a 4-step 9800-pound missile 42 feet long is required. For a stationary earth-satellite a 35,400-pound missile 64 feet long is required. All of these deliver a 100-pound payload and use the liquid oxygen-liquid hydrogen fuel system.

These figures should give some idea of the sizes and weights involved in building missiles for outer space. A very high cost is implied.

## Nuclear Power

All the foregoing has referred to conventional chemical fuels. The possibilities of the use of nuclear power have not been considered in the discussion. It may be that the utilization of this tremendous potential source of energy will completely change the present prospects for space missiles, but most knowledge of this subject is secret. It is believed that the only practical application of nuclear power to rocket propulsion will be to generate heat which can be transferred to a working fluid for expulsion at high velocity in a jet. It has been fairly definitely shown that radiation pressures and reaction from ejected matter do not present good prospects as methods of propulsion. Hence, conjecture on the applicability of nuclear power ought to

[1]Francis H. Clauser, *Flight Beyond The Earth's Atmosphere,* SAE Quarterly Transactions, Oct. 1948.

*May-June, 1949.

[2]Seifert, Mills, and Summerfield, *Physics of Rockets,* American Journal of Physics, published in parts during 1948.

await more definite knowledge of how the energy can be made available and applied to the working fluid.

### Conclusion

One may conclude from all the foregoing that the projection of missiles into orbits about the earth is within the present capabilities of our technology and that even production of an escape missile does not seem impossible. An orbiting missile will undoubtedly be of very great value in supplying scientific information. It may be of some military value. But any such activity will require a tremendous amount of money, man-power, and brain-power. To develop and construct one such missile carrying only a very modest load of equipment will require many millions of dollars. If one looks forward to the day of inhabited space missiles he must be prepared to pay for the added space and weight, heating and cooling, low accelerations, provisions for slowing and landing, and other provisions for human comfort and safety over great periods of time, by astronomical sums of money and many years of time.

# OLD "AMMO" STILL A DANGER

Live ordnance does not lose its lethality just because it is old—even if it has been buried for nearly a hundred years.

The roar of exploding Union and Confederate artillery shells from the historic ramparts of Ft. Sumter attested this fact a few weeks ago as teams from the Army, Navy and Air Force cleared the old battleground of dangerous ammunition in a demonstration attended by military and government officials, newsmen, and civic leaders.

Using the latest types of mine detectors and the most modern methods of bomb disposal, the teams located and destroyed ammunition remaining at the fort which might have proved dangerous to visitors when the fort is opened to the public. The actual search, in which the entire surface of the fort was combed inch-by-inch with mine detectors, was conducted by First Lieutenant Otto J. Lair and a special crew from the 82nd Airborne Division, Fort Bragg, North Carolina.

Deactivation of the duds was under the supervision of Lt. W. R. Brooks, officer in charge of the U. S. Naval Explosive Ordnance Disposal Unit, Indian Head, Maryland, which is under the jurisdiction of the Bureau of Ordnance.

In May a group of Army and Navy ordnance experts, headed by Lt. Brooks, processed with mine detectors a section of a private farm near Culpeper, Virginia, the scene of a violent encounter during the second Battle of Manassas. Nineteen live shells were recovered. The local publicity given this operation resulted in the surrendering of over 500 pieces of dangerous ordnance, trophies of more recent wars, from the Washington, D. C., area alone.

This story prompted the request to process Fort Sumter and other historic battlefields. In its annual report, just released, the War Trophy Safety Committee explains why it was eager to assist in the program:

"From past experience the Committee feels that the public notice given such enterprises, at first glance far removed from the original aims of the Committee, will result in the surrender of thousands of dangerous trophies from the American home, and contribute to public safety generally."

The Committee, headed by Mr. Henry Schneider of the Treasury Department, was organized at the close of World War II to promote a nationwide campaign to prevent further casualties from trophy weapons brought into millions of homes as souvenirs from the battlefronts and to educate souvenir owners on the safest means to keep trophies out of criminal hands.

"Since the inception of the Trophy Committee, approximately one million pieces of ordnance have been processed," according to the annual report. "About 10% of this number have been found to be 'alive' and have been demilitarized; about 14,000 machine guns have been registered with the Commissioner of Internal Revenue. Of this number, approximately 70% have been rendered permanently inactive by welding. More than one thousand pieces of government-owned ordnance have been recovered."

The National Safety Council has credited the work of the Committee with saving several thousand civilian lives a year.

The Committee is justifiably proud of these accomplishments but feels that its work toward the recovery and demilitarization of weapon souvenirs is not finished. Whereas the death rate has been reduced, casualty figures, especially among children, continue to be challenging. Authorities estimate that approximately 60% of the armed crime in this country is committed with weapons that are either war trophies or government property items.

# Colonel Moultrie's Fort

## By Jerome Kearful

In our War for Independence, more than one victory was won against seemingly unbeatable odds. But no American success was more of a surprise to the confident British than the successful defense of Charleston by a single fort constructed of palmetto logs!

When the Revolutionary War got under way, the port of Charleston, South Carolina, was marked out as an early target for the British fleet. In planning to seize Charleston, the King's advisors were moved by two objectives: the town and port of Charleston were not only of considerable strategic importance, but the colonists in that area had been particularly offensive in the manner in which they had defied royal authority, and an object lesson was deemed suitable and proper.

At the outbreak of the Revolution, the population of Charleston was only some 10,000. Yet Boston was then only twice as large, and Charleston was in the front rank in its commercial importance to the Colonies. The temper of the people of Charleston was inflexibly opposed to legislative and military domination from the Mother Country across the Atlantic. Several incidents showed their early will to resist.

When the King's representatives pronounced the terms of the hated Stamp Act in Charleston, they stirred up a hornets' nest. Quietly gathering and arming a hundred and fifty men, the South Carolinians advanced stealthily on Castle Johnson, a fortress in the bay where the stamps were kept under guard. The colonists surprised the garrison, seized the fortress and the stamps, and exacted a promise that the stamps would be returned to England. For this, Charleston was not loved in London!

Nor did Charleston's next expedition endear the city to the English. Shortly after Lexington and Concord in Massachusetts, Charleston heard that an English ship laden with fifteen thousand pounds of gunpowder was in the port of St. Augustine, Florida. Immediately, daring men of the South Carolina port fitted out a ship, sailed to St. Augustine, captured the British vessel, and returned safely with the valuable powder!

These bold acts of defiance to the royal authority were in the thoughts of Sir Peter Parker, English admiral of note, as he led his fleet, comprising some of the best ships in the Royal Navy, into the waters off the city of Charleston. Sir Peter, his officers and men, thought that they had good reason to believe that the heavy fire which their warships could deliver would soon reduce the rebellious stronghold to submission.

The British opinion might have proved to be correct, save for the palmetto logs! Colonel Moultrie, in command of the American forces in Charleston, had ordered the construction of a fort on Sullivan's Island, commanding the approach to the harbor. Because of the paucity of materials, the fort was built largely of palmetto wood, of unknown value and distrusted by the Americans. Necessity provided what proved to be an excellent defense!

After maneuvering for some days in the waters off Charleston bar, the British fleet began its attack on the morning of June 28, 1776. In the city, streets leading up from the water front were barricaded; defensive positions had been thrown out on the wharves; troops had been stationed along the shore to repel any landing attempts that might be made. Lead sashes from the city's windows had been melted down for bullets!

But the chief defense for Charleston against the British fleet was Colonel Moultrie's fort. Here, four hundred men stood ready to meet the best that the British navy had to offer. To the gunners in the fort, Colonel Moultrie said: "Mind the commodore and the fifty-gun ships." The Americans were picking their own targets!

As the line of British ships swung in, the first fire from the fleet struck Fort Moultrie. The soft, spongy palmetto logs absorbed the balls without even throwing out a splinter! The guns of the fort replied, and soon a heavy cannonading shook the city and deafened the townspeople who had climbed to the rooftops to witness the action.

As the morning wore on, the British fleet passed and repassed the American fort, never letting up in the volume of heavy fire. Yet, within the fort, the defenders were growing more and more confident. The palmetto logs were absorbing the shot and shell like a sponge, while most of the shells that fell inside the fort landed in a pool of water, where their fuses were extinguished.

The American fire was doing heavy execution aboard the British ships. On many ships of the line, few, if any, officers remained on the quarterdecks. Admiral Parker's ship, the *Bristol*, had her cable shot away, and swinging stern-on toward the fort, was shelled again and again. The *Actaeon* was run aground and blown up. What had seemed an easy task to the British in the morning was turning into a disaster in the afternoon.

Dismayed at their own losses, and amazed at the failure of their terrific cannonade against Fort Moultrie, they prepared to withdraw. Ten hours after beginning the attack, Admiral Parker shepherded his battered fleet out to sea. His report showed that his ships had lost two hundred and fifty men. The American defenders of the fort had suffered the loss of ten men killed and twenty-two wounded. Colonel Moultrie reported that his men later picked up some twelve hundred solid shot and numerous thirteen-inch shells. Moultrie won great favor by the defense of Charleston. He was shortly named brigadier general, and, after independence was won, served as governor of the state of South Carolina.

Four hundred men had won a surprising victory!

# SECONDARY RADAR

## By Lieutenant Colonel Leonard M. Orman, CAC

It is generally recognized by users of radar that the maximum utilization of radar can be expected only through a complementary system of radar aids. The AAA has used one type of secondary radar in at least two ways: for orientation of radars and as targets on balloons for the determination of meteorological messages. Many AAA men were not at all surprised to find that some of the famous *flying saucers* were nothing more than the latter. Corner reflectors were used as targets for seacoast artillery radar practices. Mariners are using them to make more recognizable targets out of buoys and other small objects. Paratroopers used a form of secondary radar to identify assembly points. Aerial navigators, too, used them to get the utmost from their radars. The U. S. Coast Guard is experimenting with beacons to mark important navigational promontories. Corner reflectors are being installed in the form of a T in Liverpool Harbor to give unmistakable identification in all weather.

Secondary radar may be broadly divided into two classes, passive and powered devices. Corner reflectors fall into the first of these two classes while ramarks and racons fall into the second grouping. Since the artilleryman is concerned primarily with the passive device at the present time the major portion of the article will be devoted to it.

#### Corner Reflectors

A special case of reflection takes place when radiation is directed at an object composed of two plane reflecting surfaces which are at right angles. Such a reflector is called a *corner reflector*. The property of a corner reflector which makes it of value is that any wave which can enter the corner is reflected out of the corner along a path parallel to the incoming wave. The geometry of the corner reflector is shown in figure 1 to illustrate this effect. A wave AB which enters the corner at any angle Θ with the vertical side will be reflected from this surface at the same angle Θ. Therefore the angle at which the reflected wave strikes the horizontal side is 90-Θ, and the wave leaves the corner along CD. If this wave is projected back to B′, it is clear that AB and DCB′ intersect the vertical plane at the same angle, so that these waves must always be parallel.

A reflector of this sort will produce a strong echo on a radar because the energy that strikes the corner is reflected back directly to the radar without the excessive scattering that occurs with most targets. However, such reflectors can frequently occur in nature, as in rock formations, sharp vertical cliffs that rise out of the water, or in the many perpendicular metal surfaces aboard ship. Artificial corner reflectors are usually made in the form of three sides of a cube rather than simply as two perpendicular planes. The larger the corner reflector is made, the greater will be the energy intercepted, thus producing a stronger echo.

Various types of reflectors have been designed and tested using both 3 cm and 10 cm radars. Results have been most satisfactory using a basic type trihedral reflector unit, the number and arrangement of which can be varied to meet different application requirements. See Figure 2. The dimensions of these basic units were chosen and proven by test to be optimum for the frequency range of all present type of commercial radar. All tests made so far have indicated that reflectors are most useful to mark objects or points where no reliable radar targets already exist, such as on low lying sandy beaches and small buoys, thus making excellent orientation points. They are also useful to increase the effective reflecting area of poor targets, increasing the range at which they will provide a good echo.

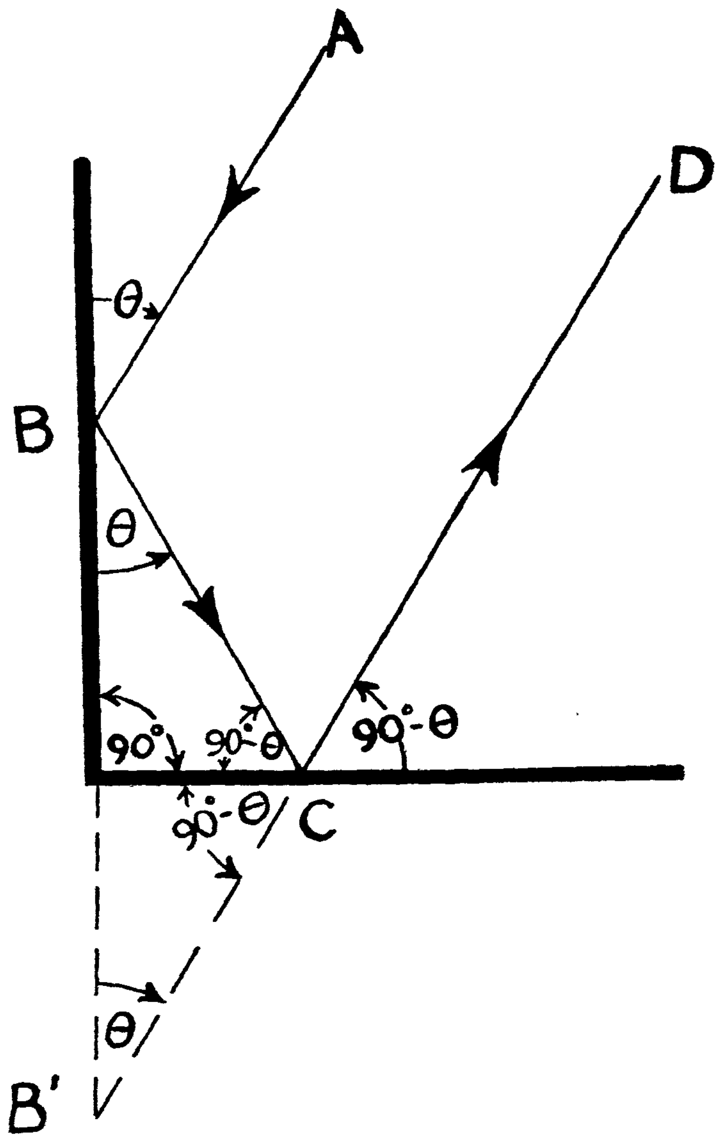



**Figure 1. Illustration of basic principle of Corner reflector. Ray entering along A leaves along D.**

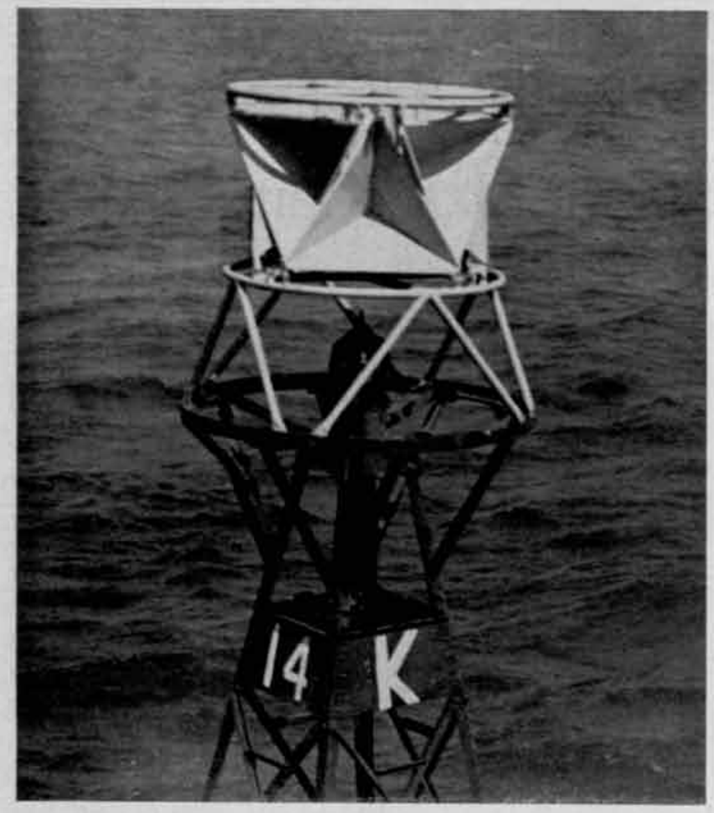


Figure 2. Basic type Trihedral reflector used here by U. S. Coast Guard to mark a buoy.

While reflectors can be useful for specific purposes they have limitations, and do not serve to particularly amplify an already good radar echo. When using reflectors to mark low lying sandspits and other obstructions that might otherwise go undetected on the radar scope, results have been good. Results also vary to some extent depending upon the frequency of the radar being used for a particular application of a reflector. Radar reflectors, therefore, have only special application and each installation will, in general, be a separate problem.

### Construction

In constructing a corner reflector, the planes can be made of any material which gives good radar reflection. Any sheet metal is satisfactory, and even wire screens and meshes may be used provided the spacing between wires is no more than about one-sixth of the wave length of the radar set with which the reflector is to be used. Knitted cloth interwoven with a silver-coated thread or silver-plated copper spiral has been used for life raft and dinghy reflectors. If screens or meshes are used, good contact at the crossover points of the wires is essential. If they have been exposed to salt atmosphere, the contact may not be satisfactory.

For good results, the planes of corner reflectors should intersect at right angles, and only slight deviation from 90° is permissible. The angular accuracy required is proportional to the length of the sides and the frequency. For a corner reflector with sides two feet long for use with S-band radar equipment, the deviation from 90° should not be more than 1.7°. If a framework is made of wood, it should be dry and weatherproofed. Since reflectors are directional, orientation of them is important.

The range at which a corner reflector may be observed from the air at an altitude of over 1,000 feet is proportional to the length of its sides. A reflector with sides two feet long can be seen from aircraft twice as far as one with sides one foot long.

From the ground, however, a four-foot reflector can be seen only twice as far as a one-foot reflector. Further, the maximum range at which a reflector can be observed depends on the height of the radar antenna and the height of the reflector above the ground. The reflector should be placed as high as possible above the ground if it is to be "seen" with radar. All other conditions being equivalent, a corner reflector is more effective at short wavelengths.

Corner reflectors have the advantage of being relatively inexpensive and simple to build, being responsive to a wide range of frequencies, require no electrical or mechanical power, and last, are relatively easy to maintain.

Ramarks and racons are being used to an ever increasing extent in the navigational field. They have not been used extensively with artillery radar. However they do seem to offer possibilities since they are usually much smaller than corner reflectors. For that reason they will be mentioned briefly.

### Ramarks

At the time radar was first released for civil use considerable thought and investigation was devoted to developing a form of powered radar aid that would require a minimum of maintenance, be relatively inexpensive, could be tended by the regular lighthouse keeper without further training, have low electric power consumption, employ simple, dependable circuits and require a minimum of change and cost to the shipboard radar. Operationally, the beacon should reliably furnish at least sufficient information for the navigator to orient himself and preferably to fix his position. Actually, when the navigator can definitely orient himself with respect to one radar target he is enabled to properly interpret the radar scope picture and thus proceed with safety.

As a practicable solution to this problem, the U. S. Coast Guard has several development models of the "ramark," or radar marker beacon, which gives bearing information only. Two ramarks are required for a fix. This beacon transmits continuously on the beacon frequency, 9310 mc for 3 cm radar or 3256 mc for 10 cm radar and does not in any way depend upon the radar's transmission. To use the ramark, the mariner operates the beacon receiver control which tunes the radar receiver to the beacon frequency and clears the scope of the radar picture—he then observes a pencil of light extending radially from the center to the periphery of the scope on the bearing of the beacon. The accuracy of the bearing and the width of the light beam corresponds to the accuracy and azimuthal resolution of the radar.

If the mariner sees the ramark and his radar is operating properly he can depend upon the bearing. The navigator makes use of this information in a similar manner to bearing on lights and shore objects. Like the corner reflector there is no ready means of identification other than properly locating the beacon. It is not anticipated that this will be a serious problem owing to the short ranges involved and the small number of beacons required in any one area. Ramarks have an advantage, not enjoyed to the same degree by other radar aids, of giving bearing information under all but the most severe weather conditions. One ramark, with any other suitable radar target, can be used to provide a range.

Peak output powers of the order of magnitude of one hundred milliwatts to a few watts should be ample for most applications. This amount of power is considerably in excess of that returned as an echo from normal radar targets. High power is not necessary. The equipment would normally be contained in one cabinet. It is envisaged that a ramark could be installed and maintained with little difficulty at an existing light or other aid to navigation station. The equipment installation would be in duplicate for each frequency in order that operation could be switched to the standby beacon in case of failure of the beacon in use, probably automatically.

If continued use of radar indicates the need, we can anticipate a responder type of radar beacon meeting requirements.

### Racons

Early in World War II a responder type beacon, known as "*racon*" was developed for aircraft as a military necessity. The responder beacon concept is an idealized system which is highly desirable from a purely operational standpoint; however, both the radar and beacon must be designed as sister components, each dependent upon the other. Generally speaking the circuits are complicated, expensive, difficult to maintain and the ordinary commercial radar can not utilize them without adding to the construction costs.

The principle of operation is straightforward, the beacon (normally quiescent) receives the incoming radar signal, converts it to a coded signal and retransmits to the radar on the beacon frequency. This coding positively identifies the transmitter and extends the maximum distance and accuracy of measurements upon the beacons. See Figure 3. Distances in excess of 50 miles are readily achieved. Theoretically the time required to perform this operation is small and fixed in amount, usually 2 or 3 microseconds, so that the error introduced in range is negligible even in the case of aircraft.

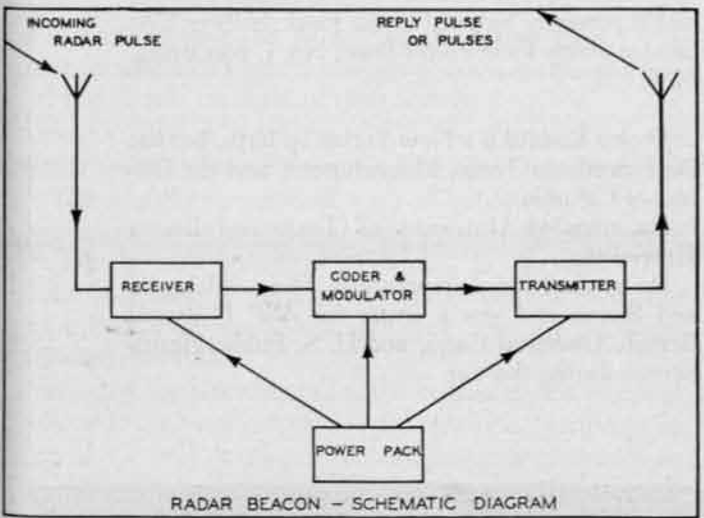



Figure 3.

The presentation on the radar scope consists of a series of dots extending radially to the edge of the screen on the bearing of the beacon. The distance to the beacon is determined by noting the range to the first dot, the remaining dots and spaces serve to identify the particular responder beacon. Military aircraft have found this device important for general navigational purposes. It is believed that future developments and research will eventually provide a simplified responder beacon system more nearly meeting the requirements.

The radar beacon transmitter frequency is slightly different from the frequency to which the receiver is tuned. Thus, the receiver of the radar that challenges a radar beacon must be detuned from the radar frequency in order to accept the beacon response. As a result, a radar can be used either to challenge a racon or to search for targets, but never for both operations simultaneously. The reason for designing the beacons for this type of operation is to prevent interference between radar echoes and racon responses. Therefore, signals returned from racons are clearly visible on the indicator because the clutter of sea return and echoes from land are eliminated. Another beneficial feature of this type of operation is that racon responses may be viewed on a clear scope in one installation, while an adjacent radar in the same frequency band may search normally without interference from the radar beacons.

The range to a beacon is given by the range to the first code pip. The bearing is given by the center line of the pips. Figure 4 shows the appearance of a PPI with a range-coded beacon response. This type of reply is advantageous because the beacon identifies itself on every response, which eliminates any delay in recognizing its geographic position.

After sufficient practice, it is claimed that the technician can retune a radar for normal radar operation in about 10 seconds. Thus, using this radar for interrogatng a beacon does not limit to any great extent the use of the equipment as a radar. On some sets this retuning is not necessary.

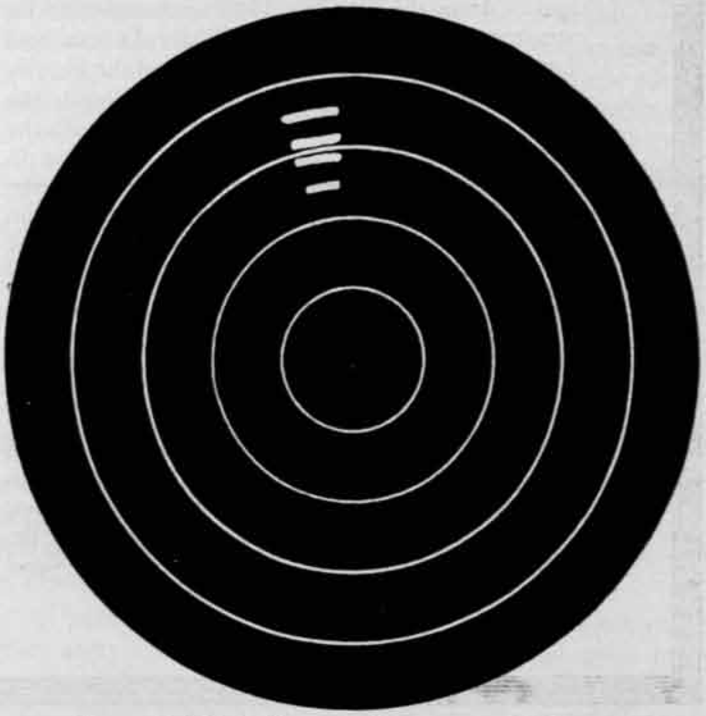


Figure 4. PPI Indicator with range-coded beacon.

# ABOUT OUR AUTHORS

Colonel Norman E. Hartman, C.A.C., a graduate of the Pennsylvania State College and the University of Michigan, has seen service as an officer in the Coast Artillery Corps in both World War I and in World War II. During World War II, after duty as Director of the Enlisted Division of the Antiaircraft Artillery School, he commanded the 106th Antiaircraft Artillery Group for approximately two and one-half years in the United States and in the North African, the Mediterranean and the European Theaters of Operation. Shortly before VE Day he joined the Army Air Forces Evaluation Board of the European Theater for the purpose of conducting a special study of German flak defenses of strategic targets. For the past three years he has been P.M.S.&T. at Fordham University.

Colonel Franklin K. Fagan entered active duty from the Connecticut National Guard. He served in World War II as Antiaircraft Officer for the Twelfth Air Force in North Africa and is presently serving in Washington, D. C. as Chief of the Security Division, Air Provost Marshal's Office, U. S. Air Force.

Lieutenant Colonel Leonard M. Orman is a steady contributor to the JOURNAL. After serving as an instructor in the Department of Electronics and Electricity at the United States Military Academy for a number of years, he is now attending the University of Pennsylvania.

