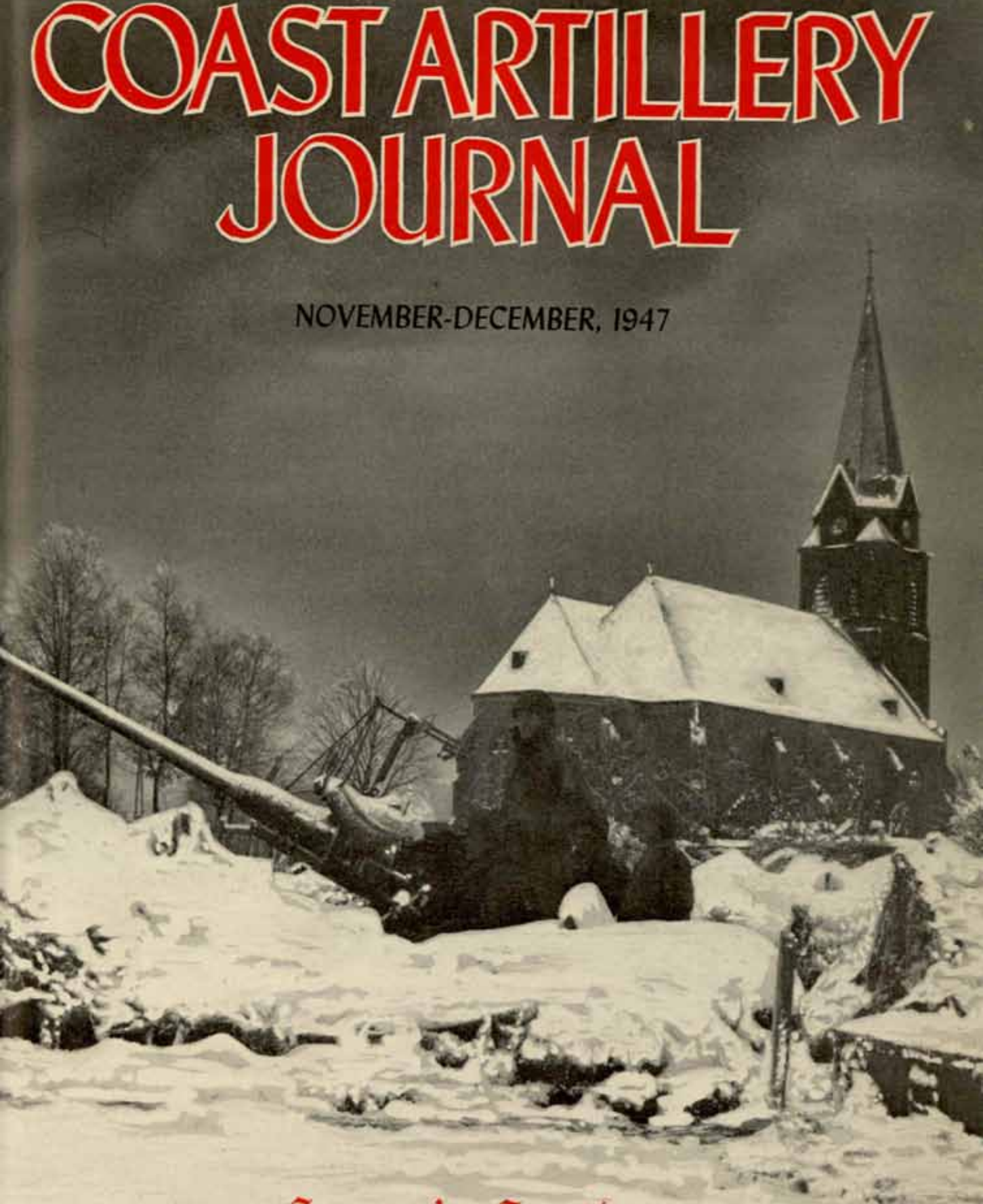
COAST ARTILLERY JOURNAL

NOVEMBER-DECEMBER, 1947



Season's Greetings

FEATURING THE 45th AAA BRIGADE

HEADQUARTERS
ARMY GROUND FORCES
OFFICE OF THE COMMANDING GENERAL
FORT MONROE, VIRGINIA

To all members of

The Coast Artillery Corps:

Once again it is my happy privilege to extend to you every good wish for joy and prosperity during the holiday season and throughout the year to come. On this, the third Christmas since the cessation of hostilities of World War II, it is my fervent prayer that the peace which we are striving to maintain be a just and lasting one. I ask of you men in the Armed Forces, particularly the Ground Soldiers, scattered as you are throughout the world, that you do your utmost to perform your duties in a manner that will reflect only credit upon yourselves and the nation you represent. Let our hope be that our country will remain as strong as it is just, and that through its desire for justice for all mankind it will contribute to an everlasting peace throughout the world. During this Christmastide, and during all those to come, free men must have the right to exclaim, "Merry Christmas and a Happy New Year!"