Lieutenant Colonel D. T. Michael entered active service from the ORC in 1940 as Antiaircraft Instructor for the Cincinnati Military District and later the Ohio Military Area. He joined the Faculty of the Coast Artillery School at Fort Monroe the following year and moved to Camp Davis with the Officer Candidate School as Senior Instructor in Searchlights and Communications. He served overseas as Chief of Branch for the Antiaircraft Section of the Officer Candidate School in the Southwest Pacific Theater. He joined the staff of the 14th Antiaircraft Command shortly after its activation and remained with that organization until the end of the war. He is now commanding the 2738th Antiaircraft Group (Training) in Cincinnati.

Lieutenant Commander J. P. Field was graduated from Millsaps College, Jackson, Mississippi, with B.S. in Chemistry. Served as Gunnery Officer, Executive Officer, and Commanding Officer of destroyers during the war. Attended U. S. Naval Academy Postgraduate School and Rensselaer Polytechnic Institute in Ordnance Engineering (Jet Propulsion) Course, receiving M.S. degree. Has been stationed at the Applied Physics Laboratory, The Johns Hopkins University for 18 months. Now commanding USS *Burdo* (APD 133).

An honor graduate of the University of Texas, Mr. Hughes was commissioned in the Naval Reserve in 1942, and served on the Staff of Commander Service Force Pacific and in the USS *Pawnee* in the South Pacific Force. He later commanded the USS *Quapaw* and the *ATR-55*. He is a contributor to many well known magazines.

Major James N. Olhausen served during the war as battery commander, seacoast artillery, in Hawaii; Assistant S-3, AAATC Camp Davis, N. C. and Ground Liaison Officer, Headquarters, Sixth Army Group. Since the war, his assignments have included: Chief Gun Computing Section, Research and Analysis Department, AA & GM Branch, TAS; Assistant P.M.S.&T., Washington University, St. Louis, Mo. For the past year, Instructor, Gunnery Department, AA & GM Branch, The Artillery School.

Captain Francis P. Le Mere during the war served as battery commander 72d and 87th AAA Battalions in the ETO. For the past three years, Instructor, Gunnery Department, AAA & GM Branch, The Artillery School.

Captain Donald E. McArthur entered active duty from the National Guard of the State of Washington with the 146th Field Artillery, of Seattle. He served with his unit in the Pacific Theater as a battery commander and on the staff of the 41st Division Artillery. He has been a faculty member of the Department of Gunnery at The Artillery School and is presently assigned to the Field Artillery Test Section, Army Field Forces Board No. 1, Fort Bragg, N. C.

Jerome Kearful is a New Yorker by birth, but has lived mostly in Texas, Massachusetts, and the District of Columbia.

He attended University of Texas and Boston University.

He worked for newspapers in Flint, Michigan, and Boston and was a writer for ASF Historical Branch, Chemical Corps, and U. S. Public Health Service during the war.

# 1960—?

## By Lieutenant Colonel D. T. Michael, CAC Res.

**FOREWORD. How many Antiaircraft Artillerymen ever dreamed —1940—that the next 10 years would bring the automatic tracking radar, the electronic director, the proximity fuse, and the mobile, remote-controlled 120mm antiaircraft gun. Yet, as the aircraft designers plan the supersonic planes of the future, we are left with little but our imagination to surmise how they might be destroyed by fire from the ground. So why not try to imagine how an antiaircraft defense might function, say—in 1960?**

Aggressor Forces have invaded a small neighboring country and Defender Forces are mobilizing to meet the situation. Long-range radar stations around the edge of Defender territory probe the air as they search for a possible surprise air assault. Antiaircraft units have been moved into critical areas and Air Defense Commands have been established to coordinate the defenses within each sector.

Suddenly the operator of an air search radar observes an unidentified pip on the edge of his long-range scope. The antenna stops swinging as measurements are swiftly taken. An IFF interrogation receives no response. An unidentified object at an altitude of 50,000 feet is approaching at a speed of 750 miles an hour.

Target plots begin to flow from the radar station to the Air Defense Headquarters and a raid stand appears on the operations board. The Air Defense Commander observes that the object is 200 miles away from an important strategic area and moving directly toward it. At 750 miles an hour it will be over the area in 16 minutes. He turns to the Antiaircraft Operations Officer and directs him to engage the target. The Operations Officer checks his dispositions and, over his command communications net, assigns the target to Battery A of the 100th Guided Missile Battalion, SAM (Surface to Air Missile), one of the units defending the threatened area. A plot observer begins to relay target plots over the intelligence net to the Battery command post.

A siren alerts the Battery. Each platoon radar is plugged into the intelligence net to receive the target plots. The chief radar operator notes the target position on his plotting board and directs his crew in their search.

At each platoon firing position, the members of the launcher section remove the cover from the assembled missile. The launcher consists of a set of guide rails mounted on trunnions set at a pedestal base permitting 360-degree traverse in azimuth and 0 to 90 degrees in elevation. The launcher is normally pointed by remote control from the director but handwheels and indicator dials are provided for manual operation.

Resting on the launcher rail is the booster rocket required to accelerate the missile up to a speed at which its supersonic ramjet motor will develop sufficient thrust to permit it to travel under its own power. The booster is equipped with a light frame which fits snugly around the rear section of the missile.

The missile itself is a long, slender cylinder, pointed at each end, with sharply swept-back wing and tail surfaces. The nose terminates in a long tapered spire with a contact fuse in the tip. In the head, a small, automatic radar projects its beam directly forward through the nose cap. Behind the radar is the explosive charge. Then comes the fuel tank with a capacity for approximately 3 minutes of flight at 1500 miles an hour. In the rear section is the guidance equipment consisting of a flight stabilizer, a radio transmitter and receiver, and the necessary amplifiers and servo mechanisms to convert the guidance signals to movements of the control surfaces. The transmitter sends out a continuous signal to provide a more accurate tracking source than would be obtained from radar echoes. Below the rear section hangs the tube of the ramjet motor.

During alert periods, the assembled missile is carried in the launcher fueled and ready to be fired. The guidance equipment is checked at scheduled intervals to assure that it is functioning properly.

When the cover has been removed, the launcher operator takes his seat on the mount and lowers the assembly to a horizontal position. The gunner opens a door on the side of the missile and closes a switch energizing the missile electrical system. A technician places a test oscilloscope in front of the missile.

The pulse pattern soon appears on the test scope indicating that the homing radar in the nose is functioning. At the same time the operators at the missile tracker report that the tracking signal is being received.

The chief of the launcher section orders: "Stand by to fire."

The launcher operator elevates the assembly to an angle of approximately 45 degrees. The gunner disengages the clamping levers holding the missile to the booster and the booster to the launcher so that the assembly is held together only by the weight of the components. He removes the electric cable providing power to the missile during the testing and standby period so the missile battery will not be discharged, and closes the cover.

All personnel take cover behind a parapet a short distance away. The chief of the launcher section takes his position before the launcher control panel and closes a switch which connects the launcher remote-control circuit to the firing panel at the battery command post and lights a green signal light. He releases a safety lock and closes another switch connecting the launcher firing circuit to the firing panel, and lighting a red signal light.

In the meantime the platoon radars have picked up the target and reported in to the command post. The range officer throws the switch connecting the director to the 1st Platoon radar and present position data begins to flow to the director.

On the receiving dials of the director appear the azimuth, altitude and range of the target. The director, based on the flight characteristics of the missile and the current meteorological conditions which have been set in, automatically computes the firing azimuth, firing elevation (which depends largely on the rate of climb characteristics of the missile) and the range to the interception point. On another dial appears the maximum possible range of the missile computed for the target altitude.

Beside the director is the firing panel. It is divided into four sections, one for each platoon. On each section are two switches, one for connecting the director data receiving circuits to the platoon radar to provide present target position data, and the other for connecting the director data transmitting circuits to the launcher to position the launcher in azimuth and elevation by remote control. Thus the director may be used with any radar and any launcher to engage up to four different targets in sequence, or two or more launchers may be fired together or in sequence at the same target using present position data from any one radar. This provides the necessary flexibility to compensate for the fact that with a command control system only one missile can be controlled at a time by each set of guidance equipment.

Each section of the firing panel is also provided with two signal lights, a green light to indicate that the launcher is ready, and a red light to indicate that the launcher firing circuit is energized. At the bottom of each section is a red firing button. In an emergency, the launcher may be fired from the launcher control panel.

On orders from the Battery commander, the range officer prepares to fire the 1st Platoon launcher at maximum range. The present horizontal range dial indicates 110 miles. The maximum missile range dial stands at 60 miles. The future range dial to the interception point indicates 68 miles and is decreasing at the rate of 8 miles a minute.

The range officer closes the switch connecting the director to the 1st Platoon launcher and the launcher swings to the firing azimuth and elevation. As the future range pointer on the director crosses the 60-mile line representing the maximum missile range, he pushes the firing button. With a roar, the booster rocket fires and the booster and missile rapidly disappear into the air leaving a trail of smoke.

At the Battery Command Post the range officer transfers the director to the 2d Platoon radar and prepares to fire the 2d Platoon launcher in case the first missile fails to make a successful interception. At the 1st Platoon launcher, a mobile crane moves up with a booster unit and the launcher crew begin to assemble another missile.

The booster and missile continue their upward flight at rapidly increasing speed until the booster rocket burns out. When acceleration ceases, an inertia switch operates to open the fuel valve and ignite the ramjet motor. As the motor builds up to full power, the missile moves forward and separates from the booster while the booster slows down as it loses momentum and then falls back to the ground. On the missile, a time delay relay closes and arms the fuse.

At the 1st platoon command post, the radar tracking the target and the radio receiving equipment tracking the missile automatically feed position data into a computer which calculates the control settings (modified as necessary by the flight characteristics of the missile) to establish a collision course. Course changes are sent by radio to the missile receiver. The computer operator keeps close watch on the dials indicating the movements of the missile and target, ready to report any malfunctioning to the range officer.

The missile continues to climb to 50,000 feet with gradually increasing speed and then levels off. As it approaches the target, the automatic radar in the missile picks up the target and locks on it. The missile veers slightly as the more accurate signals from the homing control override the command signals from the ground, and the missile speeds on under its own guidance as the distance between the missile and the target closes at over half a mile a second.

At minimum range the firing circuit trips. The tracking signals from the missile cease and the radar operators tracking the target see their pip disintegrate and fall away.

# Unification and The National Defense*

## By Paul H. Griffith, Assistant Secretary of Defense

I propose on this occasion to make it clear that unification of the Armed Forces is necessarily the very keystone of the whole scheme of National Defense under modern conditions. I intend to offer concrete proof that we are attaining unification despite millions of words, oral and written, to the contrary notwithstanding. I hope to nail up this thesis in language so blunt and plain that it cannot be misconstrued. I aim to build up my case with forthright facts about the solid accomplishments of unification rather than let it rest on academic arguments, unsupported assertions or eloquent words.

Unification of the Armed Forces was provided for by an Act of Congress which became effective September 18 two years ago. For at least a year before passage of the Act, unification was hotly debated in every forum from the halls of Congress to the crossroads pool halls. Passage of the Act did not foreclose upon the argument outside the armed services or within. Neither did a more recent Act of Congress which added greatly to the authority of the Secretary of Defense and which was a clear-cut mandate for unification, expressed by the Congress as unquestionably the will of the people.

For the assurance of any who may harbor doubts, let me emphasize right here that we are building our ramparts so strong that no aggressor will care to attack us. We are building the strength on land and sea and in the air which will bulk large enough on the world's political horizon to act as an effective deterrent to war. Such strength would be impossible without unification. Much of this strength actually is derived from unification. These general assurances and assertions will be supported presently with concrete examples and facts. But before I plunge into a play by play spell-out of the accomplishments of unification I want to lay a trifle broader foundation. I want to recall some of the whys and wherefores of national defense as we know it today so that I can properly highlight the role of unification.

Some time between World War I and World War II we hit a new low in defense organization and defense planning. Attribute it to what you will—national innocence in international affairs, instinctive retreat into isolationism, or just plain stinginess. At any rate we regarded the former aggressors Germany and Austria as prostrated nations. We looked upon Hitler as a half-mad, silly little house painter and his Nazis as a set of ruffians capable of harming only their own country.

Japan, a theoretical ally in World War I, was still regarded as a potential ally long after she had started to plot aggression, long after she had flooded the East with her anti-West propaganda, and long after she started to infiltrate her military power into every political vacuum in the Far East, and incidentally while she was using our scrap iron.

Seeing no danger on the horizon, this country permitted its Armed Forces to deteriorate in strength and pursue their traditional paths and assume their traditional attitudes without serious question. We calmly viewed or ignored, as the case may be, the spectacle of our Army and Navy existing side by side often in complete ignorance of what the other was doing.

We had no real machinery for coordinating our international political policies with our military policies and seemed to feel no real need for any. It is true that the Army and Navy each had their M-Day plans but there was no person or agency other than the President as Commander in Chief with the responsibility or authority for coordinating them.

Above all, there was no person or agency with the authority and responsibility for planning over-all industrial mobilization. In this stage of our military preparedness, or more properly lack of it, industrial mobilization was provided for largely by suggestions to Congress, often conflicting, in the general M-Day plans of the two military services. In their procurement programs, even after the shooting war had started, the Services were often in active competition.

You very likely have heard these situations, these weaknesses hashed over many times before. But you need to have them clearly in mind when trying to evaluate the accomplishments of unification. Unification deals with all of them. Unification does not merely deal with bringing together our three Armed Forces into an administrative unit known as the Department of Defense.

How much and in what coin have we paid for our policies of weakness, for our shameful indifference to our military strength and our complacent acceptance of divided responsibility for national defense? We have paid in hundreds of thousands of lives, billions of dollars in treasure, in the depletion of our national resources, the obligation to care for the disabled, and the stagnation of many projects for human welfare and advancement because of the deterrent influence of our current uncertain, uneasy peace.

After Pearl Harbor we eventually armed ourselves, thanks to our allies, not the least powerful of which were time and space.

As our forces moved out to smite our enemies spread across the globe, warfare presented a brand-new picture. We learned conclusively that the employment of air power made it impossible to isolate war-making into compartments of land battles and sea battles. This was a triphibious war of land, sea and air battles in which teamwork between our three great forces was a necessity and unity of command was indispensable to victory.

We finally slugged our way to military victory. In doing so we learned more lessons. But the tuition in the school of global warfare is terrific. We paid it, as I have said, in blood and in treasure and in depleted resources.

The war ended with America in possession of the greatest military strength ever created in history. It cast its shadow over the whole world. As long as it existed there was no talk of aggression. There was no danger of stronger powers trampling over their prostrated neighbors. The war had

---

*Extracted from an address at Texas City, Texas, October 17, 1949.

solved some old problems. But like all wars it had created some new ones. It might had been prudent for us to have maintained some of our military might until these new questions had been answered forthrightly and to the satisfaction of freedom-loving peoples. Perhaps the world then could have settled down to a real peace in which the human race could have busied itself with the problems of human welfare instead of the problems of further destruction. But our strength wasn't maintained.

The vast military power which our enemies couldn't dent we stripped down like a Model T Ford in a junk dealer's yard.

A historian with a Ph.D. or a newsboy with sore feet could see that we were hell bent on getting back as quickly as possible to all our traditional policies of weakness. History was getting all wound up to repeat itself.

Fortunately at this juncture we had a look around before dozing off to sleep again. We noticed that our stalwart allies and heavy lend-lease beneficiaries, the Russians, weren't acting like pals any more. Their military strength and their insidious propaganda were being poured into the political vacuums of Asia and Europe which had been created by the destruction of power during the war. In the United Nations they were vetoing from the hip without taking time to aim.

It didn't take an admiral or a general or a learned professor of political science to foretell what was going to happen to us and to democracy everywhere the world around if we continued to dissipate our military strength. Our eventual fate could have been accurately predicted by anyone slightly more than half-witted.

In short, it was obvious to everyone that for our own sake as well as for the sake of democracy everywhere we must have a strong national defense system. An adequate program for maintaining our national security, come what may. There was no such agreement of opinion, however, on how that system of defense should be fashioned. That is what started all the argument.

Suppose, for example, we had figured it out this way. It will take blank number of divisions of ground forces, blank number of airplanes of various types, and blank number of naval craft and planes to insure victory against any possible attack which conceivably can be launched against us. So we will assemble a standing army of ground forces on all the ground available for it to stand on. We will slosh the oceans over the beaches by floating all the ships we can build, and we will darken the skies with planes. Then we will stockpile all the munitions and items we can possibly use or hope to use before they rot or become obsolete. Incidentally there are only 2,500,000 varieties of them. Such a plan would settle for all time the question of national defense. It would erase the problem completely. Before we could get started on it we would be completely bankrupt and starving. We would have defeated ourselves for all time, saving our potential enemies the trouble of striking a single blow against us.

This is an absurd picture of defense preparation. I have sketched it to show that there are two limitations to any defense system. On one hand we find that an inadequate defense system is little better than no defense system at all. On the other hand it is quite clear that an attempt to keep in being military force sufficient to meet any conceivable emergency would certainly prove, in too brief a time, worse than no defense system at all.

Obviously the only course which can be followed in maintaining national security is the happy medium. Now let us see in detail what this happy medium is, and why it gives us the greatest actual security in a troubled world that we can hope to enjoy.

Instead of the bankrupting burden of the mass brute force I just pictured we are depending on a highly skilled, evenly balanced team trained to strike as a unit and backed up by reserves of civilian components prepared to assume instantly many military duties in case of an attack on this country. Instead of amassing in advance huge stores of billions of military end items and other accoutrements, we are depending upon soundly conceived and carefully worked out plans for industrial mobilization to get needed equipment quickly, and to move and feed and generally support our armed forces. It should be obvious that this defense system will prove adequate with unity—unification—if you prefer. It is just as obvious that it must have unity—unification—to succeed.

Despite service disagreements few will deny that there exists today a readiness and defense potential superior to that of any previous period in our nation's peacetime history. Strategic plans for the nation's defense are far advanced beyond those of any previous peacetime year. The American people may rest assured that their defenses never have been before in peacetime so competent and promising.

# Atomic Defense—A Constructive Approach*

## By Lieutenant Colonel Richard D. Wolfe, Corps of Engineers

Since the advent of the atomic bomb, many articles have appeared in the public press and elsewhere concerning the terrifying aftereffects of the radioactive contamination produced by the explosion. Unfortunately, much of this writing has been in thoroughly alarmist vein, implying or stating in so many words that nothing can be done immediately to minimize the effects of this contamination or subsequently to remove it. These exaggerated "scarehead" statements have frequently been in error as to fact. More important, in best Sunday-supplement style, they have often presented ideas by implication and "facts" by conjecture, all of which are calculated to produce the impression that the radioactive aftereffects of atomic explosion are always present, always horrible beyond imagination, and impossible to do anything about.

This is a negative attitude which is completely inconsistent with our national character as a vigorous people who can tackle a practical, finite problem, however complex, with ingenuity and with improvisation if necessary, to arrive at a workable solution. The correction of the unfortunate impression which the "nothing-can-be-done" school of thought has attempted to create in the public mind is the subject at present of an educational campaign sponsored by the Atomic Energy Commission, the Armed Forces Special Weapons Project, and other agencies.

### The Bomb As A Blast Weapon

No attempt is here made to minimize the immediate blast effect of the bomb as an explosive weapon. But the bomb is a finite weapon which differs in intensity but not essentially in quality from other weapons. Its immediate effect as an explosive on matériel and personnel in the worst case could be reproduced by high explosives; high explosives used in conjunction with chemical warfare agents could in turn reproduce the contamination effect if numbers of casualties rather than type of injuries are used as a criterion of effectiveness. The defense against the explosive effects lies in dispersion, in placing a few key installations underground, and in preventing the enemy from delivering the weapon in one's own neighborhood. If it be argued that this constitutes no real defense, then equally there is no defense against mass strategic bombing as practiced by this country and its allies in the war just concluded.

Considering the bomb as essentially a large-scale blast producer (in which role it utilizes its destructive power most efficiently), it creates maximum physical damage when exploded in the air fairly high over the target, as was done at Hiroshima and Nagasaki. In this case, in which it acts predominantly as a high explosive, any direct radioactive effects are practically instantaneous with the explosion and cause not more than 10 to 15 per cent of personnel injuries. The radioactive by-products of the explosion boil up immediately in the cloud of hot gases, and are dissipated to infinite dilution in the upper atmosphere. Residual contamination on the ground is minimal or nonexistent.

### The Bomb As A Contamination Weapon

When the bomb is exploded beneath the surface of water or earth, it does become in some measure a new weapon. In this case the only practical evidence we have to go on is the Baker Test (underwater explosion) at Bikini. From the data of this test and by analogy to underwater or underground conventional explosions, the surface damage produced will be much less than in the case of the air burst. There will also be damage from the subsurface shock wave to ships and utilities in an area roughly equal to that damaged by an air burst. The additional new aspect is that the water or earth thrown up by the explosion contains a fair proportion of the radioactive by-products of the explosion, and will probably be distributed over an area approximately equal to that suffering maximum damage in the case of the air burst. The comparison between the air burst and the subsurface burst reveals the following facts. (*a*) The air burst produces immediate destruction or damage to matériel, and in the absence of forewarning, to personnel in an area say 3 miles in diameter. (*b*) The subsurface burst produces immediate destruction or damage in a smaller area (say 1 mile in diameter) and in addition covers the 3-mile diameter area with radioactive contamination which does no material damage, but which is potentially dangerous or lethal to animal life.

It is evident, therefore, that the only new feature of the bomb as a contamination weapon is that it differs in quality from the bomb as a blast weapon. The extent of physical damage to structures in the subsurface explosion is less; whereas the number of personnel casualties in the area in the worst case is probably no more than with the air burst. Herein lies the fallacy in the claim that the underwater or underground burst is a more dangerous and destructive weapon than the air burst; on the one hand the damage done by the air burst inside the 3-mile diameter is immediate, and is effective in destroying both material things and living creatures; on the other hand the immediate damage from the subsurface burst is much smaller in area, and the potential danger from contamination which extends to the 3-mile diameter applies only to living things, is not instantaneous, and therefore permits action to be taken in mitigation of the hazard.

Three factors permit reduction of casualties in this doughnut-shaped area lying outside the radius of the heavy physical damage and inside the radius of radioactive contamination. The first is the fact that the contamination falls from the air in the form of rain or dust, or both, in a matter of say five minutes after the explosion occurs, and thus is restricted initially to external surfaces of buildings and to ground areas. Now the dangerous radiations emitted from the contamination are dissipated by distance, and by the shielding afforded by any solid material such as earth, or the

*Reprinted from November-December 1949 issue of *The Military Engineer*.

walls or roof of a building. Thus, if the populace can be trained to remain indoors in the center portions of structures, as far from outer walls and roof as the building permits (preferably in basements), being careful to wash off any contamination which they may have acquired by contact with the outdoors, casualties can be considerably reduced. The populace must be further convinced that it must remain in such protective isolation, whatever the inconvenience, for at least four days, as explained below.

The second factor, which in reality makes the first effective as a measure of protection, is the fact that the radioactivity in the contamination dies out quite rapidly as an inverse exponential function of time following the explosion, such that within approximately four days movement can be permitted in the area by properly equipped working parties for limited periods of time. This permits the third defensive phase to become active, that is, evacuation of personnel, together with decontamination.

### Decontamination

The statement has frequently been made (often by supposed authorities on the subject) that decontamination is impossible, or at best impracticable. This echoes the negative do-nothing approach mentioned above. The statement is untrue both in fact and in implication. Much has been learned concerning practical methods of decontamination, and research now in progress at the Naval Radiological Defense Laboratory and elsewhere gives promise of even better methods than are now known.

However effective these methods may become, it should be realized at the outset that they will always be expensive in man-hours and materials; sufficiently to preclude anything approaching complete decontamination of areas and structures immediately following an underwater or underground burst. Initially, decontamination efforts will probably be limited to those predetermined approach ways, areas, and structures whose reoccupation and continued use are vital to prosecution of the war effort. After evacuation of personnel, other areas must be blocked off and isolated for the time being. Later on, the decision can be made whether it is cheaper to decontaminate, to replace the structures and facilities in a new area, or to delay for a period of months until reduction of radioactivity by decay has reduced both the personnel hazard and the difficulty of decontamination.

Practical field decontamination to date has largely been concerned with the decontamination of ships following the atomic bomb tests at Bikini in 1946. The methods used are successful in removing contamination, although they are considered to be inordinately time-consuming and expensive. Ships have nevertheless been completely cleared for normal usage as a result of decontamination performed by the San Francisco Naval Shipyard in conjunction with the Naval Radiological Defense Laboratory. In general, the results indicate that any ship, no matter how badly contaminated, can be successfully decontaminated by present methods provided the ship itself is sufficiently valuable to warrant the time and expense involved, together with replacement of such equipment as cordage, wooden decking, et cetera.

### Research For Atomic Defense

Much of the work done by the agencies of the Manhattan Engineer District and later by the Atomic Energy Commission has contributed valuable information toward defensive measures. However, since their aims have been primarily toward development of offensive nuclear weapons and the development of nuclear power, none of these agencies has pursued an integrated program aimed at the defensive aspects of the problem. In fact, the only agency in the nation, service or civilian, which is actively prosecuting a broad research and development program pointed toward defense against the various forms of radiological warfare is the Naval Radiological Defense Laboratory (NRDL) at the San Francisco Naval Shipyard.

The NRDL grew initially out of the necessity for decontaminating some of the ships which participated in the Bikini test. Its nucleus was set up in November 1946 when several of these ships were brought to San Francisco for decontamination and rehabilitation. The phase of ship decontamination has been essentially complete for many months. Since those early days the scope of the laboratory's activities has broadened immensely and it has grown in size until it now employs approximately 171 civilians, 19 officers (including 4 Army officers), and 21 enlisted personnel and occupies 90,000 square feet of floor space in part or all of thirteen buildings.

The present research program of the laboratory embraces four principal fields of endeavor: (1) Studies on the contamination and decontamination of land installations, ships, and aircraft; (2) Evaluation, test, and development of radiation detecting instruments including portable and semiportable survey instruments and such laboratory-type instruments as are necessary in prosecuting the work; (3) Investigation of individual and collective protective devices to determine their ability to safeguard personnel against inhalation and ingestion of radioactive material; (4) Investigations in the medical and biological field with a view to determining the nature of radiation sickness and the means of early diagnosis of radiation damage, together with prognosis as to probable effects on the efficiency of the individual and his life expectancy.

Put in another way, the first job of the NRDL and of the National Military Establishment to implement radiological defense is to provide for the immediate and continuing safety of personnel. This involves determining allowable limits for each type of radiation under varying operational situations. Following that, instruments must be provided to indicate what kind of radiation is present and how much there is. The next step is to provide diagnostic procedures to determine the imminence of radiation damage, to establish criteria for its detection and estimation of its seriousness either in the immediate post-irradiation period or distant future. A very important auxiliary job related to the latter is the one of working toward an understanding of the mechanisms of radiation damage, so that treatment of it can be provided on a more rational basis than is now possible.

The second principal task is the discovery and development of expeditious and economical means of removal and disposal of radioactive contamination, meanwhile providing protection for personnel engaged in this operation to insure that they are not overexposed in the process.

The laboratory is supported in its research program by funds from several Navy bureaus, from the Army Corps of

Engineers through the Army Chemical Corps, from the Armed Forces Special Weapons Project and the Air Force; and by personnel from the Public Health Service. Close liaison is maintained with a number of agencies of the Atomic Energy Commission, with the Army Signal Corps, and with a number of other governmental and commercial activities.

The laboratory is a coordinate department of the San Francisco Naval Shipyard, but is under the direction of the Shipyard Commander only for administration and logistic support. The technical and scientific operations of the laboratory are supervised directly by the Bureau of Ships of the Navy Department in Washington.

The scientific work of the laboratory is carried on by seven branches operating directly under the Scientific Director. These consist of Chemistry, Physics, Health-Physics, Biology, Instruments, Engineering Applications, and Technical Information and Materials Control, each headed by a civilian scientist or engineer who is a specialist in his field and its application to nuclear work.

As stated earlier, one of the principal efforts of the laboratory is the field of decontamination studies, for which the burden of research falls on the Chemistry Branch and its Chief, and also on the Engineering Applications Branch. The mission of the Chemistry Branch and, in part, of the Engineering Applications Branch is to find practical means of decontaminating structures, ships or aircraft which have become contaminated by radioactive materials as a result of some form of radiological warfare, and to investigate practical means for eliminating or minimizing initial contamination.

Depending on the time intervals after the blast (assuming an atomic bomb detonation), the contamination may consist of a mixture of part or all of some fifty elements which have been rendered radioactive by the explosion, plus unexploded material from the bomb itself. This contamination is deposited initially on surfaces by "falling-out" from the radioactive cloud, or is contained in water or earth thrown up by an underwater burst. In general, the contamination is found to be associated almost entirely with the external surface of the area on which it lands. Thus, there are three general methods toward decontamination, or toward preventing contamination. The first consists of surface removal methods. In this category are the successful methods used to date in decontamination of ships. In crudest form they include paint removal by caustic solutions, and such brute-force methods as sandblasting and scraping to remove paint and part of the surface of the material. The second approach is that of decontamination without affecting character or quality of the surface; this method includes the use of chemical solutions to dissolve the contaminants and to carry them away. The third method involves the means of preventing contamination, including such devices as the interposition of a water film on the surface, which mechanically impedes the attachment of contamination to the surface itself. Obviously, there is great variation in the relative contaminability of various surfaces. Naturally, rough or porous materials will tend to hold contamination to a much greater degree than hard smooth surfaces.

### Planning, Organization, Training

As with all research, progress tends to be slow and laborious. Nevertheless, it is hoped that within approximately one year, practical, expeditious and relatively economical means of decontaminating structures and areas will have been reached. This time limit applies to the fundamental technique as developed in the laboratory. Following this step, engineering development must take place and procurement must be instituted in order to make the benefits of these discoveries available for practical use by services in the field. In addition, personnel must be trained in the techniques of such decontamination work and in the use of the equipment developed. Organization must, therefore, be set up within the current organizations of Naval, Army, and Air Force units, all in coordination with similar plans for civil defense.

It is obvious that a great deal of thought and action must go into the job of preparing the military services and the civilian population to act both as organizations and as individuals, according to precepts outlined earlier, in order to minimize casualties as a result of radiological warfare. A start has been made in this direction, both by the military services and by the Office of Civil Defense Planning. The scope of the task is broad however; probably it will be of the same magnitude as the effort expended in producing the atomic bomb itself. It will not be solved by "shoestring" operations, splinter efforts, or by the part-time consideration of planning staffs, whether civilian or military. It requires an energetic, coordinated, integrated effort which has the support of an educated populace as well as of governmental and military agencies, backed by sufficient funds to implement a firm program. Such a program of organization, procurement of equipment, and training in its use will not be accomplished overnight nor in a period of a few weeks or months. The program will require vigorous prosecution if it is to be done in one or two years.

But the problem is finite, and far from impossible of execution. It is probably no more difficult of solution than the tremendously complex planning and training which was performed in preparation for any of the large amphibious operations of World War II, or in preparing the very effective organization of the British citizenry to cope with the air attacks in the *Blitz* of 1940 and after. Finally, it is a job which must be done, and the earlier the better, for our peace of mind and protection as a nation—at least until international control of atomic energy becomes a reality and the threat of war is much less than it appears to be at the present time.

# Subject Schedules for National Guard Training

National Guard Training Programs (NGTPs) pertaining to AAA and numerous Subject Schedules have been published and distributed to National Guard units. Subject Schedules outline text references, training aids and equipment recommended for each one-hour period of instruction of each subject listed in the NGTPs.

The following AAA NGTPs have been published and distributed:

## National Guard Training Programs

| | |
|---|---|
| (a)*44-10-1N | Hq. & Hq. Btry., AAA Brigade |
| (b)*44-12N | Hq. & Hq. Btry., AAA Group |
| (c)*44-16N | Hq. & Hq. Btry., AAA Gun Bn. (90mm) |
| (d)*44-17N | AAA Gun Battery (90mm) |
| (e)*44-26N | Hq. & Hq. Btry., AAA AW Bn., Mobile |
| (f)*44-27N | AAA AW Battery, Mobile |
| (g)*44-76N | Hq. & Hq. Btry., AAA AW Bn., Self-Propelled |
| (h)*44-77N | AAA AW Battery, Self-Propelled |
| (i)*44-116N | Hq. & Hq. Btry., AAA Gun Bn. (120mm) |
| (j)*44-117N | AAA Gun Battery (120mm) |
| (k)*44-7N | AAA Operations Detachment |

*Small case letters are not part of the title but have been inserted here as a reference for Subject Schedules listed below.

The following Subject Schedules have been published and distributed:

| *Subject Schedule Number* | *Subject* | *Pertinent Units*** |
|---|---|---|
| 44-201 | Local Security (1 hour) (3d year) | d, f, j |
| 44-203 | Characteristics of AAA Weapons of the AAA AW Battalion, Mobile (2 hours) (1st year) | e, f |
| 44-205 | Organization of AAA Group (1 hour) (1st year) | b |
| 44-206 | Characteristics of AAA Weapons of the AAA AW Battalion, SP (2 hours) (1st year) | g |
| 44-207 | Characteristics of AAA Weapons of the AAA Battalions (2 hours) (1st year) | a, b |
| 44-209 | Organization of the AAA Brigade (1 hour) (1st year) | a |
| 44-210 | Organization of the AAA Gun Battalion (90mm) (1 hour) (1st year) | c, d |
| 44-211 | Organization of the AAA AW Battalion (Mobile) (1 hour) (1st year) | e, f |
| 44-212 | Organization of the AAA Gun Battalion (120mm) (1 hour) (1st year) | i, j |
| 44-213 | Military Correspondence (9 hours-3 hours each year) | a, b, c, e, g, i |
| 44-214 | Organization of the AAA AW Battalion, SP (1 hour) (1st year) | g, h |
| 44-215 | AAAIS, AWS, AAOR (2 hours) (3d year) | a, b, c, e, g, i |
| 44-216 | Nomenclature, characteristics and operation of the Twin 40mm Gun Motor Carriage M19 (1 hour) (1st year) | h |
| 44-217 | Characteristics of AAA Weapons of the AAA Gun Battalion (90mm) (2 hours) (1st year) | d |
| 44-218 | Nomenclature, characteristics and operation of the Multiple Gun Motor Carriage M16 (1 hour) (1st year) | h |
| 44-219 | AAAIS AWS, AAOR (4 hours) (3d year) | d, f, h, j |
| 44-221 | Logistics (1 hour) (1st year) | a, b, c, e, g, i |
| 44-222 | Journals and Periodic Reports (4 hours) (3d year) | a, b, e, g |
| 44-223 | Reconnaissance, Selection, and Occupation of Position (2 hours) (3d year) | a, b |
| 44-224 | Reconnaissance, Selection, and Occupation of Position (2 hours) (3d year) | c, i |
| 44-225 | Reconnaissance, Selection, and Occupation of Position (2 hours) (3d year) | g |
| 44-226 | Reconnaissance, Selection, and Occupation of Position (2 hours) (3d year) | e |
| 44-227 | Combat Orders (2 hours) (1 hour 1st year and 1 hour 3d year) | a, b, c, e, g, i |
| 44-228 | Combat Orders (1 hour) (3d year) | c, e, g, i |
| 44-229 | Combat Orders (3 hours) (1 hour each year) | a, b, c, e, g, i |
| 44-230 | Organization of Section (1 hour) (1st year) | a, b, c, e, g, i |
| 44-231 | Organization of Section (1 hour) (1st year) | a, b, c, e, g, i |
| 44-232 | Organization of Section (1 hour) (1st year) | a, b, c, e, g, i |
| 44-235 | Organization of Section (1 hour) (1st year) | a, b, c, e, g, i |
| 44-237 | Signal Operating Instructions (3 hours) (1 hour each year) | a, b, c, e, g, i |
| 44-238 | Messages (2 hours) (1 hour 1st year and 1 hour 2d year) | a, b, c, e, g, i |
| 44-239 | Organization of Section (1 hour) (1st year) | c, e, g, i |
| 44-240 | Military Correspondence (1 hour) (2d year) | a, b, c, e, g, i |
| 44-241 | Motor Marches (10 hours) (3 hours 1st year, 3 hours 2d year, 4 hours 3d year) | a, b, c, e, g, i |
| 44-249 | M16 Half-Track (5 hours 1st year, 5 hours 2d year) | h |
| 44-250 | M19 Motor Carriage (5 hours 1st year, 5 hours 2d year) | h |
| 44-251 | Observation (3 hours) (1 hour each year) | a, b, c, e, g, i |
| 44-252 | Ammunition, General (4 hours) (1 hour 1st year, and 3 hours 2d year) | h |
| 44-254 | Antiaircraft Artillery Target Practice (4 hours) (2 hours 2d year, 2 hours 3d year) | a, b, c, e, g, i |
| 44-255 | Examination of Prisoners (2 hours) (3d year) | a, b, c, g |
| 44-256 | Organization of Section (1 hour) (1st year) | a, b, c, e, g, i |
| 44-258 | Command Post Operation (10 hours) (3 hours 1st year, 3 hours 2d year, 4 hours 3d year) | a, b, c, e, g, i |
| 44-259 | Intelligence (6 hours, 2 hours each year) | a, b, c, e, g, i |
| 44-263 | Difficult Driving (2 hours) (1st year) | a, b, c, e, g, i |

**Indicate the NGTPs to which the Subject Schedule pertains.

The editors believe that these National Guard Training Programs with accompanying Subject Schedules comprise the best material ever published in this field.

# Flak Defenses Of Strategic Targets In Southern Germany


## By Colonel Norman E. Hartman, CAC


### Introduction

The object of this survey was to determine the details of organization, tactical employment, and technique of German flak artillery, particularly in the highly defended industrial areas, with a view to assisting the Strategic Air Forces.

Accordingly the following targets were investigated on the dates indicated:

| | 1945 |
|---|---|
| Frankfurt-am-Main | 18 April-23 April |
| Mainz-Wiesbaden | 23 April-25 April |
| Mannheim-Ludwigshafen | 26 April-30 April |
| Schweinfurt | 1 May - 5 May |
| Munich | 6 May -20 May |
| Augsburg | 21 May -23 May |

At every site visited extensive demolition had destroyed practically all abandoned equipment. Command posts, except those at Munich, had been cleared of documents, maps, and operational orders, and the installations therein almost completely destroyed.

Enough information was available, however, to determine that flak installations were substantially the same in all defended areas and conformed very closely to the general principles prescribed by the High Command.

The Munich area had been evacuated hurriedly and sufficient information was left in the form of maps, documents, orders, and overlays to reconstruct the entire defense and modifications during the past year. Division headquarters, headquarters of all groups and undergroups, and all battery sites were visited to accumulate this information. While most of the references are made to the Munich area, they apply equally to the other places investigated. Furthermore, the interrogation of flak officers of all ranks from various sections of Germany, who had gravitated to the south as our ground forces advanced, indicated that all the fixed flak defenses were practically uniform.

### Organization for Operation in the Static Defense of Germany

Germany and the German-occupied territories were divided into air defense districts known as Luftgau. A Luftgau was responsible for the complete air defense of its assigned area, including the administration, supply, and maintenance of its subordinate units, passive air defense, and early warning. Within its area it controlled the flak, barrage balloons, smoke, searchlights, observer corps, air defense service, and certain fighter units.

Under the Luftgau and in tactical control of all flak was the division. It was a flexible organization, consisting of a headquarters and staff together with such units as were attached to it to defend its assigned area. It could have under its control two or more groups. A flak group was a headquarters with a given area to defend. It was on a regimental level, and was manned by a regimental headquarters and staff. It had under its control a variable number of subordinate units depending upon the area to be defended. It could have under its control two or more undergroups. An undergroup was a headquarters with a given area, generally a section of a group area, to defend. It was on a battalion level and was manned by a battalion headquarters and staff. However, the battalion retained its own designation. The undergroup controlled a variable number of batteries and/or grossbatteries and also had certain service units, such as a repair troop for maintenance and repair of fire control equipment.

### Equipment

Heavy flak batteries were armed with either the 88mm, 105mm, or 128mm gun. No 150mm flak guns were found.

The 88mm guns were of three types, the 88mm/18, the 88mm/36, and the 88mm/41, though there were no indications of any widespread use of the 88mm/41 guns in Germany. Prisoners interrogated stated that most of the 41-model guns were lost in Africa. While some mobile 88mm guns were used in the defenses of Germany, most of the 88mm guns found were on concrete bases. The 105mm gun, a gun similar to but larger than the 88mm, was always found mounted on a concrete base. All 128mm guns found were mounted on specially built railway cars. All the rest of the equipment of a railway flak (eisenbahn flak) battery was mounted on standard railway cars. The estimated time for preparing a railway flak battery for action after arriving in position was about an hour.

### Tactical Employment

At the outbreak of the war in 1939 German heavy flak batteries were equipped with only four guns each. Batteries were disposed on and inside the bomb release line in concentric rings depending on the number of guns available. Several gun batteries were located inside the defended area to insure that the attacking bombers could be engaged even after bombs were released. Emphasis was placed on engaging all planes, if possible, and destroying them. This policy was in effect throughout 1940.

With the advent of heavier British raids in 1941, it became apparent that more fire power would be required to destroy the attackers. Batteries were equipped with 6 guns, some with 8, and experiments were conducted with 12 guns.

The use of 12 guns with one set of fire-control apparatus, data from which might be inaccurate, was considered uneconomical from the standpoint of ammunition expenditure and was abandoned, except as an emergency measure.

As gun-laying radars became available late in 1941 and early 1942, three or four were assigned to a regiment and several batteries were furnished data from one radar by various plotting devices. This method produced a greater concentration of fire and appeared to offer the best means of defense against larger formations. Difficulties inherent in the data transmission problem naturally led to the combination of two complete batteries at one site. Experiments were conducted with the double battery late in 1942.

In the early months of 1943 high altitude American attacks and larger British formations required a radical change in the defense installations. The old policy of attempting to destroy individual planes by the battery commanders' action was discarded. Instead the defense was planned to provide for the maximum fire to be delivered against the most dangerous formation before the bomb release line was reached. This required a high degree of control and led to the establishment of very elaborate Flak Operations Rooms (Auswertungen). Concentration of fire and centralized direction were obtained by the formation of grossbatteries or strongpoints—two or three complete batteries combined at one site under one experienced commander. The grossbattery was required to fire as a unit, its component batteries always engaging the same target. For this report a grossbattery will be considered to be a triple battery (combination of three single batteries).

The following general principles were prescribed for the employment of heavy flak:

a. The maximum number of grossbatteries would be formed.
b. Grossbatteries would be placed on or outside the bomb release line.
c. Grossbatteries of larger caliber guns (105mm) would be emplaced as far from the defended area as practicable along the expected avenues of approach.
d. The minimum number of single batteries would be used to fill the gaps between grossbatteries and to provide an inner defense ring.
e. The bomb release line would be computed for an altitude of 7000 meters and a speed of 110 meters per second. In September 1944 these figures were increased to 8000 meters altitude and a speed of 160 meters per second.

Figure 1 shows the heavy gun defense of Munich as of 1 January 1944 and illustrates the foregoing principles, with particular reference to the formation of grossbatteries and the reduction of single gun sites.

#### Heavy Gun Defense of Munich—1 January 1944 to 29 April 1945

Since the city of Munich was a highly defended area more or less isolated from other industrial sections, it offered an excellent target for study. Besides the large industrial installations, it was a very important communications center.

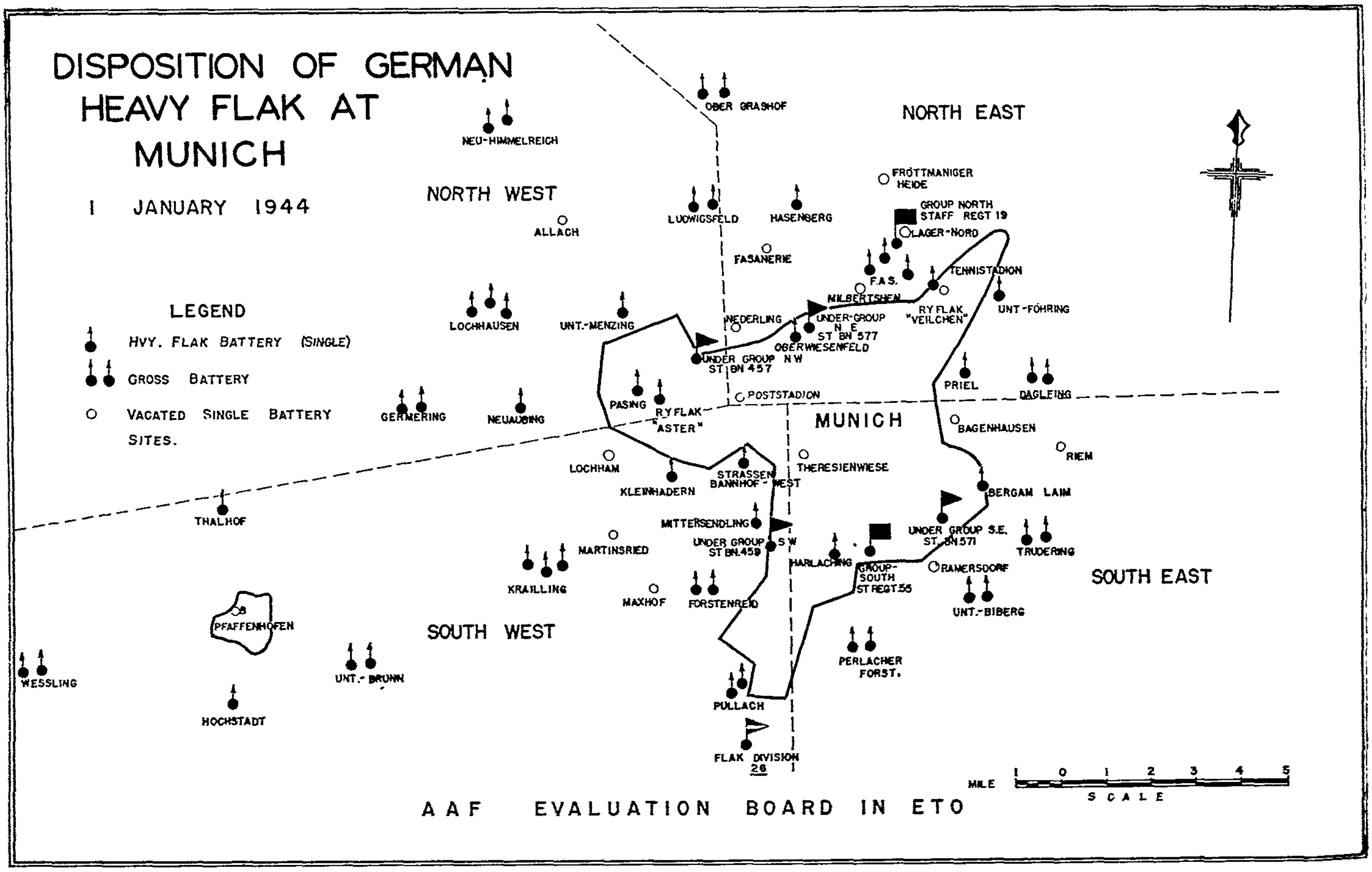



Figure 1

By March 1945, after most of the southern section of the city had been destroyed, the flak defenses were definitely increased in the north.

### Light Flak

As was to be expected German light flak, including 37mm and 40mm guns, played almost a negligible role in the static defenses. In the beginning efforts were made to blanket the defended area with light weapons of every caliber. When it became evident that only high-level attacks could be expected, guns were removed from industrial buildings and a minimum number left around certain important installations such as airports, outlying factories, and marshalling yards.

The unit of employment remained the platoon of three guns which were usually emplaced in a triangle about thirty meters on a side. The fire of one weapon, the pilot gun, was directed by the platoon leader either by voice or hand signals, and the other two guns were guided by its tracer stream. No evidence was available as to the effectiveness of this system.

### Light and Heavy Railway Flak

The growing demand for protection of trains was usually met by reducing the static light flak defenses still further. Railway flak cars were improvised with whatever weapons were at hand. A platoon of three guns were emplaced on two standard flatcars, a single or dual 37mm gun on one car and two 20mm (either single or multibarreled) on the other. Machine guns of domestic or foreign manufacture were also used, if available.

When the train was made up, one platoon of light flak guns was placed behind the first one-third of the cars and another platoon was placed in the last one-third.

Heavy railway flak batteries of four 128mm guns were the largest caliber and most modern weapons in general use. Sites for these guns were prepared in all defended areas, communications were installed, and orienting data kept available. Batteries were moved from one area to another to meet expected attacks depending on our strategic bombing program at the time.

### Barrage Balloons and Smoke

During late 1943 and early 1944 it became evident that the employment of barrage balloons was more of a liability than an asset to the defense. There were no low-level attacks and the balloons could not be flown at high altitudes, so they served only to mark the target for the attacking formations. By the spring of 1944 their use was abandoned.

As the war progressed it was found in Southern Germany to be impracticable to cover large defended areas entirely with smoke. Large concentrations of smoke interfered with the gun defenses. There was also a shortage of sulphuric acid used in the most common types of generators. By the middle of 1944 the use of smoke was limited generally to fairly small objectives or made for purposes of deception.

### Air Warning Service

One of the most successful features of the whole air defense system in Germany was the Air Warning Service. Until the time Germany proper was overrun not a single instance was found where ample early warning was not furnished the flak defenses, except for several small raids by "Mosquito" bombers.

Visual observation posts manned by the Air Observer Corps and long-range radars operated by Air Signals units were located at strategic points to cover the assigned area.

### Camouflage and Deception

No evidence was found of any serious effort on the part of flak batteries to camouflage their installations nor were any dummy guns left when sites were vacated. Flak prisoner of war officers stated that it was believed that the positions could be detected anyway when fire was opened. Orders had been issued in 1940 that dummy sites would always be prepared, but little attention seems to have been paid to it.

It was stated that rocket projectors were utilized at night to fire flares similar to those dropped by Pathfinders. This was done in order to divert night bombing from the true targets.

There was a decided effort made to camouflage industrial plants, locomotives on sidings, and other important installations. A dummy plant was installed in the area, north of I. G. Farben Industry, Ludwigshafen. This dummy plant was bombed on two occasions at night.

### Technique of Battery Operation
### The Grossbattery—General

This discussion is based primarily on the technique of battery operation as applicable to the grossbattery. The grossbattery has been selected because it represents the most advanced, and apparently the most effective, type of installation in the German gun defense against Allied air attacks. This opinion was the concensus held by the German officer prisoners of war interrogated.

In order to bring an effective volume of fire against any formation to be engaged, the Germans felt that the fire of at least 18 to 24 heavy guns was required. Their experience indicated that the most practical method by which this could be accomplished was by means of grouping three single batteries in one strongpoint under the control of an experienced officer.

This method had the disadvantage of making the batteries more vulnerable to direct air attack, a disadvantage which was recognized and accepted as being outweighed by the advantages of centralized control and concentration of fire power. However, to minimize this weakness within the limits possible, the guns of the three component batteries were emplaced in distinct battery positions at the corners of a triangle about 300 to 400 meters on a side.

### Fire Control

To achieve the desired control, all fire control instruments were grouped in the approximate center of the triangle. The sketch shows the approximate spacing of the fire control instruments in a typical installation. The close proximity of all directors and radars permitted convenient interconnection and switching of data lines from either radar to all directors. The data transmission system used permitted satisfactory operation with one radar controlling up to three directors. While it would seem that good control could still

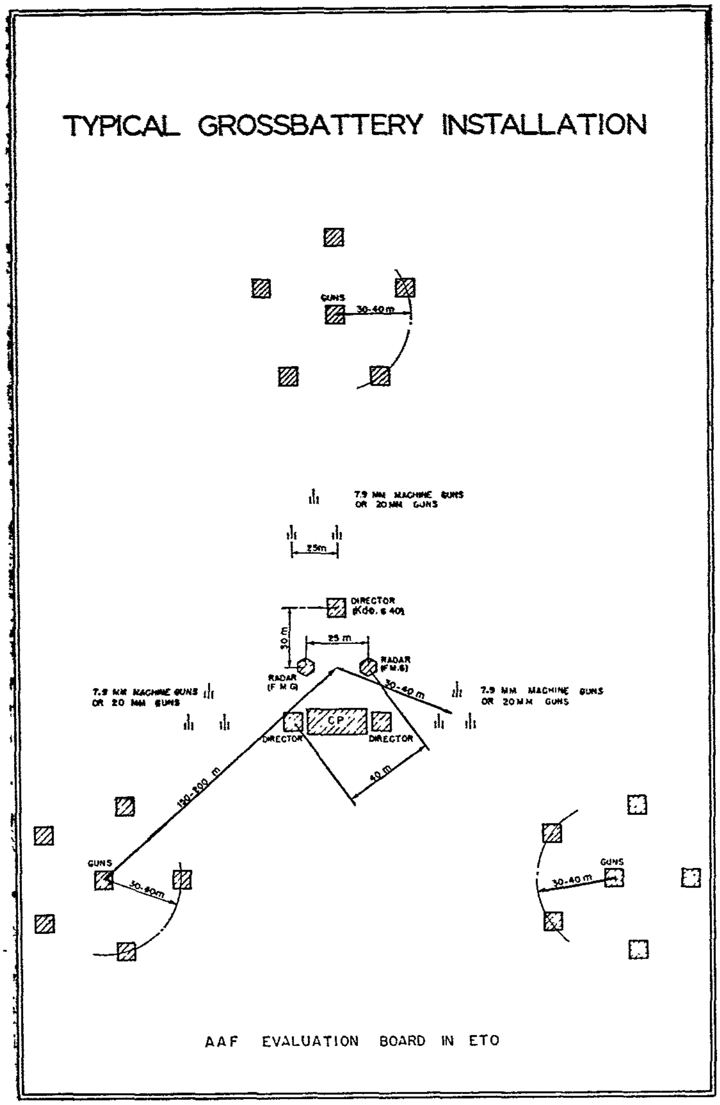



Figure 2

be exercised with the directors separated a greater distance from the radars and from each other, limitations on cables, data transmission difficulties, and the problem of keeping three directors on the same target in optical engagements, prevented further separation.