Jacob M. Devers

JACOB L. DEVERS
General, USA

DEPARTMENT OF THE ARMY
WASHINGTON, D.C.

To all members of

The Coast Artillery Corps:

On behalf of the officers and members of the Executive Council of the United States Coast Artillery Association, may I extend to all Coast Artillerymen throughout the world congratulations for their conscientious performance of duty and successful accomplishments, and my best wishes for a Merry Christmas and Happy New Year.

Leo. Lutes.

LeF. LUTES
Lieutenant General, USA
President, Coast Artillery
Association

COAST ARTILLERY JOURNAL

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CONTENTS

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ACTIVITIES

By Colonel Gerald G. Gibbs, CAC

On the 24th of July, 1944, Headquarters 45th AAA Brigade was situated comfortably on the estate of Count Ottini, some six miles southeast of Pisa. It was a hot Sunday afternoon and little activity was noticeable. Members of the staff were catching up on their correspondence or perfecting their gin rummy. There had been little or no German air activity for the past few days and it was evident that the Luftwaffe had turned its attention to more pressing matters than the Italian Campaign. The IV Corps, to which the 45th was attached, was occupying generally the line along the Arno River with the 34th Infantry Division on the left and the 91st Infantry Division in the center. Further east, the 1st Armored Division was pushing forward through terrain which would be considered impassable by most armored units.

The Brigade Commander, Brigadier General Paul W. Rutledge, put aside his crossword puzzle to answer the field phone conveniently attached to his bunk. The conversation which started from a reclining position, developed to sitting, and ended in standing. At the conclusion, General Rutledge woke up his executive officer and they departed in a jeep for IV Corps Headquarters. They were immediately taken to the Commanding General, Major General (now Lieutenant General) Willis D. Crittenberger who lost no time in delivering his instructions. Briefly, the 45th Brigade was to abandon its antiaircraft artillery role, convert its forces into provisional infantry and field artillery units, and relieve elements of the 34th and 91st Divisions along the Arno River.

On the return trip to the Brigade C.P., the General and his executive were silent. The lazy Italian sunshine (and dust) did not encourage conversation or stimulate the mental processes required to convert old Coast Artillerymen into Doughboys. Coast Artillerymen have always been versatile and many unusual problems have been presented to them. But here was one that was without precedent and totally unexpected.

The 45th Brigade had been activated, organized, and trained at Camp Stewart, Ga. in the summer of 1942. After the usual Training Center duties, it arrived at Casablanca in the Spring of 1943, shortly before the close of the Tunisian Campaign. The Brigade Headquarters proceeded overland to Oran, reporting to the Commanding General Fifth Army for assignment. It was immediately given the responsibility for the antiaircraft defenses of Fifth Army and Base Port installations in the area from Beni Saf and Nemours to Tenes. This mission also included ground security of the Coastal Frontier of the Fifth Army area in North Africa. This was accomplished with its own forces and by liaison with the French Army and Navy units in the area and British Naval forces. A major victory was attained in bringing together for a common purpose, the French and British who had been very hostile towards each other up to this point. Cold French hostility and British austerity disappeared around the conference table through the efforts of good natured Americans. In a short time friendly relations were established and all elements cooperated fully in the common effort.

The Brigade was also responsible for the processing and equipping of all antiaircraft units arriving in the Fifth Army area, both from the States and from Tunisia. Many of the latter were returned for retraining and re-equipping. The Brigade Headquarters assisted the AA Officer, Fifth Army, in planning for the Sicilian and Salerno landings. During this period, the 45th Brigade became the Fifth Army Antiaircraft Command, the staff operating in a dual capacity as an Army planning staff and as a brigade operational staff. It organized and supervised the pre-invasion training of the antiaircraft units making the initial landing at Salerno and itself landed on the Salerno beaches on D plus 12 at which time it took over command of all antiaircraft units of the Fifth Army. The Brigade acted as the coordinating and liaison agency for the Fifth Army in its control of British Antiaircraft units and the total number of troops either under direct command or associated with it amounted to some 40,000.

This armored railroad car was originally a present from Hitler to Mussolini and was captured in the Naples area. It is armed at both ends with turret guns of German manufacture. This was one of the captured weapons manned by troops of the 45th

# of THE 45TH AAA BRIGADE

One of the first missions of the Brigade after its conversion to Task Force 45 was to send reconnaissance patrols across the Arno River in the general area shown in this picture.