According to captured German documents, each director could supply data to a maximum of twelve guns. The greatest number of guns found connected to any one director was eight. The standard director, and the only one found in any position, was the Kommandogerat 40. These statements are based on inspections of sites whose total of guns approximated five hundred.

The equipment employed the usual types of fire control—full optical, full radar, and radar range combined with optical tracking. The prescribed procedure was to put both radars on search in the normal or directed sectors upon receipt of the alert. The first radar to pick up a target was connected to the three directors and supplied present position data through "selsyns." The second radar continued on search and attempted to select a target which could be engaged at maximum range after the first target reached the bomb release line. This process was continued during the raid; one radar furnished data while the second searched. This method reduced considerably the time lag between the engagement of successive flights.

The Germans had developed a very useful piece of fire-control equipment called the "Malsi." This device, in general, served the same purpose as the grid plotting systems used in our gun-battery command posts in the European Theater. The functions of the "Malsi" were:

a. To receive present position data from its radar and convert same to plots for the operations room.
b. To relocate present position data for use of an adjacent searchlight.
c. In event of failure of local radar, to accept data from a distant radar and relocate same for feeding into its own kommandogerat.
d. In event of failure of its own kommandogerat, to accept data from local radar and furnish firing data for the guns.
e. To quickly determine firing data for barrages when called for by the barrage officer in the operations room.

The use of the "Malsi" therefore provided good insurance against the loss of the fire power of a battery due to radar jamming, or due to the failure of normal methods of fire control. For example, with a grossbattery connected to two adjacent sites, it was possible for any one of the six available radars to supply firing data for all three grossbatteries.

**Radar**

Interrogation of prisoners of war showed a considerable ignorance of radar use on the part of German flak officers. Only the radar maintenance noncommissioned officers appeared to have an intelligent grasp of the subject. One noncommissioned officer supplied most of the information on this subject. Since complete thoroughness characterized German demolition of radar equipment, it was not possible to get a thorough demonstration of procedure on the F.M.G. 39 or the F.M.G. 41.

The methods used to combat "window" jamming on German radars were designated as "Nurnberg," "Wurzlaus," "Taunus" and a back-to-back presentation instead of the normal side-by-side display. The prisoner of war knew of no descriptive name for the latter, but it appears to have been called "Kehrbild" in previous Military Intelligence Reports.

Nurnberg procedure, the audible presentation of modulation of the received radar signal produced by airplane propeller rotation, was used widely. It had its greatest value in identifying targets when the rate of range change was small, as on angles of approach close to 90 degrees.

Wurzlaus procedure used the Doppler effect produced by a target on the reflected radar wave due to its rate of range change with respect to the radar. It produced an oval blob of light on the time base instead of the normal pip. It was considered one of the most effect anti-jamming procedures.

Taunas procedure displayed pips the amplitude of which depended on the slope of rise of the received echoes. Since "window" echoes had a more gradual slope than those of the target, the net effect was to provide much better discrimination, on the cathode ray tube, in favor of the target pips. Over-all window clutter was reduced considerably.

Kehrbild procedure was simply back-to-back split presentation on the scope. The effect of this was to reduce clutter on the scope by about one-half.

While no single one of these procedures was a satisfactory solution to the "window" jamming problem in itself, it appears that the combination of the four procedures just mentioned made it possible for the German gun-laying radars to give reasonably good data in the presence of heavy concentrations of window.

In most cases "Wurzlaus," "Taunus," and "Kehrbild" appeared together. These three procedures provided the plotting facilities. "Nurnberg" was widely installed but it was reported that the installation of this equipment had been recently discontinued without explanation. Prisoners of war felt that "Nurnberg" was not necessary when the other procedures were used and tended to cause extreme fatigue to the operators. It was not a plotting procedure, but merely an aid to following through "window" jamming.

Against airborne (electronic) jamming, the only reported anti-jamming procedures were "Wismar" and "Stendal." "Wismar" was the term applied to procedures for changing the frequency of the set. "Stendal" was a system of tracking an airborne jammer using the jamming signal itself.

Wismar procedure on the Wurzburg "D"-F.M.G. 39 T(D)-radar was accomplished through the selection of any one of six "spot" frequencies in either band "A" or "B." There was also a "C" band which was not used extensively. The process of changing to a different "spot" frequency required about two minutes and could be done by battery personnel. Changing from "A" to "B" band and the reverse required about an hour and was always done by the radar maintenance detachment. This last required changing the effective length of the dipole which had clamping positions for the "A" and for the "B" band marked. Going from "A" to "B" band increased the dipole span about four centimeters.

"Wismar" had been effective against impulse jamming in a narrow frequency range, but had failed against noise jamming. It was difficult to get definite statements on the effectiveness of this anti-jamming procedure. It appeared to depend on the band width of the jamming, directional characteristics of the jammer, the distance of jammer from the radar and, to a great extent, the skill of the radar crew.

Stendal procedure—taking the transmitter off the air and tracking the jamming signal directly—could be accomplished by removing a tube from the impulse generator. There was no standard switch for doing this. This method apparently was no longer prescribed because the accuracy obtained had been of the order of 100 to 200 mils in direction and it had been impossible to obtain range. According to prisoners of war Stendal procedure had been discontinued during the latter part of 1944.

The use of I.F.F. equipment for gun-laying radars had been planned and space for the equipment had been provided on the mount but its use had been discontinued. The function of identification, by radar means, had apparently been left up to the early warning radars.

#### Personnel

Following the defeat at Stalingrad the flak personnel problem soon became acute. Attempts to relieve the situation were made by the use of schoolboys, part-time use of factory employees, the employment of "heimat flak" or home-guard flak personnel, foreign labor used on gun crews, and by the extensive employment of women on clerical, switchboard, and plotting work as well as for manning searchlights and barrage balloons. There can be little doubt that the loss of well trained personnel to the field forces and their replacement by, at best, partially trained crews had a decidedly adverse effect on the efficiency of the flak defenses.

#### Conclusions

The failure of the German flak defenses to seriously hamper our strategic bombing program can be attributed primarily to the following factors, all of which were exploited by the Strategic Air Forces:

a. High-altitude bombing.
b. Saturation of the flak defenses by large formations of aircraft.
c. Radar countermeasures.

High-altitude attacks of 26,000 feet rendered the 88mm (18 and 36) gun, which composed about 70 per cent of the defensive strength, practically useless. Reverses on the Eastern Front and demands from the other arms for additional equipment precluded a complete re-equipping of the flak organizations with modern weapons. As the bombing program progressed, critical shortages made this problem of supply still more difficult. Furthermore, batteries had to be placed more distant from the defended area, thus greatly reducing the gun density of the defense.

Failure to produce a gun-laying radar comparable to our SCR-584 by 1944 when numerous raids were made under unfavorable conditions of visibility, coupled with our active jamming procedures, reduced the combat effectiveness to a still greater degree. Modifications to existing radar sets were designed and rather elaborate methods of fire control were in use. These, however, did not compensate for the lack of a modern gun-laying radar.

Interrogation of flak officers of all ranks indicated that the V-weapon psychology had crept into their expectations. They continued to hope also for the development of some new weapon, such as the rumored sonic homing rocket, or for a resurrection of the Luftwaffe.

The final role of the flak defenses of Munich is vividly portrayed by the last message recorded in the Battle Journal of Group Munich. A translation of this message appears below:

"Battle Headquarters,
29 April 1945.

Daily report number 7.

2 SS Battery, Hasenberg, 1218-1418 hours. Engaging enemy tank formations (25-30 enemy tanks) with indirect fire, range 6 kilometers."

# SHOOTING WITHOUT FACTORS*

## By Captain Donald E. McArthur, FA

A new and simple method of conducting observed fire has been developed at The Artillery School. This new method *is described in Department of the Army Training Circular No. 1, dated 31 January 1949 and will be contained in FM 6-40 to be published in the latter part of November.* The observer's procedure has been so simplified in this new method that observer training time can be greatly reduced.

Probably the worst headache to the average artillery *observer using the former method of conducting observed fire was* the mental juggling of factors.

The purpose of this article is to present *the* new technique which *eliminates* the use of factors regardless of where the observer is located and without requiring the observer's position to be known. This technique *allows* the observer to shoot every problem as though he were at the battery position, even though he hasn't the slightest inkling as to where the battery is located.

The observer's procedure can best be illustrated by an example: The observer has just joined an infantry company in the front lines. He has no maps or photos, nor does he know where his batteries are located (the battalion was changing positions while he was on *his* way forward). He can, however, identify the battalion base point on the ground. The infantry commander requests artillery fire on an enemy machine-gun position which is holding up the advance. The artillery observer, with a pocket compass, measures the Y-azimuth to the target to be 4,350 mils. The target appears 200 mils right of the base point and approximately 1000 yards nearer to the observer. The observer estimates the distance to the base point to be 3000 yards. His initial fire request, then, is:

FIRE MISSION
AZIMUTH 4350
From BP Right 600 (3 x 200) Drop 1000
MACHINE GUNS
WILL ADJUST

The first volley is fired and appears 40 mils left of the target, doubtful for range. Using the estimated distance to his target of 2000 yards, the observer applies the mil relation and sends the correction, "Right 80, Repeat Range" (2 x 40 = 80).

The second volley is fired and the observer sees it in line with and beyond his target. His next correction then is DROP 400. Notice that he is using no factors. The next volley lands between the observer and the target, so he says ADD 200. The next volley is also short, so the observer says ADD 100. This volley is over, so he says DROP 50, FIRE FOR EFFECT.

Why can the observer shoot this problem so easily without using S and d factors? The answer to this question is a device used at the fire-direction center known as the target grid (Figure 1).

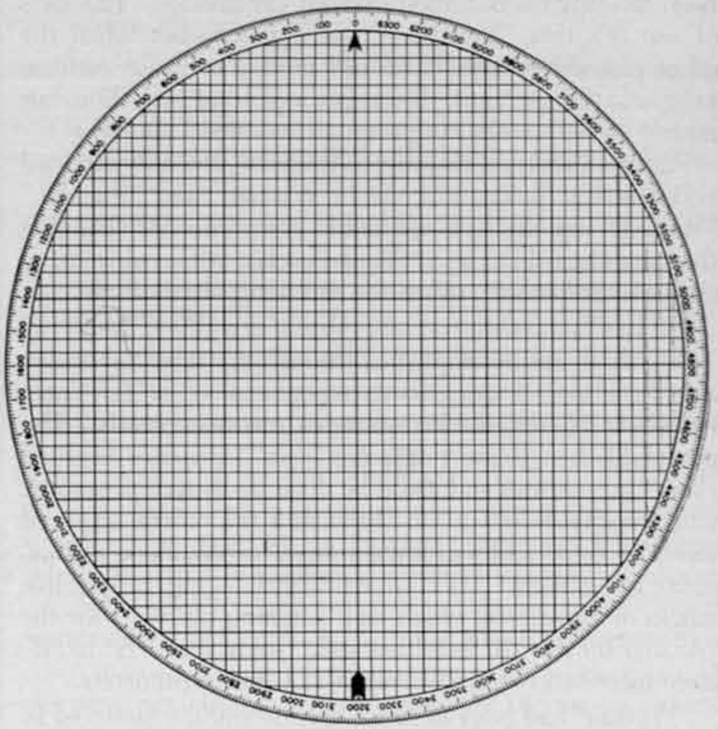


Figure 1

The target grid is like a sheet of graph paper, differently weighted lines representing *500 yards and 100 yards.* It must be to the same scale as the firing chart being used. The azimuth circle on the target grid is for the purpose of orienting the grid to the observer-target line. The center of the grid is fastened to the firing chart at the base point with a thumbtack, thus leaving the grid free to rotate around the base point to the reported observer-target azimuth.

In the example cited above, the observer reported AZIMUTH 4350. The target grid is rotated until 4350 on the azimuth circle appears opposite the north index. By doing this, the large arrow and all grid lines parallel to it are oriented to Y-azimuth 4350. The chart location for the initial round in the problem is found by moving the target pin on the grid according to the observer's corrections from the base point. The observer's corrections were FROM BASE POINT RIGHT 600 DROP 1000 (Figure 2).

Data for the initial round is then measured with a range-deflection fan, as will be shown later. When the observer's correction DROP 400 is received, the target pin is moved down the observer-target line 400 yards. Notice that the actual gun-target range is not reduced 400 yards but the position of the next burst is moved 400 yards nearer to the observer. Thus when data is measured to this new position of the target pin, the burst will automatically be kept on the observer-target line. The proper relation between the gun-

*Reprinted and revised with permission from Sept.-Oct. 1948 issue of the *Field Artillery Journal.*

target line and the observer-target line is established by the observer's azimuth to his target (which is constant throughout the problem) and the azimuth on which the guns are fired (which changes from round to round).

Instead of measuring a deflection shift for each round the actual deflection to be set on the piece is measured. ("Deflection" is the horizontal clockwise angle from target to aiming point. As the gun sight is graduated only to 3200 mils, the deflection is always less than 3200 mils. A clockwise angle of 3700 mils from target to aiming point is a deflection of 500 mils.—Ed.) In order to do this, deflections must be marked on the fan in grease pencil (Figure 2). Both edges of the fan will represent the same deflection, usually 2800 *for 105mm howitzers.* For measuring to the right edge of the fan decreasing deflections are marked at each 100-mil graduation on the fan as 2700, 2600, 2500, and 2400. For measuring to the left edge of the fan, increasing deflections are marked at each 100-mil graduation as 2900, 3000, 3100, and 3200. (The range-deflection fan may be used for measuring azimuth for antiaircraft guns which are laid in azimuth. Place right side of fan against target pin at base point and mark index on firing chart opposite a point on the fan whose graduations indicate the last two figures in the number of mils in the azimuth of the base point. This point should be the one nearest the right edge of the fan. Then with a grease pencil mark the fan with hundreds in azimuth increasing counterclockwise beginning with the hundred value in the azimuth of the base point, so that with the edge of the fan on the base point, the reading on the fan opposite the index indicates the azimuth of the base point. Then mark fan with decreasing hundreds beginning on the left edge of the fan with the hundred value in the azimuth of the base point.—Ed.)

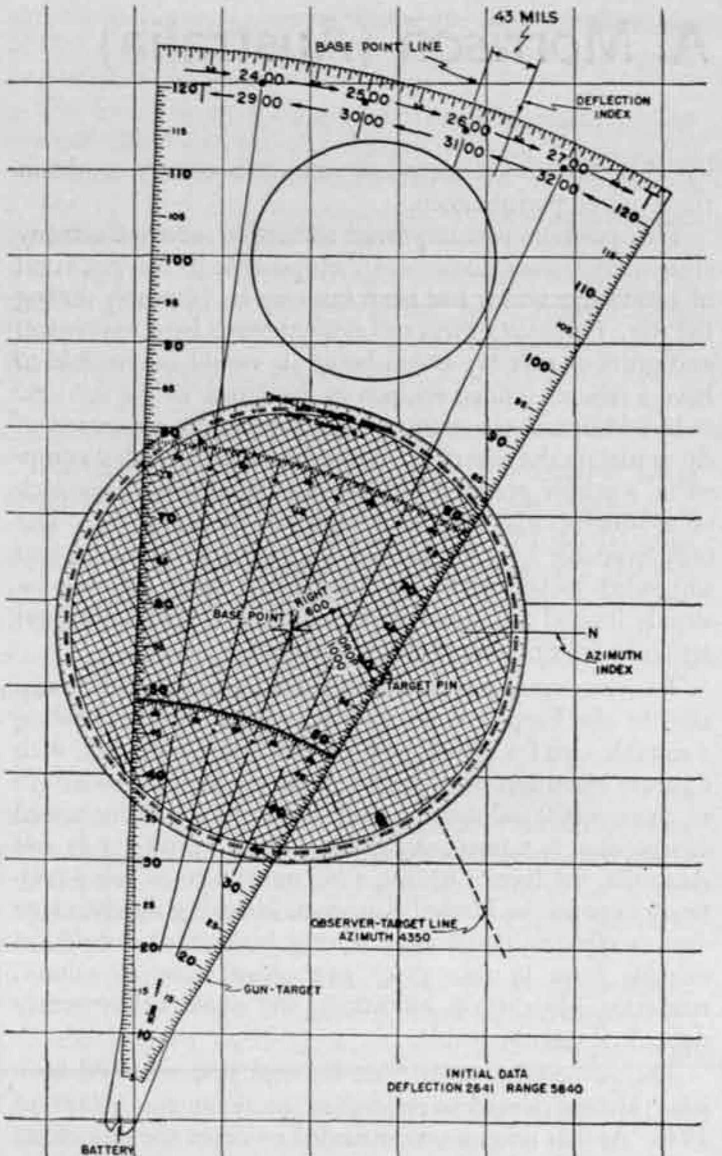



Figure 2

In order that deflection commands rather than deflection shifts may be handled properly at the firing battery, all pieces must have the same deflection when parallel. If possible, all aiming stakes are set out at the same deflection after the battery is laid parallel, usually 2800 *for 105mm howitzers.* If this is impossible because of terrain obstructions, *those pieces unable to put out aiming stakes at the common deflection, put them out at an even 100 mil deflection and the piece carries a constant to be applied as a correction to all deflections received. It is contemplated that a modification to the present M12 sight will allow aiming stakes to be set out at random, but will still permit a common deflection for all pieces.*

Deflections are read on the firing chart opposite the *base point line* extensions, deflection for the base point being 2800 or whatever deflection is marked on the edge of the fan. If, after registration, the adjusted deflection to the base point is found to be some figure other than an even hundred mils, such as 2843, deflection 2800 must be offset from the *base point line* extension. In this case, it would be 43 mils to the right. A new tick mark, then, is drawn at deflection 2800, and this mark will be used as the index for measuring deflections (Figure 2).

In area fire missions, the target grid and range-deflection fan are used throughout to determine data for firing. Fire for effect is commenced when a 100-yard bracket along the OT line is split. In precision missions, however, it will be seen that it is impossible to refine deflection and elevation to 1 mil by graphic methods. Therefore data are determined by moving the target pin through the adjustment only. The final position of the target pin, then, is at the center of a 100-yard bracket along the OT line. From this point on, elevation is changed only if the first half-group of three rounds results in the same range sensing for all three rounds. Deflection is changed by the fire-direction center according to the observer's sensings.

*Reports received from units, both in the United States and overseas, indicate excellent results from shooting with the target grid. These reports indicate a substantial saving in both time and ammunition. The best feature of all, however, is the ease of training observers.* With the use of factors eliminated, anyone can learn to shoot well in a relatively short period of time.

(A subsequent article will discuss the operation of the fire direction center and the functions of the forward observer.—Ed.)

# Australia's Long-Range Weapons Range*

## By Lieutenant Colonel S. A. Morrison (Australia)

### Historical Background

During World War II, it became evident, especially to Germany, that some radical change to the accepted methods of antiaircraft defense and long-range bombardment had to be brought about to compete with the Allied air superiority and the increased performance of modern aircraft. The antiaircraft gun for high-altitude shooting was rapidly becoming obsolete, and large numbers of shells were being expended in order to shoot down a single aircraft.

In an effort to overcome this problem, rendered extremely acute by the highly successful Allied bomber offensive, Germany turned a large proportion of her scientific effort to the production of high-speed pilotless-guided antiaircraft and ground bombardment weapons. In this work, the German scientists were greatly assisted by a considerable amount of knowledge already available on rocket propulsion, a great deal of research having been carried on in this field prior to the war.

As a result of the enormous scientific and industrial effort devoted to this work, several types of subsonic and supersonic offensive weapons appeared in service. In addition to these offensive weapons, several types of defensive antiaircraft weapons were also under development, though none were completed in time to appear in service.

This work continued under high pressure until the end of the war, but due to the immense amount of damage caused to Germany's industrial areas and research establishments by Allied bombing, relatively little production was achieved. A considerable amount of fundamental research was carried out, however, and a mass of valuable data was accumulated.

Toward the end of the war, it was agreed that in spite of complete Allied air superiority, some effort should be devoted to research and development work on guided weapons, so that Britain should not lag behind in this new and very important field of defense. As a result, work was begun in the Ministry of Supply late in 1944.

It immediately became evident that the production of a reliable and efficient guided weapon called for an enormous expenditure of money and a correspondingly large effort in terms of manpower. At this time, very little was known either in Britain or America of the problems associated with controlling guided weapons flying at speeds greater than the speed of sound. Practically no work had been done on liquid-fuelled rocket motors or ramjets necessary to obtain the required performance.

This position was improved somewhat when Germany surrendered, since access was then possible to the vast fund of knowledge which had been built up by Germany during the war. However, it was still evident that a long, expensive, and arduous task lay ahead before it would be possible to have a reliable guided weapon in the hands of the services.

In addition to the many scientific problems presented in the actual production of the weapon and its associated equipment, a purely practical problem was presented by the lack of a suitable trial ground within the British Isles. The only available ranges designed for gunnery, bombing, and unguided rocket trials, involved firing over the sea for strictly limited distances, rendering recovery impossible and seriously limiting observational facilities.

To overcome this problem, the possibilities of other countries in the Empire were assessed with a view to finding a suitable area for constructing a long range over land, with a future extension over the sea, to give a total range length of about 3,000 miles. The only Dominions which showed any promise as a result of this assessment were Canada and Australia, the former having a big advantage in being relatively close to the United Kingdom, but a big disadvantage due to climatic conditions. Firing in Canada would inevitably have to take place over deep snow in winter, rendering observation hazardous and recovery extremely difficult, if not impossible.

The proposed area in Australia was first surveyed by a joint United Kingdom-Australian party in the winter of 1946. At that time, it was intended to locate the rangehead at Mount Eba, but later it was decided to move back to Woomera so as to reduce the distance from Adelaide and increase the length of the range.

A report was made to the United Kingdom Ministry of Supply on the possibilities of the area, and negotiations were commenced between the United Kingdom and Australian governments early in 1946. At the same time, work was begun in various Ministry of Supply establishments, planning the technical aspect of the proposed range, assessing the requirements, and estimating the cost of the project.

The proposed range was to run from Woomera across the desert for a distance of about 1,200 miles, with the possibility of a future extension of about 1,500 miles across the Indian Ocean toward Christmas Island. The advantages of the area are immediately apparent. It is virtually un-

*Reprinted from the November 1949 issue of *Military Review*.

inhabited, so that little, if any, risk would be incurred. The climate though very hot during the summer months, is good during the remainder of the year. The visibility, with the exception of ground heat haze, is good. Recovery of expended missiles presents no insuperable problem, and the setting out of observational facilities and general range instrumentation is relatively simple.

The disadvantages of the area are, in the main, those which would inevitably be associated with the setting up of any large project in a virtually uninhabited desert region. These are broadly covered by lack of water, poor communications, and general absence of essential facilities. But none of these problems is insuperable, and all are being dealt with as described elsewhere.

The Department of Munitions—now Department of Supply and Development—was charged with the responsibility of setting up the organization necessary to conduct all aspects of long-range weapons research, development, and trials in Australia. Early in 1947, a party of engineers and scientists from the United Kingdom Ministry of Supply arrived in Australia to take part in this work, and the Long-Range Weapons Organization, a joint United Kingdom-Australian enterprise was formed.

### Range

The range establishment, located at Woomera, is being planned to provide all services and facilities necessary to carry out large-scale experiments as required by the chief superintendent. The majority of these services and facilities will be manned by personnel from the three fighting services, while the more special scientific measurements and the conduct of experiments will be in the hands of civilian scientists.

### Range Instrumentation

In view of the immense cost and effort that goes into the making of a single experimental projectile, considerable care must be taken to ensure that the maximum amount of information is obtained from every firing.

The type of information required will vary from missile to missile since each firing is a scientific experiment designed to obtain valuable data on some aspect of scientific interest.

Thus, a trial might be run to get data on longitudinal accelerations, lateral acceleration, angles of pitch and yaw, and information on roll. Another trial might demand information solely concerned with the means of propulsion, such as temperatures, pressures, or time of burning.

To meet these varying requirements, a very elaborate system of range instrumentation must be built up.

### Electronic Methods

To obtain the position of the missile at any given instant, straight radar tracking can be used. This operates in exactly the same way as a radar set tracking an aircraft. A pulse transmitted from the set is reflected back from the missile and picked up in a receiver. The direction of the missile is thus obtained, and its distance from the set is given by the time taken for the pulse to complete the "journey out and back." From this information, the elevation and bearing of the missile are established, giving its position in space at any given instant.

By carrying a telemetry set in the projectile, information as to what is happening inside the missile itself can be transmitted to the ground and picked up on a special receiver. By this method, information on accelerations, roll, pitch and yaw, pressures and temperatures inside the missile can be obtained during flight.

### Optical Methods

Several optical methods of instrumentation are used, the main ones being:

1. High-speed Photography. By means of a high-speed movie camera, with a time base photographed on the film, it is possible to follow the missile during the early stages of its flight and obtain useful data on altitude and velocity.
2. Acceleration Cameras. Acceleration cameras, operated by remote control and located to a flank, take a series of photographs of the missile at fixed time intervals during the acceleration period. These photographs can then be interpreted to obtain the axial accelerations during the early part of the trajectory.
3. Kine Theodolites. The kine theodolite is virtually a theodolite operating with a camera, the theodolite readings being photographed together with the missile in flight. By using two or more of these instruments located at known positions, it is possible to compute the position of the missile and its velocity at any given instant.

### Terrain

The country around Woomera is very sparsely populated. It is a wool producing area with a carrying capacity of about 20 sheep to the square mile. The rainfall never exceeds 10 inches a year, water is obtainable from artesian wells.

Much of the country over which the missiles will be fired is uninhabited, so the operation of the establishment will cause little inconvenience to anyone.

# By The Rockets Red Glare: Inyokern*

## By Lieutenant Warren R. Hughes, USNR (Ret.)

The Naval Ordnance Test Station, near Inyokern, California, is one of the largest establishments under the cognizance of the Bureau of Ordnance. The station, about one hundred and fifty miles north of Los Angeles, covers more than a thousand square miles of plains and mountains. Its bounds spread twenty-six miles from east to west and forty-seven miles from north to south. The Grand Duchy of Luxembourg is smaller than the Navy's desert installation.

But its tremendous size is not the Inyokern station's chief claim to fame. It is one of the most spectacular developments of modern times, and it is one of the leading primary research centers operated by the Bureau of Ordnance. How the station came into existence and grew into an unparalleled research facility; what vital development work has been undertaken there; and how it is pushing forward in new fields of scientific research—all combine to make the Naval Ordnance Test Station one of the most significant shore establishments today. Its scientific approach typifies the dynamic quality of weapons development in the modern Navy. The full impact of its work has not yet been felt throughout the service; many of the naval weapons of the future are its research projects today.

In early days of World War II, the United States was behind other powers in the field of rocket warfare. Germany, Russia, and Great Britain ranked ahead of the United States in rocket development. The Germans had begun intensive research in the field of unconventional weapons as early as 1936, had designed V-2 by 1939, and saw it successfully fired by 1942. There was a frightening urgency in our catching-up.

The Office of Scientific Research and Development contracted with the California Institute of Technology to undertake research and development of rocket-powered weapons. Dr. C. C. Lauritsen, a World War I rocket specialist who had been helping the British in their weapons development program, returned to the United States to head the Institute's research project. First tests of the new missiles were made in mid-1942 at Goldstone, a dry lake in the desert about fifty miles southeast of the present station. For extensive testing, however, more room than that available at Goldstone was needed.

A site committee was formed. The group searched about for a location which offered a wide expanse of relatively unpopulated area, close to research facilities in Pasadena, near a railroad and good highways, with water, power, and other utilities available, and finally, near an adequate labor supply. The Inyokern area possessed the greatest advantages, fulfilling all requirements for the station except that of labor supply. The prospective location had an added advantage: flying is closed down because of weather in fewer than ten days per year. The group selected the site.

Officers of the Bureau of Ordnance played a leading part in October, 1943, in obtaining the land for the station. They hurriedly got in touch with authorities all over the country. Most of the area was public domain and came under the jurisdiction of the Department of the Interior; a small part belonged to the State of California; the Army had leased a part; the relatively few acres remaining belonged to homesteaders. Of the whole expanse of the base as first set up, only about 3000 acres were patented.

Title of public domain was transferred from Interior to Navy. The Army traded its leased airport for a marshy tract elsewhere to use for testing amphibious equipment. An exchange was negotiated with the State. Private lands were taken over under the Second War Powers Act.

Naval Officers and scientists assigned to the embryonic station coped with almost every conceivable problem while living under conditions which, at the very best, were hardly luxurious. In December, 1943, one slept near the station at Harvey Field in a Quonset hut which had neither windows nor doors. "I've slept in the snow in the High Sierras," he says, "but never have I seen such a cold place as that open-air Quonset!" The Commanding Officer shared his Quonset hut with the Executive Officer and the Experimental Officer. The hut was used not only as their living quarters but also as the administrative office of the base.

By winter of 1943 the first rockets, an American modification of a British development, were fired in the dry bottom of China Lake while the station was still essentially in its infancy. Sage and creosote bushes were removed to make way for buildings. By February 29, 1944, the station had eight Quonset huts. The base was being expanded. Suitable test ranges were being set up and rocket development was going apace.

Everything was done under pressure. Over a thousand separate projects of local or Bureau origin were undertaken during the war while the station was still being built.

Rockets for use against submarines; air-to-air missiles fitted with V-T fuses, medium and high altitude antiaircraft rockets; rocket-propelled chemical weapons and antitank grenades; all these were turned out by the Inyokern scientific group. Using almost any type of portable firing platform—from jeep to small craft—barrage rockets could make the densest jungle as desolate as the Sahara. Rockets helped clear landing beaches of opposition; assault forces could hit the beach standing up; and countless American lives were saved because of the new weapons. The Director of Research for the Pacific Coast Group was awarded the Medal for Merit for his contributions and leadership.

To appreciate fully Inyokern's wartime job, the observer must keep one eye on scientific developments and the other on the expanding station. While unconventional weapons were being built and tested, buildings were springing up everywhere and asphalt roads were being laid out over the

---

*Reprinted from the November 1949 issue *U. S. Naval Institute Proceedings*.

desert. A hot-mix plant was set up for building roads. To bring in supplies, Inyokern built its own ten-mile railroad.

Prior to April, 1945, the facilities of the station were used primarily for the rocket program of the Bureau of Ordnance acting through Caltech (the California Institute of Technology) under its contracts with OSRD (the Office of Scientific Research and Development). Initial work toward establishing the station's own research and development program was commenced in January, 1945. This was a significant departure, for it marked the beginning of the station as an integrated agency for weapons development: all activities were coming under one roof, so to speak. From April through October of that year, activities of the OSRD Group such as Caltech were largely absorbed by the permanent technical organization of the Naval Ordnance Test Station. Almost completed, the station required finishing touches. Projected scientific laboratories were not yet to be built. Technical facilities were expanded for the integrated activity which, because of its location, can collaborate effectively with the aircraft industry of Southern California and naval installations of the Pacific Coast area. The Naval Electronics Laboratory at San Diego and the Air Missile Test Center at Point Mugu, each relatively near by, are particularly noteworthy in this respect.

Today the station represents a hundred million dollar investment in the future of new ordnance. Two thousand buildings have arisen in what was once wasteland. The sun still shines hot in summer, but life is more pleasant now. Permanent buildings of modern desert-type architecture are air-conditioned, and three hundred miles of hard-surface roads lead through the base where once only desert trails could be found. With facilities placed there for its 12,000 inhabitants, one could live a lifetime and never go beyond the gates of the station for any reason. Stores, barbershop, beauty parlor, dispensary, chapel, theater, library, schools, athletic fields, swimming pools, and banking facilities are in operation. Housing facilities are being expanded. New housing developments for both civilians and service personnel are being completed this year. Four thousand five hundred workers, about 900 of them service personnel, are manning Inyokern's offices, laboratories, and ranges. Normally about 115 officers are assigned to the station. Ship's service commissary, and recreational privileges are extended to civilian personnel. An Officers' and Scientists' Club is maintained.

Exact information weapons development at Inyokern today is, of course, subject to security regulations. Speaking before the Navy Industrial Association in the fall of 1947, the Technical Director stated that the development program of the station includes (1) rockets for air-to-air and air-to-ground application, (2) guided missiles and missile components, (3) underwater ordnance and missiles for underwater attack, and (4) aircraft fire control systems for projection of airborne rockets, bombs, gun projectiles, and torpedoes.

Guided missiles, in themselves, are not too mysterious. A guided missile has been defined as "an unmanned vehicle moving above the earth's surface, whose trajectory or flight path is capable of being altered by a mechanism within the vehicle." Acoustic homing torpedoes, except for their operating a different medium, would be guided missiles. The adaptation of rockets, which we have, and ramjets, which we have, into guided missiles of extended range is principally a problem of increasing their range with lighter, slower-burning fuels, building an air-frame that will not be destroyed by the burning of the fuel, and giving them guidance.

It is logical to assume that the Navy needs a guided missile of medium range (taking the popular figure of 5,000 miles as long range) for sea bombardment of coastal and inland industrial targets within an aggressor nation. With the U. S. Navy controlling the seas, vessels such as the *Kentucky, Hawaii,* or guided missile submarines could reduce the aggressor's warmaking potential in much the fashion that industrial targets in Japan were reduced by highly accurate shore bombardment. Accuracy and considerable range, of course, are essentials of a guided missile capable of removing the capacity to wage war. Fast firing short-range weapons would be required for sea warfare.

How soon and how well the problems of lightweight fuels, temperature resistant metals and other factors of long-range propulsion are to be solved are questions of the hour.

Whether we use sound, heat, light or some other phenomenon as a homing agent is, today, imponderable to any except those at work on them. Whether we solve the problem of electronic beam refraction in the ionosphere is only a question.

The challenge, however, does not dismay those of Inyokern, for it was by just such efforts that the Naval Ordnance Test Station, the city within itself, earned the title: "Rocket Town, the Miracle City."

# Changes of Addresses of Subscribers

**The following changes of address have been made since publication of the Address Listing in the September-October issue:**

LIEUTENANT GENERAL

Lutes, LeRoy, Office of the Commanding General, 4th Army, Ft. Sam Houston, Tex.

BRIGADIER GENERALS

Badger, George M., FSFC, Rm. 330, Martin Bldg., Columbus, Ga.
Clark, Frank S., 2109 Kecoughton Road, Hampton, Va.
Hayden, Frederic L., Qtrs. 151, Ft. Lewis, Wash.
Mitchell, James B. (Ret), Hobe Sound, Fla.

COLONELS

Biehl, Phillip F., PO Box 531, Savannah, Ga.
Boyd, Harry R., 22d AAA Group, Ft. Custer, Mich.
Brown, James D., Personnel Ctr., Ft. Dix, N. J.
Chamberlain, Lyn C., 829 Verona Court-Mission Beach, San Diego, Calif.
Crawford, Howard F., Jr., 122 Fairview Rd., Delaware Co., Springfield, Pa.
Ellis, Henry J., Statesboro, Ga.
Forman, Ovid T., 1st GM Regt., Ft. Bliss, Tex.
Gough, A. Deane, 4418 Q St., N.W., Washington 7, D. C.
Hearn, George J., Box 206, Monroe, Ga.
Hickey, Daniel W., Jr., 1201½ N. Evergreen St., Arlington, Va.
Holcomb, Carl W., 1443 18th Ave., San Francisco 22, Calif.
Irvine, Michael M., Ft. Bliss, Tex.
Kane, Francis B., Bx. 153, AA & GM Br., TAS, Ft. Bliss, Tex.
McEniry, Charles T., P & C Office, Ryukyus Comd., APO 331, c/o PM, San Francisco, Calif.
McFadden, William C., Hq., 68th AAA Group, Ft. Ord, Calif.
McLean, Donald, Hq., South Post, Ft. Myer, Va.
Musselman, Arthur C., 91 Cornwell Ave., Valley Stream, L. I., N. Y.
Perry, Willis A., US Army, Alaska, APO 942, c/o PM, Seattle, Wash.
Seward, John R., G-2 Div., USARPAC, APO 958, c/o PM, San Francisco, Calif.
Shaw, Lawrence E., OAA-Venezuela, c/o Intel. Div., GSUSA, Msg. Ctr. Br., Pentagon, Washington 25, D. C.
Shelton, Cyrus Q., G-1 Sect., AA & GM Ctr., Ft. Bliss, Tex.
Shumate, Joseph P., 2400 E. 9th St., Topeka, Kan.
Sullivan, Andrew P., Oregon City, Ore.
Timberlake, E. W., PMS&T, Utah State Agricultural College, Logan, Utah.
Toenes, Henry K., Rt. 6, Box 380, Mobile, Ala.
Wallace, Everett C., 145 Culver Rd., Rochester 7, N. Y.

LIEUTENANT COLONELS

Adams, Gilbert N., Hq., 79th AAA Gun Bn., APO 713, Unit 1, c/o PM, San Francisco, Calif.
Ashworth, Edward T., Hq., 69th AAA Gun Bn., Ft. Bliss, Tex.
Atwood, G. Lloyd, Army Language School, Presidio of Monterey, Calif.
Baldry, George A., 530-3 Kearney Ave., Ft. Leavenworth, Kan.
Ballentine, John F., 75th AAA Gun Bn., Ft. Geo. G. Meade, Md.
Bradley, Francis X., 088 Highview Ave., Orangeburg, N. Y.
Brown, Raymond L., 37 Hilton St., Noroton Hgts., Darien, Conn.
Brownson, Harold N., Hq., EUCOM, Ordnance Div., APO 403, c/o PM, New York, N. Y.
Dougan, Murray D., 5169 11th St., South, Arlington, Va.
Durschnitt, Samuel, Hq., US Army Forces, ORC-Antilles, APO 851, c/o PM, New York, N. Y.
Farnham, George W., 31-8 Elk Court, Hempstead, L. I., N. Y.
Farren, James H., 1775 Ridge Rd., North Haven, Conn.
Fuller, Arthur L., Jr., National War College, Washington 25, D. C.
Gard, Harold P., 125 Murray Ave., Fort Totten, L. I., N. Y.
Gilbert, Charles M., 48 Amherst Rd., Stoughton, Mass.
Green, John W., c/o Geophysics Service, Inc., 6000 Lemmon Ave., Dallas 9, Tex.
Heaney, E. J., 36 Davis Ave., Valhalla, N. Y.
Hubbard, William H., Qtrs. 112-A6, Governors Island, New York 4, N. Y.
Hutchinson, George W., Seacoast Br., TAS, Ft. Winfield Scott, Calif.
Jefferson, D. K., 190 Hillside Ave., Mt. Vernon, N. Y.
Lewis, Berkeley R., US Mil. Mission, c/o American Embassy, Caracas, Venezuela.
Lewis, Donald L., 441 Dogwood St., Park Forest, Chicago Heights, Ill.
Mannes, Conrad O., Jr., Hq., 865th AAA AW Bn., APO 503, c/o PM, San Francisco, Calif.
Martin, Robert J., G-3 Sect., Hq., First Army, Governors Island, New York 4, N. Y.
Maynard, Hiram H., 925 N. Orlando Ave., Winter Park, Fla.
Miller, Gay E., OCAFF, Trng. Sect., Ft. Monroe, Va.
O'Connor, Daniel A., 3201 Tularoosa St., El Paso, Tex.
Ogden, Milton L., Mil. Security Bd., APO 742, c/o PM, New York, N. Y.
Orman, Leonard M., 45-3 Revere Rd., Drexel Hill, Pa.
Parker, James C., Hq., 96th AAA Gun Bn., Ft. Bliss, Tex.
Peterson, Iver A., 1201½ N. Evergreen St., Arlington, Va.
Pierre, George H., Student Det., Ft. Leavenworth, Kan.
Pindell, John H., 2813 E. 75th St., Seattle 5, Wash.
Priest, Perry B., G-1 Sect., Hq., 8th Army, APO 343, c/o PM, San Francisco, Calif.
Ratcliffe, L. C., Hq., Continental Air Command, Mitchell AFB, N. Y.
Robbins, H. M., Hq., 519th AAA Gun Bn., Ft. Lewis, Wash.
Schmick, Peter, 31st AAA Brigade, Ft. Lewis, Wash.
Schouman, Hazen C., Hq., Ft. MacArthur, San Pedro, Calif.
Schweidel, Kermit R., AA & GM Br., Ft. Bliss, Tex.
Stevens, R. A., Jr., 209th AAA Group, 1015 W. Delavan Ave., Buffalo 9, N. Y.
Townsend, Harry F., 3820 Mesa Verde Dr., Albuquerque, N. M.
Turner, Robert A., Ft. Bliss, Tex.
Wallace, William A., 1745 Pine St., Paso Robles, Calif.
White, Hartley G., 111 Birr St., Rochester 13, N. Y.
Wilson, Donald B., Hq., Caribbean Command, Quarry Hts., C. Z.
Witt, Landon A., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Woodes, R. C., 20 Allen St., Newburyport, Mass.

MAJORS

Ackner, Ned, 209-3 Third St., Ft. Leavenworth, Kan.
Ballagh, Robert S., 138 Coronado Dr., El Paso, Tex.
Bard, Robert T., 6415 Fairfax Rd., Apt. 21, Chevy Chase 15, Md.
Bell, Wilson B., Dept. Biology, Va. Poly. Inst., Blacksburg, Va.
Bennett, W. J., Hq., USARF, Ant., G-1 Sect., APO 851, c/o PM, New York, N. Y.
Bogue, William B., Hq., 60th AAA AW Bn., Ft. Ord, Calif.
Chavis, Thomas N., 4052 ASU, AA & GM Ctr., Ft. Bliss, Tex.
Collins, LaFiece D., Statesboro, Ga.
Counley, Richard T., 1040 Texas Ave., Grand Junction, Colo.
Crook, Sydney L., 64 Frost St., Cambridge 40, Mass.
Denby, Roland E., C & S Dept., TAS, Ft. Knox, Ky.
Eckstein, Paul A., 373 N. Granada St., Arlington, Va.
Fleck, Levan R., Apt. 2-D, Bldg. E, The Hetherlands Apts., White Plains, N. Y.
Francis, Joseph H., 63 Cliff Lane, Levittown, L. I., N. Y.
Furr, Carl J., Director, Academic Trng., Army Language School, Presidio of Monterey, Calif.
Garwood, Edgar F., American Consul General, Berlin, APO 742, c/o PM, New York, N. Y.
Hartung, Edward W., Jr., 43 Thackeray Court, Tonawanda, N. Y.
Hatch, Chester E., Jr., 110 McPherson Lane, Greenville, S. C.
Healy, Patrick J., Hq., 22d AAA Group, Ft. Custer, Mich.
Holdsworth, Edward H., 10th AAA Group, Ft. Lewis, Wash.
Hovell, Bergen B., 512 Vista Dr., Falls Church, Va.
Johnson, George M., 157 S. Oliver St., Elberton, Ga.
Jones, Harold C., 61 Westwood St., Mobile 18, Ala.
Kenz, John, Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Laing, James A., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Lambert, W. H., 1826 17th Ave., San Francisco 14, Calif.
Lanpher, R. A., Hq., 865th AAA AW Bn., APO 503, c/o PM, San Francisco, Calif.
Lash, Eugene L., Hq., 40th AAA Brigade, APO 503, c/o PM, San Francisco, Calif.
Lavin, Thomas F., Peekskill Mil. Acad., Peekskill, N. Y.
Lesperance, Lawrence J., 3429 Van Buren St., El Paso, Tex.
Lueth, Paul F., Jr., c/o Union Oil Co. of Calif., Oleum, Calif.
Maisel, Alex, 4845 Louise, San Diego 5, Calif.
Marshsteiner, N. F., 5716 Eastwood Ave., Chicago, Ill.
Mathes, Edward S., 40th AAA Brigade, APO 503, c/o PM, San Francisco, Calif.
May, Joseph B., 22d AAA Group, Ft. Custer, Mich.
Nagel, James R., c/o 112th AAA Brigade, 1800 Mission St., San Francisco, Calif.
Neill, William H., Hq., 56th Fighter Wing, Selfridge AFB, Mich.
Oakes, Ray E., 37 Donald Pl., E. Rockaway, N. Y.
Oberst, Leopold P., 1649 Edison Ave., Bronx 61, N. Y.
O'Brien, John A., Weapons Dept., TAS, Ft. Knox, Ky.
Pafford, Parnell M., ROTC Unit, Fordham Univ., New York, N. Y.
Pappas, Christopher L., Student Det., Transportation School, Ft. Eustis, Va.
Parrott, John B., Hq., 67th AAA Gun Bn., Ft. Bliss, Tex.
Reagan, John F., Hq. & Hq. Btry., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Rice, Herbert E., Ft. Hancock, N. J.
Rimes, William P., Statesboro, Ga.
Rolph, Herbert F., 307-3 3d St., Ft. Leavenworth, Kan.
Rousseau, Walter, Hq. & Hq. Btry., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Saberhagen, Harold A., 979 Schofield Circle, Ft. Riley, Kan.

Sanders, Albert J., 189-02 64th Ave., Apt. 7-G, Flushing, N. Y.
Sherrets, Donald C., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Simpson, Allen H., 18 Chestnut St., Lakeport, N. H.
Smith, Henry G., 199 Brandon Court, Danville, Va.
Stiles, M. R., 1706 N. 2d St., Sheboygan, Wisc.
Treu, William L., 617 Woodside Pl., Webster Groves 19, Mo.
Trussell, John B. B., Jr., Apt. 8, 418 The Esplanade, Hackensack, N. J.
Twomey, L. A., Qtrs. 90-A, Presidio of Monterey, Calif.
Wood, Oliver E., c/o Mil. Dept., ROTC, Syracuse Univ., Syracuse, N. Y.

CAPTAINS

Adcox, George E., 3263d ASU, CAC-ROTC, Florida A&M College, Tallahassee, Fla.
Alacam, Fethi, AA & GM Br., TAS, Ft. Bliss, Tex.
Babb, Leo D., Hq., 88th Abn. AA Bn., 11th Abn. Div., Camp Campbell, Ky.
Baker, Robert W., Btry. C, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Barbee, Ray C., 4th AAA AW Bn. (M), Ft. Bliss, Tex.
Barlow, W. C., Box 355, AA & GM Br., TAS, Ft. Bliss, Tex.
Barnwell, Charles B., York, S. C.
Beaumont, John, 53 Francis Ave., Harrison, N. Y.
Bellion, Henry E., 220 Vernon Ave., Yonkers, N. Y.
Benner, James D., Hq., 69th AAA Gun Bn (M), Ft. Bliss, Tex.
Bigger, Walter K., Hq., Pacific Sector, Ft. Clayton, C. Z.
Birnley, Francis W., ETA JIMA School-CMD, Eta Jima, APO 354, c/o PM, San Francisco, Calif.
Bland, Raymond A., Univ. of South Carolina, Columbia, S. C.
Bond, John B., AFF Board No. 4, Ft. Bliss, Tex.
Boyle, John R., 23831 Lloyd Court, Detroit, Mich.
Brokaw, Newton A., RR, No. 10, Box 359-N, Cincinnati 27, Ohio.
Brown, Cameron, Spring Valley Road, Ossining, N. Y.
Browne, Eppes W., Jr., 8504 Irvington Ave., Bethesda, Md.
Buchler, Edward, 5031 N. Nashville, Chicago 31, Ill.
Burger, Lawrence J., 1225th ASU, Ft. Hancock, N. J.
Canfield, Raymond G., 3799 Main St., Stratford, Conn.
Cannon, Joel E. (Chaplain), 314 W. Palmetto St., Florence, S. C.
Childress, Herbert J., Jr., 8611 North Loop Road, El Paso, Tex.
Clark, Robert W., Hq. Btry., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Czarnecki, S. S., 10 Skillman Ave., Jersey City, N. J.
David, Robert E., Box 427, Camden, S. C.
DeFranco, Theodore J., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Durham, John D., 2 Roselle Ave., Pleasantville, N. Y.
Eggert, Frederick W., Jr., 718 E. 236th St., New York 66, N. Y.
Erikson, Edwin E., 170 Avenue A, Shanks Village, Orangeburg, N. Y.
Erwin, Roy C., Btry. B, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Fedosi, Alec L., Hq. Btry., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Fitzgerald, Edward J., 801 West End Ave., New York 25, N. Y.
Fox, Gabriel, 1122 ASU, Boston Army Base, Boston, Mass.
Franklin, George W., Btry. B, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Gaines, George A., 225 Heard St., Elberton, Ga.
Garambone, Peter, 261 Jessamine Ave., Yonkers, N. Y.
Gernon, Richard W., Hq. Btry., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Gleason, Benedict F., 80 Argyle Rd., Albertson, L. I., N. Y.
Grant, J. W., 121 N. Clark Rd., El Paso, Tex.
Griffith, Warren C., 218 Bentwood Ave., Johnstown, Pa.
Guertin, Sabin W. (197th AAA Group), Canterbury, N. H.
Hess, Frank S., 411 E. 53d St., New York 22, N. Y.
Hofstatter, Frank W., 2211 Garfias Drive, Pasadena 9, Calif.
Hopkins, John R., 145 Glenridge Rd., East, Stratford, Conn.
Hufstetler, John R., Btry. D, 504th AAA Gun Bn., Ft. Bliss, Tex.
Hultgren, Robert A., 117 W. 57th St., New York 19, N. Y.
Hutchinson, J. A., Jr., Waynesboro, Ga.
Isham, Orville A., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Jensen, Orvie A., 400 E. 2d Ave., Jerome, Idaho.
John, Ralph C., 3500 Nebraska Ave., N.W., Washington 16, D. C.
Johnson, Richard C., 222 E. Delaware Place, Chicago 11, Ill.
Jones, Lee G., 3662 Morenci St., El Paso, Tex.
Jordan, Hugh E., 405 N. 16th Ave., Pensacola, Fla.
Kenan, James S., Statesboro, Ga.
Kenney, A. W. George, 103 Guion Pl., Apt. 2, New Rochelle, N. Y.
Kimball, Freddie M., 1937 Village Dr., Springfield, Mo.
Klon, Francis P., 3406 S. 22d St., Milwaukee 15, Wisc.
Knapp, Vincent E., 624 E. 20th St., New York 9, N. Y.
Knarr, Frank E., Clyde Rd., Box 503, Bryn Mawr, Pa.
Kohlhagen, W. S., PO Box 550, Ft. Bliss, Tex.
Koon, Johnnie C., Box 1731, Greenville, S. C.
Krangel, Albert, 3216 Kossuth Ave., Bronx 67, N. Y.
Lanelli, Lester P., 6707 ASU, Senior ORC Instr., Seattle, Wash.
Laukaitis, Adam B., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Leadbetter, Horace G., 72 Maple St., Dobbs Ferry, N. Y.
Lehne, Christian A., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Leslie, Elwyn E., Jr., Wynerlie, Bristol, N. H.
McCartney, Dan A., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
McKinney, James C., 1273d ASU, NG Armory, Jersey City 6, N. J.
Maldonado, Alberto, Escuela de Artilleria, Pueblo Libre, Lima, Peru.
Malloy, Wesley J., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Matthews, John H., Jr., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Meyer, George C., Jr., 810 Cliff St., El Paso, Tex.
Mielke, John W., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Miner, James C. (209th AAA Gp.), 68 Ashland Ave., Buffalo 13, N. Y.
Moore, Alva J., Btry. A, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Morris, Abraham, 30 S. Broadway, Yonkers, N. Y.
Mulrain, Mandas S., 31 Carmen St., Patchogue, N. Y.
Murello, Chas. E., 60th AAA AW Bn. (SP), Ft. Ord, Calif.
Nemeth, Stephen A., 98th AAA Gun Bn., APO 846, c/o PM, New York, N. Y.
Newman, James W., Btry. C, 67th AAA Gun Bn., Ft. Bliss, Tex.
Oppenheim, David S., 307 E. 44th St., New York 17, N. Y.
Patterson, Fred, 5165 Commonworth St., Detroit, Mich.
Plant, Ottis M., 2113 Ferris, Lawton, Okla.
Price, I. Lee, Jr., Swainsboro, Ga.
Proctor, Frank T., Statesboro, Ga.
Proctor, William M., 11th AAA AW Bn. (SP), Ft. Lewis, Wash.
Purvis, Chas. R., 2014 Somerset St., Green Meadows, Md.
Raigoza, Juan, Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Riggs, Leland, Statesboro, Ga.
Ringen, Harry S. C., 15 Laurel Pl., Glen Ridge, N. J.
Rose, Kirk M., 7550 18th Ave., N.W., Seattle, Wash.
Ryon, John C., Hinesville, Ga.
Sense, George A., AFF Board No. 4, Ft. Bliss, Tex.
Shockley, James W., Hq., 22d AAA Group, Ft. Custer, Mich.
Simon, Lincoln E., 84 S. 14th St., Apt. 2, Richmond, Ind.
Skipper, John D., AAOC No. 1, AA & GM Br., TAS, Ft. Bliss, Tex.
Smith, Walter M., Hq., 80th Abn. AA Bn., Ft. Bragg, N. C.
Staley, Francis S., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Stauffer, Chas. J., 4773 E. Southern Ave., Albuquerque, N. M.
Steinmann, Wm., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Stutts, John R., Btry. D, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Sullivan, Daniel L., Jr., 2302 ASU Schuylkill Arsenal, 2620 Greys Ferry Ave., Philadelphia 46, Pa.
Sullivan, Timothy F., 2232 Davidson Ave., Bronx 53, N. Y.
Thomas, Earle F., 287 Avenue C, New York 9, N. Y.
Treacy, James J., Jr., 1461 Commonwealth Ave., Bronx 60, N. Y.
Underwood, John D., Statesboro, Ga.
Van Schelven, William J. (260th Gp., D. C. NG), PO Box 128, Greenbelt, Md.
Weiss, Horton C., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Williams, Billie C., Hq., 70th AAA Group, APO 713, c/o PM, San Francisco, Calif.
Wilson, Glenn H., Hq., 22d AAA Group, Ft. Custer, Mich.
Witty, Stuart E., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Young, James W., Qtrs. 1065-C, Ft. Bliss, Tex.

FIRST LIEUTENANTS

Arant, Philip W., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Armstrong, Thomas R., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Bailey, Ewell B., Statesboro, Ga.
Baker, Glen, Armed Forces Spec. Wpns. Project, PO Box 2610, Washington, D. C.
Barrett, Harold H., 25 Vredenburg Ave., Yonkers 4, N. Y.
Barron, John I., York, S. C.
Baumgartner, Ira P., Hq. Btry., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Beckage, Paul, Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Bednarz, Jos. P., Btry. D, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Branch, Jesse J., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Broida, Donald, Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Calkin, Geo. R., 208 Pasadale Road, El Paso, Tex.
Capo, Chas. E., 32-45 47th St., Long Island City 3, N. Y.
Cavin, Jos., Jr., Hq Btry., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Chandler, Archie L., Box 1731, Greenville, S. C.
Chapman, James R., Btry. D, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Cholewinski, John S., 3-10 Astoria Blvd., Long Island City 2, N. Y.
Collier, James G., Box 1731, Greenville, S. C.
Covington, Chas., AA & GM Br., TAS, Ft. Bliss, Tex.
Culbreth, Douglas F., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Curran, Horace E., Hq. Btry., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Darsey, James R., Hinesville, Ga.
Diehl, Wm. A., 146 Vernon Ave., Yonkers 4, N. Y.
Doyle, Chas. J., 119 N. Terrace Ave., Mt. Vernon, N. Y.
Dynia, John, Btry. B, 502d AAA Gun Bn., Ft. Ord, Calif.

Edgington, Donald W., Btry. A, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Eichling, Robt. E., Hq. Btry., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Emery, James I., Co. A, 36th Armd. Inf. Bn., 3d Armd. Div., Ft. Knox, Ky.
Fahey, Russell E., PO Box 74, Notre Dame, Ind.
Furman, H. W. C., Btry. A, 88th Abn. AA Bn., Camp Campbell, Ky.
Gaines, James S., Btry. C, 60th AAA AW Bn. (M), Ft. Ord, Calif.
Garrett, Edward J., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Garvey, Geo. F., 96th AAA Gun Bn., Ft. Bliss, Tex.
Godfrey, Hampton J., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Goodwin, Andrew L., Btry. A, 60th AAA AW Bn. (SP), Ft. Ord, Calif.
Greenhalgh, Earl C., 246 Awbrey Rd., El Paso, Tex.
Greenia, Lawrence J., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Griffith, Henry, Btry. A, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Hamer, Jos. E., Btry. A, 95th AAA (90mm) Gun Bn., Ft. Bliss, Tex.
Hannon, L. K., Hq. & Hq. Btry., 450th AAA AW Bn., Ft. Ord, Calif.
Harry, Jas. F., Btry. A, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Hemenway, Robt. W., 79th AAA Gun Bn., Ft. Custer, Mich.
Hitchcock, Jas. M., Btry. C, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Hodges, Marion B., Jr., Statesboro, Ga.
Hubble, Philip C., 500th AAA Opns. Det., Ft. Ord, Calif.
Jones, Thos. H., Btry. C, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Junkin, Robt. A., Box 1731, Greenville, S. C.
Kaminski, Michael, Btry. B, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Keith, Jos. B., Jr., Statesboro, Ga.
Klenik, Ralph L., Box 853, AA & GM Br., TAS, Ft. Bliss, Tex.
Lawton, John G., York, S. C.
Lewis, John D., Btry. A, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
McFarland, Robt. R., Qtrs. 1066-A, Ft. Bliss, Tex.
Magrueder, Virgil E., AA & GM Br., TAS, Ft. Bliss, Tex.
Major, Wm., 1511 Highland, Camden, S. C.
Marcyes, Paul F., 4054 ASU, Stu. Det., AA & GM Br., TAS, Ft. Bliss, Tex.
Martell, Dayle L., Hq. & Hq. Btry., 79th AAA Gun Bn., Ft. Custer, Mich.
Martin, Chas. W., Btry. B, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Martin, Clifton C., Btry. B, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Marzari, Guy J., Btry. A, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Metzler, Edw. C., Jr., Box 842, Trona, Calif.
Michaux, Chas. L., Jr., 212 Woodlawn Ave., Buffalo, N. Y.
Mooers, Samuel R., Btry. A, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Murray, Chas. M., Btry. C, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
O'Connor, Thos., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
O'Donnell, Neil J., 1st Bn., 1st GM Regt., WSPG, Las Cruces, N. M.
O'Sullivan, Denis P., 33-26 85th St., Jackson Hts., N. Y.
Oztorun, Necdet, AA & GM Br., TAS, Ft. Bliss, Tex.
Porter, Geo. J., 130 S. Grand Ave., Marion, Ohio.
Propst, Clifford H., Hq., 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Purvis, James H., Btry. C, 32d AAA AW Bn., Ft. Bliss, Tex.
Rebisz, Casimir, 710 S. James St., Rome, N. Y.
Rehm, Walter R., Btry. C, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Reitz, Leonard A., 1430 S. Cheyenne, Tulsa, Okla.
Respess, Robt. B., 109 17th St., NE, Atlanta, Ga.
Ryan, Daniel P., Btry. B, 60th AAA AW Bn., Ft. Ord, Calif.
Sackheim, S. P., 126 MacDougal St., New York 12, N. Y.
Sansom, Jas. F., Btry. B, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Scarborough, Samuel T., 6437 Louisville St., New Orleans, La.
Schmutz, John W., 4725 Ledge Ave., No. Hollywood, Calif.
Senyuva, Hakki, AA & GM Br., TAS, Ft. Bliss, Tex.
Shelhorse, Geo. L., Qtrs. 550-C, Ft. Bliss, Tex.
Sheppard, Byron E., A-T-D, TAS, Ft. Sill, Okla.
Sherblom, Harry G., Btry. D, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Small, Alvin L., Btry. B, 518th AAA Gun Bn., Ft. Bliss, Tex.
Smith, Donald E., 68th AAA Gun Bn., Ft. Bliss, Tex.
Snider, Raymond, Btry. D, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Somers, Lee W., Hq., 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Spielman, Gordon L., Triumph, Minn.
Storm, Robt. W., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Suttmann, O. T., 2900 West 2d St., Dayton 7, Ohio.
Sweers, P. C., Jr., 503d Opns. Det., Ft. Meade, Md.
Talbot, Max V., AFF Bd. No. 4, Ft. Bliss, Tex.
Tuscany, Franklin, Btry. D, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Unger, Wm. H., 52 Maple Ave., Pelham 65, N. Y.
Van't Veld, Hendrik J., 2909 Q St., NW, Washington, D. C.
Vogt, Brady L., Btry. C, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Williamson, P. E., Hinesville, Ga.
Weaver, Floyd J., Btry. C, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Webb, Lloyd E., Btry. C, 21st AAA AW Bn. (SP), Ft. Bliss, Tex.
Ziemski, Frank J., 3227 Savannah St., El Paso, Tex.

### Second Lieutenants

Bedell, Jas. F., Btry. C, 713th AAA Gun Bn., NG, Cheraw, S. C.
Boykin, Chas. W., Hq., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Brewton, Lonnie R., Btry. A, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Chalmers, Carl M., Box 1731, Greenville, S. C.
Crawford, Ralph E., Btry. A, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Crolley, Edward, Rt. 2, Camden, S. C.
Darr, John H., PO Box 31, Ashton, Md.
Dearman, Harry G., Sr., Box 1731, Greenville, S. C.
Deeley, Wm. R., Btry. C, 59th AAA AW Bn. (SP), Ft. Bliss, Tex.
Edenfield, Jas. O., Swainsboro, Ga.
Epstein, Abraham, 4023 Clifton St., El Paso, Tex.
Grimes, John R., Btry. A, 26th AAA AW Bn. (SP), APO 24, Unit 4, c/o PM, San Francisco, Calif.
Grubbs, Robert J., Westminster, S. C.
Irwin, John G. (Btry. D, 308th AAA AW Bn.), 1852 Columbia Rd., NW, Washington 9, D. C.
Jones, John W., Jr., York, S. C.
Jordan, Elbert C., Box 65, Rt. 2, Cowards, S. C.
McMahon, Jos. C., Btry. B, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Malek, Edw. R., Btry. A, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Pleitner, Daniel H., 4210 74th Pl., Bellemeade, Md.
Skerkowski, Frederick P., Btry. C, 69th AAA Gun Bn. (M), Ft. Bliss, Tex.
Stone, Paul S., Waynesboro, Ga.
Timms, Clyde P., 303 Green St., Belton, S. C.
Toms, Galen E., Hq., 19th AAA Group, Ft. Geo. G. Meade, Md.
Wright, Edw. P., Seneca, S. C.

### Warrant Officers

Ellis, H. Kirby, Chesterfield Ave., Lancaster, S. C.
Parks, Henry C., Hq., 79th AAA Gun Bn. (120mm), Ft. Custer, Mich.
Winters, Robt. E., Hq. Btry., 59th AAA AW Bn. (SP), Ft. Bliss, Tex.

### Enlisted Men

Albert, Jos. (Pvt.), Btry. B, 39th AAA AW Bn., Ft. Bliss, Tex.
Dowlby, Alfred E. (Sgt.), Btry. A, 504th AAA Gun Bn., Ft. Bliss, Tex.
Brandt, James R. (Rct.), 349 S. 15th St., Harrisburg, Pa.
Chilson, Geo. H. (M.Sgt.), Hq. Btry., 138th AAA Gp., APO 713, Unit 1, c/o PM, San Francisco, Calif.
Cunningham, John A. (M.Sgt.), 5202 ASU, c/o Army Instr. Ofc., Bdwy. Armory, 5917 N. Broadway Ave., Chicago 40, Ill.
Currivean, Glenn L., Btry. A, 26th AAA AW Bn., APO 24, Unit 4, c/o PM, San Francisco, Calif.
Dineley, Richard L. (M.Sgt.), 2237 Ward St., Berkeley 5, Calif.
Duley, John M. (Cpl.), 12 Morga St., TayTay, Rizal, P. I.
Gallagher, Lavergne A. (M.Sgt.), Hq. Det., 4050 ASU, TAC, Ft. Sill, Okla.
Gonyo, W. C. (M.Sgt.), 4054 ASU, Hq. Btry., AA & GM Br., TAS, Ft. Bliss, Tex.
Graham, Jas. E. (Cpl.) 16432 Plymouth Rd., Detroit, Mich.
Hurd, Vincent A. (Pfc.), 2900 8th Ave., New York 30, N. Y.
Lee, Paul A. (M.Sgt.), Qtrs. 513-B, Hamilton AFB, Hamilton, Calif.
LeFebvre, Granville J. P. (Sgt.), 150-26 118th Ave., Jamaica 4, N. Y.
Mehl, Irving (Sgt.), C Btry., 443d AAA AW Bn. (SP), Ft. Bliss, Tex.
Navarro, John F. (M.Sgt.), 28 Arqueros St., Int. 8, Pilar, Tono, Manila, P. I.
Ringrose, Dean B. (Cpl.), 52 Morton St., Waltham 54, Mass.
Shutt, Phillip (Sgt.), Hq. Btry., 41st AAA Gun Bn., Ft. Bliss, Tex.
Vestola, Vincent M. (Sgt.), 714 Brdwy., New York 3, N. Y.
White, Albert H. (Cpl.), 289 W. 147th St., New York 30, N. Y.
White, Samuel E. (Cpl.), 289 W. 147th St., New York 30, N. Y.
Wong, A. J. (M.Sgt.), 4275 26th St., San Francisco 14, Calif.

### Civilian and Military Personnel—Rank Unknown

Cooper, W. E., Cadet Advisor, ROTC, The Citadel, PO Box 979, Charleston, S. C.
Cox, Chas. Davis, 4052d ASU, AA & GM Ctr., Ft. Bliss, Tex.
Dimmer, John P., Hotel Robert Fulton, 228 W. 71st St., New York 23, N. Y.
Genske, Jos. C., 8903 Linton St., Silver Spring, Md.
Hesse, Joseph P., Jr., GHQ, TID, GHQ, FEC, APO 500, c/o PM, San Francisco, Calif.
Hunter, Kent A., Hearst Newspapers, Rm. 607, Times Herald Bldg., Washington, D. C.
Pocock, J. W., 135 S. LaSalle St., Rm. 1600, Chicago 3, Ill.
Somkopulos, George, 234 W. 22d St., New York 11, N. Y.
Thomas, Wm. S., 4337 Alan Dr., Apt. B, Baltimore 29, Md.
Tschappat, W. H., Rt. 8, Box 841-D, Charleston, S. C.
Willis, Harry W., 20 Western Ave., Butler, N. J
Yackey, Harold H., Jr., 2425 Prospect St., Berkeley 4, Calif.

# News and Comment

## Retirement Features of New Pay Act

The Career Compensation Act—now law—has increased the financial intake of armed services personnel and "upped" the number of queries from Reserve Officers desiring additional information concerning the new law. Here are some highlighting features digested accordingly: Any disability incurred in line of duty during active service in time of war or national emergency is to be considered "the proximate result of the performance of active duty." Thus, until the present war is declared officially over, as well as in any future emergency, an officer or enlisted person, Regular or Reserve, will not be barred from retirement pay during the first eight years of service if his disabilities are not the proximate result of the performance of active duty—that is, in some way rising out of his job.

Instead, the present "line of duty" concept is retained for persons with less than eight years just as the bill previously had kept it for those with more than eight years' service. . . . Reservists retired or hereafter retired for disability are afforded all the "rights, benefits and privileges provided by law" or regulation for retired members of the Regular service. Under this the 30,000-plus retired Reserve Officers and all Reserve officers and men who are retired in the future will have access to military hospitals, commissaries and exchanges. . . .

Disability changes: An entirely new physical disability retirement system is established. The services will determine who is or is not physically qualified to continue duty, but if the person is processed for retirement and the disability is less than 30 per cent on the VA rating scale, severance pay instead of retirement will be given.

If disability is 30 per cent or more, it still must not have occurred through intentional misconduct or wilful neglect or during unauthorized absence. When severance pay is given because of disability less than 30 per cent or in peace for those of less than eight years' service it will consist of two months' active duty pay for each year of service to a maximum of two years' pay.

Those retired for disability because disability was 30 per cent or more and—if service was less than eight years—resulted from performance of duty will have the option of: 1. The same percentage of active pay as his percentage of disability that is, from 30 to 75 per cent of active pay, tax free. 2. Two and a half per cent of active pay for each year or major fraction of year of service, up to 75 per cent of that part which is in excess of what would be received on the percentage of disability option being taxable.

For the first five years after retirement, unless medical principles indicate the disability is permanent, the retirement will be temporary, and the person will be reexamined at least once each 18 months.

During those five years, or whatever the temporary retirement period is, in recognition of the adjustments needed and

## BALLOT

### UNITED STATES COAST ARTILLERY ASSOCIATION INSTRUCTIONS AND INFORMATION

**The Vice President and four members of the Executive Council are to be elected on this ballot, to replace officers whose terms of office expire December 31, 1949. Please show your interest in the Association by voting.**

**Please record your vote by making an "X" in the appropriate square or indicate your choice by writing in the name of your candidate. Ballots received with signatures, but with no individual votes recorded, will be considered proxies for the President of the Association.**

**Each candidate was considered in connection with the geographic location of his residence. The Constitution of the Association requires that at least five members of the Council reside in the Washington area, and that at least three of them be on active duty, in order to facilitate the transaction of business.**

**Ballots received after December 31, 1949, cannot be counted.**

**Ballots may be collected by Post, Battalion, or other unit commanders and forwarded under one cover.**

**Locally prepared ballots, cast by those who do not wish to mutilate their Journals, will be accepted if they are signed.**

### FOR VICE PRESIDENT

☐ Major General Lyman L. Lemnitzer
Assistant to the Secretary for Foreign Military Assistance, Office of the Secretary of Defense, Washington, D. C.

☐ ____________________

### FOR MEMBERS OF THE EXECUTIVE COUNCIL (Vote for four).

☐ Brigadier General Stanley R. Mickelsen
Chief, Guided Missiles Group P & O Division, GS, USA, Washington, D. C.

☐ Director of Training, AAA & GM Center,*
Fort Bliss, Texas.

☐ Lt. Colonel Pat M. Stevens, III
Research & Development Group, Logistics Division, GS, USA, Washington, D. C.

☐ Major Edward T. Peeples
Special Assistant to the Comptroller, Department of the Army, Washington, D. C.

☐ ____________________

☐ ____________________

☐ ____________________

☐ ____________________

____________________
(Signature)

____________________
(Rank and Organization)

____________________
(Address)

____________________

*Presently Col. John H. Madison.

the job hazard in the possible recall to duty, at least half of active duty pay will be paid.—*Armed Forces Chemical News.*

✓ ✓ ✓

## Civilian Components Retirement Benefits

Few veterans of World War II, men and women, know of the retirement pay benefits to which they are entitled as a result of their wartime service. Because only a very few are "in the know," hundreds are daily losing all their rights in this retirement plan.

Security after 60 years of age is becoming of increased importance in the eyes of almost every American, as witness pension-seeking movements, annuity-paying life insurance, and investments for old-age independence.

Veterans have already earned by their war service valuable retirement credits. Each day many of them are losing those credits. A veteran with only four years' service is losing as many credits as a nonveteran might earn in twenty years of reserve component service.

Title III, Public Law 810—80th Congress, enacted 29 June 48 (JAAF Bulletin 29, 1949), provides retirement with pay for officers and enlisted personnel of the reserve components of the armed services. The provisions of Public Law 810 give veterans the finest foundation for security yet conceived. Some of those veterans who have heard about this law, have not had its details brought to their attention with sufficient clarity and emphasis. Their war service entitles them to, and their future security warrants, a complete understanding.

When added to civilian employment pension, social security, and annuity insurance, the veterans who take advantage of the retirement benefits Congress has provided, can, upon retirement, receive monthly payments which may be the difference between too little and enough.

The retirement payments provided by Public Law 810 may, in fact, be the only retirement pay they will have! Many do not qualify under Social Security; relatively few participate in civilian employment pensions; and many find that family emergencies have consumed their hard-saved annuity insurance.

The veterans who may doubt the need of assuring themselves against the possibility that they will have to seek aid in later years, should take notice of the interesting figures released by the Life Insurance Institute.

Of a group of 100 men, at age 25, here is what will happen to that group at age 65: 1 will be healthy, 4 will be independent, 36 will have passed away, 54 will be living off relatives or charity, 5 will be working. Thirty-six men will not have a thing to worry about, they won't be here. It is the 54 men who should be concerned. Are they in a position to put money away today, for an annuity at the age of 60? A veteran might have to save $60,000 or more to give himself an income that would equal his reserve component retirement pay. All a veteran has to do is to take action, get on the rolls, and carry on sufficient activity so that he accumulates retirement credits for a total of twenty "qualified" years, as the minimum.

The veteran availing himself of the provisions of Public Law 810, can, during his reserve service, in addition to his civilian income, and in no way interfering with it, receive payments for this service. These payments can amount to $15,000 to $20,000, while he is also qualifying for retirement.

Existent reserve units provide the veteran with service based on his qualifications, interest, and convenience. Education, promotion and fellowship are more of the many advantages available in reserve units. In addition he will be making his patriotic contribution toward his country's security.

The reserve component personnel (men and women) entitled to these retirement benefits are the members of the reserve of the Army, Navy, Air Force, Marines, Coast Guard, and the members of the National Guard. Veterans of World War II may secure further information by contacting the reserve headquarters of these armed services, many of which are listed under U. S. Government in telephone directories.

✓ ✓ ✓

## Alabama Guard Unit Awarded Trophy

Award of the Eisenhower Trophy to Headquarters and Headquarters Battery, 226th Antiaircraft Artillery Group, Mobile unit of the Alabama National Guard, as the most outstanding company-size unit in the state, has been announced.

The trophy was presented by Maj. Gen. James S. Saliba, adjutant general of Alabama, during a ceremony at the unit's armory. This was the first award of the trophy in Alabama, and local, state and national officials were invited to attend the presentation.

The award was made by state boards on the basis of personnel strength, drill attendance and outstanding performance in armory and summer field training. Unit qualifications in individual and crew-served weapons are taken into consideration. The state board includes the adjutant general, senior tactical Army area commander and senior Army instructor in the state.

The trophy is named for General of the Armies Dwight D. Eisenhower and is awarded annually. A fifteen-inch replica of the trophy becomes the permanent property of the winning unit each year. Notice of the award this year was received by the local unit from Maj. Gen. Kenneth F. Cramer, chief of the National Guard Bureau, Washington.

Headquarters and Headquarters Battery, 226th Antiaircraft Group was organized in Mobile and recognized Jan. 9, 1947. It serves as headquarters for all antiaircraft artillery activities of the Alabama National Guard. Col. John D. Sides is commanding officer of the 226th Group, and Capt. E. P. Killcullen is commanding officer of the battery.

✓ ✓ ✓

## AAA Paratroops Participate in Air Fete

Continuing its tradition of participation in the annual International Aviation Celebration at El Paso, Texas, Fort Bliss this year presented a display of antiaircraft equipment and, in conjunction with Biggs Air Force Base, staged a mass jump of paratroopers.

The jump was made by 16 members of the 88th Airborne Antiaircraft Battalion of Fort Bliss on the final day of the Aviation show, October 23. Two Biggs Field planes carried the paratroopers who were led in their jump by Lt. Hulen D. Stogner and Lt. Wm. Stevens.

The antiaircraft artillery display, held on October 22 and October 23, included two 90-millimeter guns with radar, twin 40-millimeter guns, and quadruple-mounted caliber .50 machine guns. Lt. Col. Landon A. Witt was in charge of the equipment which was supplied by the 59th AAA AW Battalion and the 67th Gun Battalion. Col. Witt is commanding officer of the 59th Battalion.

### Prefab Housing Complete at Bliss

The successful completion of the last house in the Fort Bliss Prefabricated Housing Project, first of its kind to be undertaken in the Army, means another major victory has been won in the Post's "war" against the housing shortage which has been facing military personnel. First four-graders and their families now occupy all of the 211 four-room houses built during the past 12 months.

Initial action toward relieving the housing shortage at Fort Bliss was taken by Maj. Gen. John L. Homer, the Commanding General, in September 1948, when he ordered the establishment of a Housing Board to study and recommend on all phases of housing which would affect military personnel under his command.

In November 1948, after extensive study and consultation with representatives of El Paso business firms and after careful consideration of all problems involved, the Board presented a plan for the construction of 100 prefabricated houses, first to Gen. Homer and then to a large group of enthusiastic Army personnel. The plan was well received and the response was so great that the original plan to construct 100 houses was doubled. Between this date and the completion date of the project, 11 additional houses were bid for and placed in the master construction plan, thereby bringing the total to 211 units.

In December, charter members of the Fort Bliss Housing Association, made up of future owners, called a meeting to formulate a plan for a cooperative organization in which all members would take an active part in the construction of the houses and each member pay an initial deposit of $300.00 to put the plan in effect. The plan proposed was unanimously adopted. It was later approved by the Department of the Army and indorsed to the extent that an additional $500.00 per unit was appropriated for installation of utilities, roads, etc.

To aid the future homeowners in making their $300.00 deposit, the Army Emergency Relief Agency authorized loans up to $250.00 to each member of the Association. The loans have been made on an interest-free basis and are being paid back by an allotment of pay which averages about $10.00 per month. To date, the Army Emergency Relief has loaned approximately $56,500.00 to the individual builders.

Other than contractor labor on installation of utilities the members of the Association have done all the construction work, thereby reducing the cost of the units to a minimum. In the final analysis, the unit cost, less utilities, approximates $1,600.00. This cost includes plumbing, electrical fixtures, space heater, refrigerator, combination kitchen sink, automatic hot water heater, and a modern bathroom in a comfortable, practical, two-bedroom, twenty by thirty-one foot house.

The planting of grass, shrubbery and trees and the laying of walks are adding to the attractiveness of the area and will make it one of the most desirable places on the post.

Membership in the Association will also be a profitable venture. After the bank loans and other liabilities have been liquidated, the proceeds from rents over and above that required for maintenance and fixed expenses will be returned to individual members, past and present in the form of rebates on rent, in accordance with the length of time they occupied the units.

Now that this phase of the "war" against the housing shortage has been brought to a successful conclusion, the words of Gen. Homer are remembered from the opening day ceremonies of the Prefabricated Housing Project, when he said, "With the help of El Pasoans, we here at Fort Bliss have put housing on the barrelhead. Now you see the houses."

### Competitive Tours, RA

Of the 543 officers who took RA competitive tour ending 15 July '49, 422 have been selected. Appointments have been approved and confirmed. Applications of 853 officers are being processed for tour commencing 15 Jan. '50. Applications for tour commencing 15 July '50 are being accepted now.

### 16 Foreign Countries Represented at AAA & GM School

The second contingent of officers from Fort Sill, Okla., to come to Fort Bliss, Texas, this fall for antiaircraft artillery training held the opening class assembly on October 19.

The group is composed of 213 officers including 118 from the Coast Artillery Corps, 66 from Field Artillery, seven from the Marine Corps, and 22 from foreign nations. Foreign officers in the class are from the following 16 countries: Argentina, Britain, Chile, Brazil, Venezuela, Philippines, Cuba, Mexico, Korea, Norway, India, Iran, Turkey, Switzerland, Italy, and France.

Col. J. H. Madison, director of instruction in the Antiaircraft and Guided Missiles Branch of The Artillery School, welcomed the officers who will be there for approximately eight weeks' study. Directors from other departments of the AA & GM Branch were also present for the assembly.

#### Discontinue Composite Groups

Within 30 days after control groups are organized, any existing composite groups will be discontinued, and will not thereafter constitute units to which assignment is authorized.

Members of the Active Reserve, other than those assigned to control groups and inoperable T/D units, will normally be expected to obtain their reserve duty training with the unit to which assigned, but in a few cases, where a good reason is shown, the reservist may be authorized to train with a T/O&E unit, T/D unit or ORC training unit.

Reservists assigned to ORC control groups (Active Reserve) may be authorized temporarily to train with the above type units. Those eligible for and desiring regular participation in unit reserve duty training, however, should be reassigned to an appropriate ORC unit conducting such training in the vicinity of their residence or place of business.

Officers having mobilization assignments to inoperable T/D units will, to the extent practicable, be attached for training and administraton to other ORC units conducting reserve duty training near their residence. Such attachments will not exceed 50 per cent of the authorized officer strength of the unit to which attached.

Officers who cannot participate in training with an ORC unit will be attached for administration only to an ORC control group (Active Reserve) in the area of their residence.

### General Mickelsen and Colonel Samuels Named to Guided Missiles Committee

Brigadier General Stanley R. Mickelsen has been named as Department of the Army representative on the Guided Missiles Committee of the Research and Development Board. General Mickelsen is Chief of the Guided Missiles Group in the Army's Plans and Operations Division.

Colonel Andrew Samuels, Jr. (CAC), has been appointed deputy representative for the Army on the committee.

### New Radar Forecasts Weather

A new radar set designed to give weathermen and pilots advance warning of storm areas as far distant as 200 miles from the site of operations has been developed at the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey. Since the average rate of storm movement is approximately 25-30 miles per hour, it will now be possible to anticipate storms as much as six to eight hours before they arrive.

This new equipment is electronically similar to the successful wartime warning radars which told of the approach of enemy aircraft or ships. However, it utilizes what was considered a characteristic fault in the earlier radars, namely, their tendency to pick up signals from nearby rainstorms, thereby masking indications from possible enemy targets on the far side of such rainstorms. In this new equipment the design has been arranged to accentuate the storm signals and to permit their detection at relatively great distances. The clouds themselves do not necessarily appear to the eye as they look on the radar; but a section of a storm having liquid water always will produce some kind of radar indication.

### Ft. Bliss Research Unit Moves to Huntsville

Transfer of the Army's Research and Development suboffice at Fort Bliss, Tex., to Huntsville, Ala., effective immediately, was announced by the Army.

A saving of approximately $4,500,000 will be made by moving the suboffice to the Huntsville Arsenal and using permanent quarters, which are now available. At Fort Bliss temporary buildings were used to house the suboffice.

The suboffice, where work on rockets has been carried on, employed both civilian and military personnel. Over 100 are German scientists; 180 contractor employees, 120 civilians and 500 military personnel.

All of the military personel and the German scientists are expected to be transferred to Huntsville. In addition, approximately 65 civilians now employed at Fort Bliss will go to Huntsville and an additional 235 civilians will be hired. Those to be employed will, for the most part, fill clerical positions.

### Fix Basis For ORC Assignment Of Active Duty Personnel

The Department of the Army has directed that all ORC members not on extended active duty in their Reserve status be assigned to an appropriate ORC unit, except those who may be assigned for duty with an Air Force Reserve organization.

SR 140-140-10 authorizes the assignment of Active Reserve personnel to any one of the following: T/O&E units, T/D units, training units, ORC control groups. Members of the Inactive or Honorary Reserve and ORC commissioned officers on active duty as warrant officers or enlisted men will be assigned to an appropriate ORC control group. ORC control groups are units established by Army area commanders in each state to facilitate uniform administration of ORC personnel not otherwise assigned.

### Sweden Develops New AAA Gun

The Bofors Company of Sweden has developed a new antiaircraft gun. This weapon is a 120mm (approximately 4.7 inches), high and low angle, quick-firing weapon. It is the first example of adapting the fully automatic principle to a gun larger than 40mm.

The new gun is credited with solving the problem of defense against jet planes and missiles of the V-2 type. Its greatly increased rate of fire and the speed with which it can be directed against flying targets make it much more effective than the the fastest guns formerly in use.—*Irish Defence Journal.*

### GM Regiment Celebrates Anniversary

The 1st Guided Missile Regiment of Fort Bliss, known as "the only Regiment of its kind in the Army," celebrated its fourth anniversary, Friday, October 14, to commemorate the organization of its predecessor, the 1st Antiaircraft Artillery Guided Missile Battalion, on October 11, 1945.

The Organization Day observance was held on the 14th instead of on the true anniversary date, so as to disrupt normal operations as little as possible.

The Regiment, which is commanded by Col. Ovid T. Forman, brought together for the anniversary observance batteries from White Sands Proving Ground, N. M., the Research and Development area at Fort Bliss, and Fort Bliss proper.

### New National Guard Units

The following National Guard CAC units have been federally recognized since the last issue of the JOURNAL:

Delaware:
- Battery B, 945th AAA AW Battalion, Dagsboro.

Florida:
- Battery D, 265th AAA Gun Battalion, Chipley.

Massachusetts:
- Battery B, 772d AAA AW Battalion, Winthrop.

New Mexico:
- Battery D, 120th AAA Gun Battalion, Alamogordo.
- Medical Detachment, 716th AAA Gun Battalion, Silver City.

North Carolina:
- Battery D, 130th AAA AW Battalion, Southern Pines.

Puerto Rico:
- Headquarters and Headquarters Battery, 123d AAA Gun Battalion, San Juan.

# Army's Third Volume On World War I Deals With Training Of The AEF

Thirty-two years ago—at 6:05 o'clock on the morning of October 23d 1917—the first shot by an American Unit in World War I was fired from a gun of Battery C of the 6th Field Artillery.

The efforts required to get this battery into position, and the concentrated training necessary to fit American soldiers for duty in the front lines during 1917-1918 are told in documentary fashion in the Army's history, *The Training and Use of American Units with British and French.** It is the third volume in a series of seventeen on *THE U. S. ARMY IN THE WORLD WAR, 1917-1919*, publication of which was begun several months ago. The earlier volumes dealt with organization and policies.

When the United States entered World War I, there was not a single trained division in our Army; and many months were to elapse before we could produce a division that had been organized and trained in the United States.

Meanwhile, at the insistence of our Allies, we rushed infantrymen and machine-gunners overseas to reinforce the depleted ranks of the British and French. Within a year the United States had raised, armed, equipped, and sent to France sufficient forces to be of material assistance, and had accomplished "a task of military organization without precedent in history." Our Allies were beginning to get the help they so badly needed.

Once our troops began to arrive in Europe, training continued with the aid of British and French instructors. One French commander interestingly expressed his views of the Americans as "temperamental, usually strong, athletic, intelligent, and very ambitious to learn. Americans dream," he added, "of operating in open country, after having broken through the front. It is essential to take discreet measures to counteract the idea that we are inexperienced in open warfare."

"Operating in open country" was a far cry from the warfare then being conducted as a result of the virtual stalemate on the Western Front. Trench warfare was the vogue. General John J. Pershing was reconciled to the necessity for stressing this type of training for newly arrived American troops, but he did not let them forget that the war would ultimately have to be fought in the open.

Our Allies felt that the quickest way to make American help effective was to use Americans as individuals, companies, battalions, or regiments in their units and under their commanders in order to replace losses and to maintain their combat divisions at full strength. We, on the other hand, felt the necessity for national recognition by the formation in the AEF of one or more American armies, with identity as such, to operate under American commanders, alongside British and French armies.

General Pershing, under instructions from Secretary of War Newton D. Baker and with the backing of President Woodrow Wilson, labored tirelessly and against unceasing pressure from the Allies to establish an independent American Army. It was not until August 1918 that he succeeded in creating the American First Army. American partcipation in major operations on the Western Front which began as a trickle in 1917 became decisive in the last two months of the war.

The seventeen volumes of documents being published under the series title *THE U. S. ARMY IN THE WORLD WAR, 1917-1919*, are being distributed to all government depository libraries, and may be purchased by the public from the Superintendent of Documents. Subsequent volumes in this series are scheduled for publication at intervals of approximately six weeks. The next and fourth volume will be the first dealing with combat, and will cover operations at Cambrai, Somme, Lys, Aisne, Cantigny, Chateau-Thierry, and Montdidier-Noyon.

**The Training and Use of American Units with British and French. ($3.75) 743 pp. Illustrated with two maps and four terrain photographs. Superintendent of Documents, Government Printing Office, Washington 25, D. C.*

# Controlled Submarine Mine Functions Transferred To Navy

Responsibility for controlled submarine mine functions will be transferred from the Department of the Army to the Department of the Navy, the Department of Defense announced.

In effecting the transfer, the Army will turn over real estate and other property which the Navy may indicate it will need to carry on this activity. Army officers and enlisted men who have been assigned to submarine mine planting duties will be given other assignments.

In connection with submarine mine projects, the Army has operated the Submarine Mine Depot at Fort Monroe, Virginia, a facility charged with mine manufacturing, and the Controlled (Submarine) Mine School at the Seacoast Branch Artillery School at Fort Winfield Scott, San Francisco, California. Under present plans instruction now given at the Seacoast Artillery School will be integrated into other naval schools already established.

The Army will retain sufficient personnel at all facilities concerned with submarine mine planting in order to effect the transfer, expected to be completed by January 31, 1950.

Details of the transfer are being worked out by a joint Army-Navy committee.

# Newly Commissioned Officers Assigned To CAC

The following Regular Army Officers have been recently commissioned in the Coast Artillery Corps:

Captain David B. Alexander, 1st Lt. Richard C. Anderson, Captain Nemesic A. Armstrong, 1st Lt. William H. Avery, Jr.

1st Lt. Gus Backhaus, III, 2d Lt. Raymond C. Barlow, Jr., 1st Lt. James E. Beckett, 1st Lt. Charles P. Bickerdike, 2d Lt. Donald P. Braun, 1st Lt. Donald Broida, 2d Lt. John C. Burckart.

2d Lt. William M. Castellini, 2d Lt. Gilbert X. Cheves, Jr., Captain Edward H. Church, 1st Lt. Harry E. Clark, 2d Lt. David J. Colgan, 2d Lt. Charles S. Colson, 1st Lt. John E. Coon, 2d Lt. Richard S. Craig, 2d Lt. George M. Crall.

1st Lt. Frederick C. Dahlquist, Jr., 2d Lt. Robert K. Dalrymple, 1st Lt. Gordon R. Davis, Jr., Captain Theodore J. De Franco, 2d Lt. Paul J. Dickerson, Captain Lon R. Dickson, 1st Lt. James A. Downs, Jr.

2d Lt. Stanley V. Ellerthorpe, 1st Lt. Jean R. Emery.

2d Lt. James W. Ferguson, 1st Lt. Romaine S. Foss, 2d Lt. David Freeman, 2d Lt. Frederick J. Fritz.

1st Lt. James S. Gaines, 1st Lt. Daniel J. Garvey, Berkeley S. Gillespie, Jr., 2d Lt. Carl F. Godfrey, Major Maxwell Grabove, Major Orlando L. Grening, Captain William A. Gresham.

1st Lt. Kenneth R. Hampton, 1st Lt. Laurence K. Hannon, 2d Lt. Jack R. Hayne, 1st Lt. Ellsworth W. Heidenreich, Captain Lucius G. Hill, Jr., 1st Lt. James M. Hitchcock, Captain George R. Hoddinot, 2d Lt. Robert W. Howell.

William O. Keeling, Jr., 1st Lt. Travis M. Kirkpatrick, Jr.

2d Lt. John B. Latimer, 1st Lt. John D. Lewis, 1st Lt. Elwood G. Lodle, 1st Lt. Wesley T. Long.

1st Lt. Michael J. Malone, 2d Lt. William E. Marfuggi, Captain Alexander F. Mariconda, 2d Lt. Edwin S. Marks, 2d Lt. Francis R. Marshall, Captain George H. Marx, 2d Lt. Paul G. McCoy, Captain James L. McCrorey, 1st Lt. Robert R. McFarland, 1st Lt. William R. McNeil, 2d Lt. Eugene B. Mechling, Jr., 2d Lt. Rowlan L. Miller, 1st Lt. John J. Montgomery, 2d Lt. Russell J. Moon, 2d Lt. Joseph E. Muckerman, II, 1st Lt. Charles M. Murray, 2d Lt. William G. Myers.

Captain Stephen A. Nemeth.

1st Lt. Leonard K. Olvis, Captain Frank S. Osiecki.

2d Lt. Jerome J. Paden, Captain Walter A. Pashey, Jr., Captain Albert A. Piccirilli, 1st Lt. Joseph Piserchia, 1st Lt. William A. Ponder, 2d Lt. James E. Poore, III.

1st Lt. Kenneth R. Rees, 1st Lt. Edward M. Ridlehoover, 1st Lt. Kenneth G. Ring, 2d Lt. Richard O. Rosenblatt, 2d Lt. John E. Ryan.

1st Lt. George W. Sandrock, 2d Lt. Alex W. Saricone, Captain Gervies L. Semmens, Captain James W. Shockley, Captain Milton M. Silverstein, 2d Lt. Charles L. Smith, Captain James A. Snow, Captain Loren F. Stewart.

Captain Eugene Tedick, Captain Halbert C. Thaxton, 1st Lt. Richard F. Thomure.

2d Lt. John O. Vogel, 1st Lt. Brady L. Vogt, Jr., 1st Lt. Robert L. Vranish.

2d Lt. William O. Ware, 2d Lt. James A. Whitmarsh, Jr., 1st Lt. Roy L. Wood.

Captain James W. Young, 1st Lt. Evert C. Youngs.

1st Lt. Gordon F. Zeitz.

# Coordinating Methods Of Settlement For Commercial Life Insurance Contracts With Veterans' Nonservice Connected Death Pensions

A method of settlement of proceeds from a commercial life insurance policy may be designated by the insured that will not jeopardize the possibility of a pension for his widow or child.

Nonservice-connected pensions are payable under certain conditions to widows and minor children of Veterans of World War I or World War II (but not to dependent parents). These are limited to survivors whose annual income is less than $1,000 for widow or child alone; $2,500 for widow and one or more children. Proceeds or income from a government life insurance policy are not considered in determining the amount of income of widow or child.

The Veterans Administration has ruled that where the proceeds of commercial life insurance *may be paid in a lump sum,* and the widow (or child) beneficiary elects to receive payment in installments, the insurance will be considered to have been received in a lump sum. In such cases, payment of pension will be barred only for the *calendar* year in which the veteran's death occurred. The VA has further ruled that where the insured directs payment of commercial life insurance proceeds under an installment option providing for income over a period of years, or for life, *subject to the beneficiary's unqualified right to withdraw the proceeds in a lump sum prior to the commencement of the installment income,* the proceeds will be considered as having been paid in a lump sum for pension purposes.

Although a simple lump sum payment may be changed by the beneficiary to any other method of settlement provided for in the policy, there are many advantages to the alternative arrangement outlined above, according to J. D. Marsh & Associates, Estate Planners of Washington, D. C. Frequently, where a lump sum payment is specified, and the beneficiary survives the insured, the rights of the contingent beneficiaries are extinguished, even if an installment settlement is subsequently elected by the primary beneficiary in lieu of accepting the lump sum. Moreover, in such a situation it is usually impossible for the proceeds and income to be protected against creditors of the beneficiary. On the other hand, if the insured selects the type of income settlement arrangement he prefers, subject to the beneficiary's right to take a lump sum in lieu of this income, the rights of the contingent beneficiaries are fully protected if the primary beneficiary does accept the income payments specified. The insurance proceeds are prevented from passing through an estate, and thereby being subjected to unnecessary taxes and administration expenses. In addition, in many states proceeds may be protected against the creditors of the beneficiary, notwithstanding the withdrawal right.

If greater flexibility is desired, it can be obtained without sacrificing the advantages of a settlement-option arrangement, if the insured will prescribe the following method of settlement:

> "The proceeds shall be retained under Option . . . ., subject to the right of unlimited withdrawal and the further right to elect any other settlement option in the policy."

This right to withdraw a lump sum, *which need not be exercised,* prevents monthly installment payments from being considered "outside income" by the Veterans Administration, for nonservice connected death pension purposes, until the total of such monthly payments equals the total proceeds of the insurance as of the date of claim.

It should be emphasized that the foregoing comments apply only to "Nonservice Connected Death Pension" benefits payable to widows and children of certain deceased war *veterans,* and *not* to "Service-Connected Death Compensation" payable to widows, children and dependent parents of persons who die on active duty, or as a result of active duty. Of course, no "outside income" limitations are involved in the latter case.

# Antiaircraft Journal Index
## Volume LXXXXII, 1949

Jan.-Feb., 1—March-April, 2—May-June, 3—July-Aug., 4—Sept.-Oct., 5—Nov.-Dec., 6

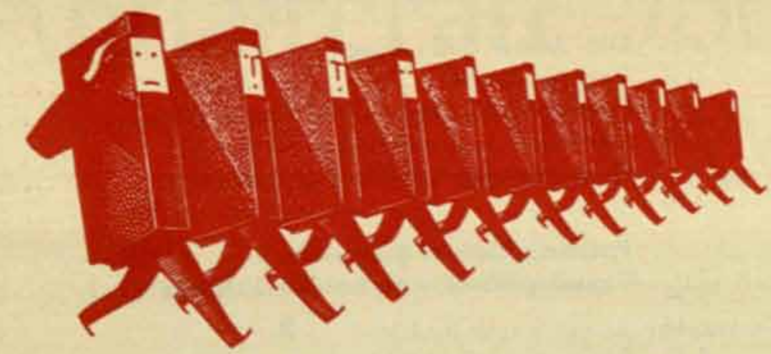
1-24 Indicates Page 24, January-February Issue

### AUTHORS



### TITLES

#### A



# BOOK REVIEWS

### "Most Authoritative"

LINCOLN FINDS A GENERAL: A MILITARY STUDY OF THE CIVIL WAR. By Kenneth P. Williams. New York: The Macmillan Company. Two Volumes. 902 Pages; Maps; Photographs; $12.50.

*(Reprinted by permission from the New York Herald Tribune Book Review, November 6, 1949.)*

The last chapter of Mr. Williams's second volume, after describing the *kriegspiel* that Meade played with Lee to a drawn game in October, 1863, ends in 1864 with the appointment of a new lieutenant general, first to hold that rank since Washington, and Lincoln's remark, after making him general-in-chief, "Grant is the first general I have had." In the preceding chapters Grant has been offstage except for short summaries of his campaigns in the West, but they make clear what Lincoln meant. The two volumes are a complex but superbly managed study of the entire Civil War from Fort Sumter (in the only chapter that is unnecessarily detailed) through the campaigns of 1863. They make fourfold analysis: the military problems the United States had to solve, the political and economic problems that affected them, the problem of command in the Union armies, and the campaigns in the East. Supporting this main purpose is a masterly study of procurement and supply, logistics, the military use of railroads, the administration of the War Department, and the light which our experience in two world wars casts on the Civil War.

Two volumes of Mr. Williams's book are still to come. Presumably one will treat in detail the campaigns in the West through 1863, the other those of 1864 and 1865 in both the East and the West. The present volumes are enough, however, to establish that *Lincoln Finds a General* is the most authoritative military history of the Civil War yet written. That is a strong statement, but it is not likely to be challenged. No one before Mr. Williams who has written on so large a scale has anchored his work so solidly in the primary sources of military history. His narrative rests on a close and critical study of almost innumerable firsthand documents of the war; the headquarters and campaign and battlefield orders of commanders and their subordinates all down the line, the reports of all ranks, the returns of quartermasters and engineers and the War Department hierarchy, many other official papers. Moreover, though Mr. Williams is a professor of mathematics (and so habituated to impersonal analysis), he is also a military man. He held company, field and staff commands in the first world war, was a quartermaster colonel in the second, and between wars had much staff training and experience. He is the first trained soldier who has written a large-scale history of the Civil War. Finally, it is clear that studying the war has been his lifelong avocation: he has mastered not only the historical sources but the historical literature.

The book overturns many accepted ideas about the war, rewrites much standard history, reverses a good many judgments, changes a good many values. The facts it presents, however, make rebuttal unlikely. It is not important that even Mr. Freeman's work is shown sometimes to be in error, for the error is never large. His fervor is well known, and it is merely warmth of heart when he sometimes assumes that what Lee's scouts reported accurately described the actual situation, or when he ascribes to an unfortunate blunder by one of Lee's subordinates a reverse that was the work of Union generals or organizations which, to Mr. Freeman's awareness, were hardly on the field. It is important that a number of sizable misconceptions and mistakes are turned up in such an established classic as Henderson's *Stonewall Jackson*. The result (and this applies to Lee, too) is to make Jackson less a demigod but a greater general. He defeated opponents who were better men than his worshipers have made them out to be; he was by far the best subordinate commander in either army till Sherman, Sheridan, and Thomas had proved themselves. But he made serious mistakes and he was sometimes outgeneraled and outfought, and Mr. Williams shows when and how. He also makes havoc of a good many recent books, most of them products of neo-Confederate wistaria or of the recent, melancholy attempt to rehabilitate McClellan. He devotes a whole appendix (one of nine) to the curiously arrogant insufficiencies of Fred A. Shannon's *Organization and Administration of the Union Army*.

The most important of his critical re-examinations is a long study of McClellan, which has surely killed the recent McClellan boom for good. He passes rather lightly over McClellan's egotism, bombast, and bluff and studies the actual conduct of his campaigns. McClellan comes out a general who directed his army in only one battle and directed it badly there, left his subordinates to fight the others piecemeal, bungled great opportunities from incompetence and something much like cowardice, earned the contempt of Lee, invariably got panicky in the field, repeatedly misrepresented important matters to the President and the War Department, sometimes lied to them, and was directly responsible for Pope's defeat at Second Bull Run. One result of this analysis is a belated demonstration of Pope's quality; he was the best general Lincoln had had so far, daring and expert as McClellan was not, he outgeneraled Lee, would probably have won his battle if McClellan had obeyed orders, was not disastrously defeated as it was, and was eagerly trying to resume the campaign at the moment when McClellan procured his retreat. What is more important, McClellan's repeated accusations that the War Department did not adequately back, support, and supply him are proved wrong. The word is "proved"—for Mr. Williams shows that the War Department, Stanton, Lincoln, and the entire government and military establishment backed him to the full with men, supplies, information, every kind of accessory assistance and cooperation, and even the flattery he needed so urgently. With this demonstration the book focuses on ideas of final importance in American history at large. For a whole recent school of historians have rested squarely on McClellan's accusation their contention that the "Radicals" in Congress and the Administration did not want to win the war too soon. Mr. Williams's study shoots the contention to pieces.

The book shows that both the Army of the Potomac and the government's conduct of the war were better than we have gradually become accustomed to believe. Its account of the speed with which the North's war potential was developed is absorbing, and the accomplishment of Lincoln's administration is shown to have been better than that of Woodrow Wilson's and does not suffer by comparison with Roosevelt's. The achievements of men like Meigs, Ingalls and Haupt get a new burnishing. And the reappraisal of the Army's campaigns, morale, recuperative ability and fighting prowess is frequently arresting. There was no panic following Second Bull Run; that following First Bull Run has been much exaggerated. The Iron Brigade fought just as well as the Stonewall Brigade and sometimes better; it simply was not commanded as well. The net effect of the whole book is to cut down the mythology about the Army of Northern Virginia—and to enhance the reputations of its generals.

For it comes in the end to leadership—Mr. Freeman's absorption in *Lee's Lieutenants* and Mr. Williams's final interest here. And leadership comes in the end to moral qualities, to character. The awful responsibility of high command broke general after general and it was this that frustrated or defeated the Northern armies in the East so often. McClellan, who should have won two campaigns and might possibly have won the war with the second is not a good example, for he was never fit for high command, and about Pope we cannot speculate for McClellan's treachery defeated him. But though Burnside had some hard luck and though bad management behind the lines handicapped him, he did not believe himself big enough for his job and so proved that he wasn't. Hooker twice outgeneraled Lee, but he crumpled under the kind of responsibility that only made Lee more brilliant and more dangerous. Meade might have won the war if he had ordered a counterattack after Pickett's charge. But he had barely been able to bring himself to fight Gettysburg and he did not dare, or could not, rise to the opportunity which Lee saw all too clearly and which Lincoln and the whole world saw soon afterward. Meade is the saddest casualty in the book.

This book will produce a whole new school of military history. One looks forward impatiently to the remaining volumes, but these two are a solid feast, rich, various, sometimes breathlessly exciting though always cool-minded, and as close to being final as we are likely ever to get.
—Bernard De Voto.

### General 'Hap' Arnold's Memoirs

GLOBAL MISSION. By H. H. Arnold, General of the Air Force. Harper & Brothers. 626 Pages; Illustrated; Index; $5.00.

General Arnold took part in air power development from the days of the Wright brothers to the B-29. Throughout World War II he was not only commander of the AAF but Deputy Chief of Staff. He attended nearly every important interallied conference. Despite his boyish face and ready smile, Arnold was a hard-driving administrator with ideas of his own and a singular capacity for getting top performance out of his subordinates. Long before other parts of the armed services were using numbers of civilian scientists and specialists, Arnold had them on the Air Force payroll. He was, I believe, the only top commander in Washington who had a staff of men whose sole function was "thinking."

Arnold did not get to France in World War I, but even then he showed original thinking. One project that he and "Boss" Kettering developed in 1917 was the "Bug," a pilotless aircraft carrying a 300-pound explosive charge. This project, revived in World War II, was a forerunner of the German V-1. Distance from pay targets and difficulties of control caused it to be dropped in the first war, and in the second it was passed up in favor of precision bombing. Arnold never intended to make the German mistake of 1944-45 when they launched a relatively small number of guided missiles at Britain. He was going to shoot the works with thousands upon thousands of "Bugs."

Though closely associated with General Billy Mitchell in the early struggle for air arm recognition, Arnold did not share Mitchell's genius for martyrdom. He had too much sense to think you could advance air power by merely pulling Army and Navy beards. Arnold *knew* that the day of the airplane was coming and nothing could stop it. It was just a question of who would be around to direct it when it came. Mitchell got the headlines and the court-martial. Arnold was in the pilot's seat when World War II arrived.

Hap Arnold never confused air power with airplanes. To his way of thinking air power was something capable of strategic as well as tactical use. It was something made up of long-range heavy bombers, medium bombers, long- and short-range fighters in balanced force, constantly maintained by an adequate flow of replacements. The backbone was the heavy bomber. He makes it clear that no Chief of Staff ever gave his concepts of air power a sympathetic hearing until the day of George C. Marshall.

In contrast to RAF night area bombing, Arnold committed our Air Force to a program of high-altitude daylight precision bombing of selected targets in Europe. It was a twin program aimed at crippling German war industry and forcing the German Air Force to waste itself in defense of the Reich, thus to attain the air supremacy needed for successful invasion of Europe. We already know from the first two volumes of the official AAF history that this was an extremely difficult assignment. At the outset we did not have a long-range fighter plane capable of escorting bombers deep into Europe. General Arnold makes it very clear that he never thought we could do the job *without* fighter escort. He also admits that the Air Force got its answer to the long-range fighter problem, the P-51, largely by accident. He admits, too, that the Air Force failed to come up with an efficient reconnaissance plane.

Those who try to discredit the strategic bombing program by pointing to the fact that both Germany and Japan had more planes at the end of the war than at the beginning, get short shrift in these pages. General Arnold says they had some planes left, numbers of them, but no air power. He takes justifiable pride in the fact that our Air Force was the only one that had a workable plan for expansion and replacement. It grew in strength constantly in spite of losses.

Though he defended high-altitude daylight precision bombing in Europe, General Arnold sanctioned the decision of the Twentieth Air Force in its final operations against Japan to bomb primarily at night from low altitudes. There was also a shift from the concept of the heavily armed bomber fighting its way to the target and back to less armament and more bomb tonnage. By then we had apparently come over to the British idea of area bombing, although the Japanese Air Force was a sick pigeon by that time, not to be compared with the German Air Force of 1942-44.

General Arnold is also a gifted narrator and storyteller. His book belongs in the library of every military reader and can be read with great profit by every citizen.—LT. COL. H. A. DEWEERD.

### *Vital Books on Russia*

STALIN: A POLITICAL BIOGRAPHY. By Isaac Deutscher. Oxford University Press. 600 Pages; Index; Illustrated.

THE FOREIGN POLICY OF SOVIET RUSSIA, Volume II, 1936-1941. By Max Beloff. Oxford University Press. 434 Pages; Index.

Soviet foreign policy, despite its vital importance and fascination and despite the oceans of ink spilt daily over it in the press, has until quite recently remained almost without serious discussion. It is only now, as the result of several meritorious efforts that we can at last think of piecing together the fragmentary and partisan accounts hitherto available.

Primary acknowledgment must go to Mr. Deutscher's new biography of Stalin, a work remarkable in its comprehensiveness of theme, mastery of detail, balance of judgment, and skill of presentation.

The tendency, both on the part of the adherents and opponents of the Soviet system, has been to emphasize its undeviating consistency with its doctrinal Marxist bases. Mr. Deutscher's reinterpretation instead brilliantly demonstrates the gradual growth and remarkable fluidity of Soviet domestic and foreign policy within the general Marxist framework. Thus the most important aspects of the early part of his story are not so much his study of Stalin's own beginnings in quaint Georgian surroundings, but his analysis of the doctrinal struggles and splits within the ranks of the Russian Marxists, out of which the Bolshevik party under Lenin's leadership gradually emerged. He shows the original conviction, strange as it sounds to us today, of all Russian Marxists that the revolution they were aiming at could not be other than democratic and bourgeois. Then he discusses the original split arising from Lenin's insistence upon a disciplined militant party, and then the final consolidation after the revolution of February 1917, when Lenin returned to St. Petersburg, swung the Bolshevik party around to the opposite course of a proletarian revolution.

Mr. Deutscher then analyzes the process by which the Bolshevik party was transformed. With its strict discipline, its freedom of inner controversy, and its intense ideological tournaments in which Lenin himself delighted in taking a leading part, it was changed in less than ten years, into the regimented "monolithic" bloc of Stalin's totalitarian regime. Once Lenin's personality and authority were out of the way, the path was free for Stalin to dominate one group after the other of his rivals.

Basically this deadly struggle for power and survival raged about issues of "internal policy": party standing, party discipline, organization and tactics, social and economic policy. Gradually, however, there emerged from it also sharper differences in the attitude and aims of the Soviet Union from those of the capitalistic world at large. Originally there had been no doubt or discussion on this score. The proletarian revolution which, contrary to all their former teachings, they had suddenly succeeded in bringing about in Soviet Russia, could be but a spark, a beginning. To complete it, it would be necessary to carry the revolutionary front on into the industrialized countries—England, France and Germany. There the highly developed labor movements would evolve the forms of the new communist society and then carry them backward to advanced Russia. Against this hitherto unquestioned dogma, which had found its strongest exponent in Leon Trotsky, Stalin raised an opposing concept. At first mainly to fight Trotsky, but with ever-increasing conviction and unflagging assertion, he supported the idea of "revolution in one country." Without in any way denying the ultimate objective of total world revolution, Stalin insisted more and more strongly, that Russia was not so backward that she could not attempt to bring the communist revolution to full completion within her own borders, nor so weak that she could not hope to survive even with a ring of capitalist enemies. Internally, the consequences of this new dogma drove him to impose upon the country the tremendous efforts and privations of the successive Five-Year Plans. Externally, it paved the way for sharp revision of Soviet foreign policy from its original belief in the imminence of world revolution to extreme scepticism and to confidence in the reality of a long-term conflict, possibly lasting several decades, between Russia and the capitalist world.

The immediate expression of this in 1925 was the attempt to create a *rapprochement* of the two wings of the Marxist movement, the Second (Socialist) and the Third (Communist) International; and the endeavor to adapt the support given to the Chinese revolution to its middle-class allies, as well as to improve Soviet-British relations through closer relations between Russia and British trade union leaders. All three failed, with the result that in 1928 Stalin swung the helm around once more with the thesis, accepted by the Sixth Congress of the Communist International, that capitalism was facing a new catastrophic economic crisis. Yet his basic policy of carrying through "socialism in one country" in Russia continued. The only practical effect of the intensification of the Comintern's ultra-radical propaganda was to turn it against its Socialist brethren at the moment when these, as in Germany, were turning to them for a common front against the rising menace of Nazi-ism. So completely blind was Stalin to the significance and destructive dynamism of the Nazis that even after Hitler had come to power and immediately began to suppress the German Communist Party with unprecedented brutality, he failed to take up that challenge. It was not until the summer of the following year, 1934, after all his efforts to maintain relations with Hitler had been rebuffed, that he finally came to the conclusion of the need for yet another radical shift in his foreign policy.

When at last the change came, however, it was radical and complete. Since the Soviet Union now found herself, for the first time since the end of the Civil War, seriously menaced both by Hitler's growing power in the West and the resurgent dynamism of Japanese expansion in the East, the entire emphasis of Stalin's policy was now thrown upon the consolidation of the existing world system. From agitation for the revision of the Versailles Treaty, Soviet foreign policy shifted to its support, entered September 1934 the League of Nations —Lenin's "robbers' den." And there it soon made itself known through the mouth of Litvinov, the foremost advocate of collective security and defense of democracy against fascism.

But once again Stalin's policy failed in its efforts to reconcile fundamentally irreconcilable tendencies in an uneasy temporary alignment. His main endeavor, which was to persuade the Western powers to accept definite commitments, led to no results. The Franco-Soviet pact of mutual assistance remained a mere scrap of paper, for all efforts to supplement it with a hard and fast military convention were politely turned down by the French. In fact, the acrimonious debates waged over its ratification in the French houses of parliament in the spring of 1936 probably contributed more to split up and alienate French public opinion than the pact was worth. In the same manner the effort through the French and Spanish Communist parties to set up Popular Fronts designed to bolster the resistance against the Nazi-Fascist enemies, led to the opposite result. Whatever Stalin's injunctions might be, he could not undo again at a moment's notice revolutionary potentialities of these Fronts. Their victories raised the anticapitalist temper of the working classes, carried their leaders with them, shook France by strikes, mass meetings and demonstrations, and provoked in Spain a civil war. This not only contributed decisively to bringing Hitler and Mussolini together, but also alienated French and British leadership from the Soviet Union. By the time Hitler's policy of expansion took on an explosive character, Russia was almost completely isolated, despite all of Stalin's efforts, a state of affairs which was openly revealed to the world at Munich.

This isolation made any new shift toward an understanding with Hitler doubly dangerous and difficult. In Mr. Deutscher's opinion the emphasis of Stalin's subtle double game in the next eleven months still lay upon an alliance with the Western powers. In his famous speech of March 1939, the door was still kept wide open for them. The other door, for Hitler, was barely left ajar. In fact, despite the obvious reluctance of their leaders he seems, in the author's opinion, to have been ready to join them up to the last critical weeks. But in the race for his favor Hitler held the stronger cards. Only through an alliance with him could Stalin hope to achieve what had now become the new goal of his ambition—the hope of sitting back as a spectator and letting his capitalist rivals exhaust themselves, before finally stepping in as an arbiter. An alliance with the West would have obliged Russia to fight from the first day.

At this point in his book the wealth of Russian sources, from which Mr. Deutscher has so far drawn his remarkable reconstruction of Stalin's domestic and foreign policy comes abruptly to an end. For Russian foreign policy during and after World War II we are, as he points out, almost entirely dependent upon the indirect secondhand inferences to be drawn from the accounts of German, British and American observers. The picture he draws from them continues to be illuminating and suggestive, but we cannot always accept it.

However, Mr. Deutscher's detailed analysis of the wartime evolution of Stalin's policy gives for the first time a really full picture of all its aspects. He is most convincing in his contrast of Stalin's military leadership with that of Hitler. Above all, he presents an excellent synopsis of Stalin's relations with the Western Allies and the gradual emergence and solution of the issues in dealing with the Second Front, the guarantee of Russia's western annexations in 1939 and 1940, the Polish question, the development of the staking out of zones of influence in Europe, the plans for a condominium after the war. But the specter that haunted the Allies right up to Teheran, the possibility of a separate peace between Stalin and Hitler, is barely touched upon.

Perhaps the most interesting, certainly the most controversial, part of Mr. Deutscher's story is his attempt at an analysis of the motives of Stalin's postwar policy.

As the title of his last chapter, "Dialectics of Victory," indicates, he sees Stalin on the horns of a dilemma. Having brought his country by a desperate effort to victory, he is unable to provide the miracle his nation expected from victory—the reconstruction of the ravages of the war and the raising of the standard of living.

The force of Mr. Deutscher's interpretation of Soviet foreign policy arises from its strict concentration upon the basic issues as reflected in the Soviet Union's relations with the key non-Communist states—Germany, Britain, France, and, from 1941 onward, the United States. The weakness is not only an oversimplification, but the almost complete neglect of other contrasts and influences, which did play their role in the shaping of Soviet policy. A useful complement and corrective of Mr. Deutscher's brilliant, but one-sided interpretation, is that of another British author, Max Beloff. His is a detailed, documented and scholarly discussion of Soviet foreign policy during the crucial decade 1931-41. Mr. Beloff's work is in almost every respect the opposite of Deutscher's. It is an exhaustive array of facts and footnotes, with only a slender thread of interpretation. The scope and variety of the materials are amazing, even though some very obvious key sources, such as the records of the Tokyo war crimes trials, are left out. This last point is all the more regrettable in view of the great attention which Mr. Beloff devotes to the little known subject of the Soviet Union's relations with the Far East and the Orient in general.—Herbert Rosinski.

### Early Naval Operations

CORAL SEA, MIDWAY AND SUBMARINE ACTIONS: May 1942-August 1942. Volume IV of History of United States Naval Operations in World War II. By Samuel Eliot Morison. Atlantic-Little, Brown & Company. 307 Pages; Illustrated; Maps; Index; $6.00.

June 4, 1942 was the "Black Day" for the Japanese, the day when the Battle of Midway presaged defeat for Nippon. It also touched off another battle which has been flaring up ever since—between land- and air-based air power, which culminated in the Battle of the B-36 this summer.

One Flying Fort strafed a Jap carrier, killed a couple of men and knocked out an AA gun. "This was the only damage which the B-17s inflicted on the enemy. The performance of land-based air [was] most disappointing, both in bombing and searching." Honors went to the Navy carrier-based dive bombers which sank four carriers, turned the Japanese away from Fiji, New Caledonia and New Zealand and persuaded the Japanese strategists that they would be lucky if they could settle for a negotiated peace.

"Raymond A. Spruance emerged from this battle one of the greatest fighting and thinking admirals in American naval history," believes Morison. His account of Midway substantiates this belief.

Morison extols the Navy, but does not gloss over its shortcomings. The absurd policy that kept torpedo officers ignorant of how the magnetic-influence exploder in the torpedo warhead worked was typical of ordnance thinking. Torpedoes which consistently ran *under* the target prompted one lieutenant commander in the undersea service to write bitterly in an official report, "To make round trips of 8,500 miles into enemy waters to gain attack positions undetected within 800 yards of enemy ships, only to find that torpedoes run deep and over half the time will fail to function, seems to me an undesirable manner of gaining information which might be determined any morning within a few miles of a torpedo station in the presence of comparatively few hazards."

Facts like these are scattered through Morison's book, and are given their true perspective. This fourth volume of his history tells how the United States turned the corner from defeat to victory with the first of the great carrier actions of the war in the Battle of the Coral Sea. Then comes the decisive Battle of Midway and the Japanese thrust at the Aleutians, which ended with their occupation of Attu and Kiska. The courageous submarine attacks against Japanese shipping, and the part they played in the Makin raid are told with gusto. The last part of the book is devoted to the beginnings of the Solomon Islands operations, and the frantic planning and preparation for Operation Shoestring—the landings at Guadalcanal and Tulagi in August of 1942.

# The Best Sellers

**as reported by *The New York Times Book Review* of November 6**

## Fiction

The Egyptian. *Waltari* .... $3.75
A Rage to Live. *O'Hara* ... $3.75
Mary. *Asch* .... $3.50
The Way West. *Guthrie* ... $3.50
Father of the Bride. *Streeter*. $2.50
The Big Fisherman. *Douglas* .... $3.75
Loving. *Green* .... $3.00
Point of No Return. *Marquand* .... $3.50

## General

White Collar Zoo. *Barnes*.. $1.00
Waters of Siloe. *Merton*... $3.50
Seven Storey Mountain. *Merton* .... $3.00
Peace of Soul. *Sheen* .... $3.00
The Mature Mind. *Overstreet* .... $2.75
W. C. Fields. *Taylor* .... $3.50
Autobiography of Will Rogers. *Day* .... $3.50
Man From Nazareth. *Fosdick* .... $3.00

*All of these books available from*

**ANTIAIRCRAFT JOURNAL**

631 Pennsylvania Ave., N.W.
Washington 4, D. C.

Captain Morison seems to be getting well into the swing of his fourteen-volume history, and this one is written much more comfortably than the preceding three volumes. His narrative is livelier, though his facts seem as solid as ever, and he writes with a judicious impartiality.—R. G. McC.

### *American Army Men in Russia*

GUESTS OF THE KREMLIN. By Lt. Col. Robert G. Emmens. The Macmillan Company. 291 Pages; $3.00.

Lieutenant Colonel Emmens, co-pilot of one of the B-25s which bombed Tokyo in the famous Doolittle raid of 1942, tells here the story of what happened afterward to himself and the other four crew members. For some reason their plane had used more gas than it should have when they arrived over Tokyo. They dropped their bombs, and then —with some uneasiness—headed for the nearest possible place to land—Siberia.

For the next thirteen months, these five young Americans were interned (imprisoned might be a more accurate word) because the Russians were unwilling to offend the Japanese. The prisoners soon caught on to the policy that guided their captors: plenty of vodka, and never a truthful answer to any question. The Americans were transported into a good many old corners of Russia but never knew where they were going until they got there. Once there, they never knew how long they were going to stay until they were on their way to somewhere else. This made for an unsettled kind of existence, but it did also give the Americans a chance to see Russia and the Russians. They learned a little of the language and talked to all kinds of people. They were appalled at the ignorance, poverty, filth, and general misery which they saw. They had all heard some good reports about communism before they got to Russia. But what they saw there soon changed such notions. As the author says, on the last page of his book: "We were better Americans for our experience. Any sympathies we may have had for the Soviets or their professed communism were dispelled by our having been there."

*Guests of the Kremlin* is a well written book, filled with anecdotes and humorous stories of daily difficulties. It is also a good adventure story—particularly toward the end where Colonel Emmens tells of their hazardous escape into Persia. It's good reading all the way through. But more than that, it is also a singularly effective exposure of the weaknesses within the Russian system. Colonel Emmens was astonished that such conditions could exist, and shocked into apprehension lest the doctrine be allowed to spread. Here is his closing paragraph:

"This is the Russia we saw. This is the Russia which exists today. That these descriptive lines should ever be used to picture life in these United States is unthinkable. And yet, communism, like a malignant scab on the skin of the world, is spreading north, south, east and west. FIGHT IT!"—M. S. LINEBARGER.

### He Applied His Seat to the Chair

I WANTED TO WRITE. By Kenneth Roberts. Doubleday & Company. 471 Pages; $3.50.

Mr. Roberts's account of his long writing career contains proof of the statement by another well-known author that writing is in sizable part the application of the seat of the trousers to the chair of the writing desk. As a young man he thought little of working sixteen and eighteen hours a day for weeks on end. Moreover, he knew very early what he wanted to do—write books; and though he had begun a newspaper career of considerable promise, he left it soon to write on his own account.

There is naturally much in this book for any man with the inclination to do either part-time or full-time writing. And it has its special interest for the non-writing military reader in Mr. Roberts's account of the work and research he put into his famous military novels, *Arundel, Rabble in Arms, Northwest Passage,* and the rest. *Arundel* and *The March to Quebec,* his non-fiction history of the terrible march from New England through the swamps of Maine and Canada, were both the subject of considerable study early in World War II, when our forces began extensive jungle fighting.—G. V.

DRINKING'S NOT THE PROBLEM. By Charles Clapp, Jr. Thomas Y. Crowell Company. 179 Pages; $2.50.

The problem, says Mr. Clapp, is not the drinking but what drives us to it. And the drive he has in mind is not the tiredness, the daily external difficulties of living, or the acute personal distress such as grief, which are often said to drive people to drink. It is rather the inner and unrealized anxiety that causes a man or woman to drink in the effort to escape the anxiety.

His book, the author insists, is not for alcoholics. It is for those who are probably going to be alcoholics. He gives simple rules for telling whether you are headed in that direction, and sound advice on what to do about it.

*Drinking's Not the Problem* is a very and useful book based on modern medicine and psychology. It will help any military leader to get a better understanding of the drinking of his men who drink to excess, and will give some leaders an insight into their own tendencies.—G. V.

### The Scientific Role In Preserving Democracy

MODERN ARMS AND FREE MEN. By Vannevar Bush. Simon and Schuster. 264 Pages; $3.50.

Never in the history of warfare has scientific development played such a decisive influence upon the conduct and outcome of tactical and strategic operations as took place in World War II.

Dr. Vannevar Bush, as the wartime head of the six thousand leading physicists, chemists, engineers and doctors who comprised the Office of Scientific Research and Development, has written a most valuable narrative of the role played by scientists in the conduct of the war.

In these days of overemphasis on push-button warfare, Dr. Bush has written with remarkable clarity a factual and highly enlightening account of the most revolutionary weapons and their development.

He describes each innovation from the early changes in submarine warfare to the introduction of guided missiles and he unfailingly points to lessons learned and objectives achieved in each specialized field of endeavor.

*Modern Arms and Free Men* is expertly reduced to laymen's language and takes the reader step by step through the maze of almost unbelievable departures from the orthodox.

While Dr. Bush has written on an important phase of contemporary history, he has also prepared a text of great value to all students of the arts of war. His book will unquestionably fill an important niche in every military library.—R. W. O.

### Books Received

LIFE AMONG THE DOCTORS. By Paul de Kruif. Harcourt, Brace & Company. 470 Pages; Index; $4.75. "How our doctors are combining new scientific miracles with the religion of the good Samaritan, bringing great hope to mankind."

THE GOOD HOUSEKEEPING GUIDE TO MUSICAL ENJOYMENT. By George R. Marek. Rinehart & Company. 342 Pages; Illustrated; Index; $3.50.

THE CASE OF GENERAL YAMASHITA. By A. Frank Reel. The University of Chicago Press. 324 Pages; $4.00.

LANGUAGE IN THOUGHT AND ACTION. By S. I. Hayakawa. Harcourt, Brace & Company. 344 Pages; Index; $2.75.

ATLANTIS: THE ANTEDILUVIAN WORLD. Edited by Egerton Sykes. Harper & Brothers. 355 Pages; Index; $4.50. A re-do of an 1882 book with the latest on the theory of the Lost Continent.

WHERE MY SHADOW FALLS: TWO DECADES OF CRIME DETECTION. By Leon G. Turrou. Doubleday & Company. 224 Pages; $2.75. The memoirs of a former FBI man and Army CID official.

THE DYNAMICS OF HUMAN RELATIONS. Three volumes. By Richard W. Wetherill. D. Van Nostrand Company. $2.75 each volume; $6.95 set. *How to Succeed With People,* 356 Pages; *How to Put Your Ideas Across,* 345 Pages; *How to Get Leadership and Influence,* 353 Pages.

FOOTBALL OFFICIAL GUIDE 1949. A. S. Barnes & Company. 287 Pages; Illustrated; $1.00.

ECONOMIC GEOGRAPHY OF THE USSR. Edited by S. S. Balzak, V. F. Vasyutin, and Y. G. Feigin. The Macmillan Company. 620 Pages; Maps; Index; $10.00.

THE WORLD AS I SEE IT. By Albert Einstein. Philosophical Library. 112 Pages; $2.75. An abridged edition of Dr. Einstein's first general book.

TROUT FISHING. By Dan Holland; Decorations by William J. Schaldach. Thomas Y. Crowell Company. 420 Pages; Illustrated; Index; $5.00. A rather complete text on a favorite sport of hundreds of thousands of Americans.

WOMEN ARE HERE TO STAY. By Agnes Rogers. Harper & Brothers. 220 Pages; Illustrated; Index; $5.00. The author of *I Remember Distinctly* offers hundreds of pictures of women, their antics and accomplishments, over the past fifty years.

A SORT OF SAGA. By Bill Mauldin. William Sloane Associates. 301 Pages; Illustrated; $3.50. Bill Mauldin's early life.

EARTH ABIDES. By George R. Stewart. Random House. 373 Pages; $3.00. By the author of *Storm* and *Fire*.

# COAST ARTILLERY ORDERS

**DA and AF Special Orders Covering September 1 through October 31, 1949. Promotions and Demotions not included.**

### COLONELS

Brown, J. D., to First A 1262d ASU, Ft. Dix, NJ.
Flagg, K. P., to First A 1100th ASU New England Mil Dist, Boston, Mass.
Martin, M. J., to 5262d ASU Sr A Instr ORC, Ft. Warren, Wyo.
McLean, D., to MDW 7025th ASU Sta Com, Ft. Myer, Va.
Myrah, Halvor H., to ret fr active sr.
Scott, W. W., to 6601st ASU Calif NG Instr Gp, San Francisco, Calif.
Supple, E. L., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Wallace, E. C., to 1272d ASU Office of the Sr. NG Instr, Rochester, NY.

### LIEUTENANT COLONELS

Barros, R. D., to 115th CIC Det Sixth A, San Francisco, Calif.
Brownlee, L. H., to 4404th ASU NMex NG Instr Det, Albuquerque, NMex.
Cox, L., to Fifth A 5302d ASU USA and ASAF Southern Rectg Dist, Chicago, Ill.
Ellsworth, L. K., to Gr Gen Sch, Ft. Riley, Kans.
Francis, W. H., to C&GSC, Ft. Leavenworth, Kans.
Gifford, J. R., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Kelley, S. R., to 1155th ASU Office of the Sr NG Instr, Boston, Mass.
Linderer, L. W., to 82d Abn Div, Ft. Bragg, NC.
Maloney, J. P., to 1272d ASU Office of the Sr NG Instr, New York, NY.
Martin, R. J., to Hq First A, Governors Island, NY.
Townsend, H. F., to 4404th ASU NMex NG Instr Det, Albuquerque, NMex.
Twyman, J. H., to 3366th ASU Ala NG Instr. Mobile, Ala.
Vance, C. S., to Second A 2303d ASU Western Pa Mil Dist, Pittsburgh, Pa.
Wallace, W. A., to Sixth A 6100th ASU, Cp Roberts, Calif.
Walton, H. L., to 2502d ASU Pa NG Instr Det, Philadelphia, Pa.
Weinnig, Albert J., to Officers Gp No 1, London, England.
Worthy, C. M., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.

### MAJORS

Burge, N. J., to Gr Gen Sch, Ft. Riley, Kans.
Byrne, R. E., to OC of S, Wash, DC.
Grandin, Daniel G., to Fifth A 5025th ASU Stu Det C&GSC, Ft. Leavenworth, Kans.
Ingraham, H. S., to 1145th ASU ROTC Univ of Maine, Orono, Me.
Payne, H. N., to Fourth A 4054th ASU Stu Det AA & GM Br Arty Sch, Ft. Bliss, Tex.

### CAPTAINS

Alexander, D. B., to 6814th ASU ROTC Univ of Wash, Seattle, Wash.
Benson, V. W., to 2322d ASU NC NG Instr, Raleigh, NC.
Bianchi, J. J., to 9th CIC Det 9th Inf Div, First A, Ft. Dix, NJ.
Boisvert, J. R., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Church, E. H., to 6815th ASU ROTC Utah State Agricultural College, Logan, Utah.
Coggins, Samuel M., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Decristoforo, W. H., to 9th Inf Div, Ft. Dix, NJ.
Fuller, R. D., to Fourth A 4054th Stu Det AA & GM Br Arty Sch, Ft. Bliss, Tex.
Hendren, K. H., to 2502d ASU Pa NG Instr Det, Philadelphia, Pa.
Hoffman, S., to Grd Gen Sch, Ft. Riley, Kans.
Jones, W. L., to First A 1108th ASU Hq and Hq Det HD of Narragansett Bay, Ft. Adams, RI.
Kidd, R. P., to Second A 2327th ASU, Wilmington, Del.
Krofchik, Paul, to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
LaGouros, J. E., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Lambert, H. W., to Stu Det A Lang Sch, Monterey, Calif.
MacDonald, George E., to ORC State of Kansas, Topeka, Kans.
Magnan, J. F., to 1st GM Regt, Ft. Bliss, Tex.
Miescher, W. H., to 2d Armd Div, Cp Hood, Tex.
Moon, Leroy Francis, to 1106th ASU, Ft. Banks, Mass.
Nichols, E. O., to 3322d ASU NC NG Instr, Wilmington, NC.
Nielsen, K. Tage G., to Sixth A 6002d ASU, San Francisco, Calif.
O'Brien, I. T., to Hq V Corps Joint Opr Cen, Ft. Bragg, NC.
Seidel, F. J., to Stu Det A Lang Sch, Monterey, Calif.
Serfin, A. T., to 6812th ASU ROTC Univ of San Francisco, San Francisco, Calif.
Shultz, J. J., to Armed Forces Sp Wpns, Los Alamos, NMex.
Snow, F. G., to 4052d ASU Fourth A AAA and GM Cen, Ft. Bliss, Tex.
Tichenor, J. F., to 2504th ASU Va NG Instr Det, Portsmouth, Va.
Turner, W. D., to 1156th ASU Office of the Sr A Instr NG for Conn, Norwich, Conn.
Whitten, R. C. B., to Hq MDW, Wash, DC.
Young, C. G., to Hq Armed Forces Sp Wpns Project, Wash, DC.

### FIRST LIEUTENANTS

Beckett, J. E., to 6815th ASU ROTC Utah State Agricultural College, Logan, Utah.
Behenna, D. L., to 2d QM Bn, Cp Hood, Tex.
Bushman, E. C., to QM Cen, Cp Lee, Va.
Concannon, J. F., to 7th Inf Regt, Ft. Devens, Mass.
Dall'Acqua, M. R., to SGO, Wash, DC.
Diebod, J. A., to 3d Armd Div, Ft. Knox, Ky.
Foss, R. S., to Fourth A 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Gleason, J. J., to 2d Inf Div, Ft. Lewis, Wash.
Hall, H. H., to 2d Inf Div, Ft. Lewis, Wash.
Hibbard, P. H., to First A 1205th ASU, Ft. Wadsworth, NY.
Jackson, Lloyd S., to 115th CIC Det Sixth A Presidio of San Francisco, Calif.
LeValley, M. W., to 115th CIC Det Sixth A, Ft. Douglas, Utah.
Lucas, J. A., to Sig Cen, Ft. Monmouth, NJ.
Payne, R. F., to 2d Armd Div, Cp Hood, Tex.
Sos, Joseph P., to US Army Alaska, Ft. Richardson, Alaska.
Stoke, G. D., to Stu Det A Lang Sch, Monterey, Calif.

### SECOND LIEUTENANTS

Cox, Charles D., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Luers, H. L., to Sig Cen, Ft. Monmouth, NJ.
Morris, D. E., to Stu Det A Lang Sch, Monterey, Calif.