During the next few months, numerous missions were performed including the responsibility for the antiaircraft defense of Naples. There the German bombers acquired a fondness for the Brigade Command Post and several times provided bomb craters close enough to make the digging of foxholes unnecessary. Attacks on the Port were frequent and much experience was gained in gunnery. Field Operations Room Detachments were formed and trained with the assistance of British units and much of our present doctrine for the coordination and control of antiaircraft is based on the work done by these detachments. A Fifth Army Firing Point was established and units withdrawn from combat positions were given an opportunity to brush up on their firing technique. After the fall of Rome, moves were frequent and the Brigade, now attached to the IV Corps, had the mission of protecting field artillery units as well as airfields and ports. A vast knowledge of field conditions had been acquired during these months; personnel had become hardened and equipment adapted to a fast moving situation; close contact with the IV Corps had made the Brigade conversant with the tactical situation; in short, the 45th Brigade was ready for one of the most unusual assignments ever given an antiaircraft artillery unit.

Conversion of units from antiaircraft to provisional infantry was initiated at once. IV Corps provided infantry officers to act as advisers for all units from brigade to company. Also attached were a photo interpretation officer, an engineer, Allied Military Government officials, and a prisoner of war interrogation team. Several infantry and field artillery officers were received from the Replacement Depot to fill vacancies in units and staffs. The Brigade Gunnery Officer became the Task Force Artillery Officer and other staff officers assumed corresponding positions. Key personnel were dispatched to the 34th Infantry Division Headquarters to absorb as much information as possible in the brief period available.

The 536th and the 898th Automatic Weapons Battalions withdrew from their antiaircraft positions and stored their guns in a rear area, leaving only a small maintenance detachment with the equipment. They adapted their structure of four firing batteries to the infantry design of three rifle companies and one heavy weapons company each. Rifle companies were equipped with eight Browning Automatic Rifles. Heavy Weapons Companies were equipped with six 81mm mortars, ten 30 caliber machine guns, and five 50 caliber machine guns. Instructors were borrowed from the 34th Division and familiarization firing conducted with all weapons.

On 25 July, the 435th and 439th Automatic Weapons Battalions began their conversion to provisional infantry. They were moved to a bivouac area near Livorno (Leghorn) while the 209th Group, the 105th and 401st Gun Battalions and the 630th and 900th Automatic Weapons Battalions were relieved from attachment to the 45th Brigade and assigned to the 71st AAA Brigade to continue antiaircraft missions.

The next day, IV Corps issued Field Order No. 6 which designated the 45th Brigade as Task Force 45 with the following troops:

Headquarters and Headquarters Battery, 45th Brigade
- 91st AAA Group
  - 435th AAA Battalion
  - 439th AAA Battalion
  - 673d Medical Collecting Company
- 107th AAA Group
  - 536th AAA Battalion
  - 898th AAA Battalion
  - 671st Medical Collecting Company
- Hq & Hq Co, 2d Armored Group
- 91st Cavalry Reconnaissance Squadron
- 751st Tank Battalion (—)
- Reconnaissance Co, 894th Tank Destroyer Battalion
- One Co, 805th Tank Destroyer Battalion
- One Btry (plus) 434th AAA Battalion
- 34th Infantry Division Artillery

The mission assigned by IV Corps was:

a. Relieve elements of the 34th Infantry Division and the 91st Infantry Division in zone and assume command of sector on Corps order.

b. Hold forward positions and conduct active patrolling in zone to prevent enemy infiltration.

c. Send small reconnaissance patrols across the Arno River to determine enemy strength and dispositions.

d. Maintain contact with Task Force Ramey.

e. Protect left flank of Corps.

f. Prepare to follow up any enemy withdrawal.

What other Antiaircraft Artillery Brigade had ever received such a mission? Here was a situation not covered in training camps nor in any literature from the AA Command. Both officers and men had been primarily trained in the defensive mission of shooting down enemy planes. The problem now was to convert overnight to assume an offensive role in a field far removed from previous concepts.

Not to be outdone by the IV Corps, the Brigade issued its Field Order as follows:

Troops.

91 AAA Group
435 AAA Bn
439 AAA Bn
Rcn Co, 894 Tank Destroyer Bn
673d Medical Collecting Co.
107 AAA Group
536 AAA Bn
898 AAA Bn
91 Cavalry Rcn Squad (–1 Troop)
671 Medical Collecting Co.
2 Armored Group
39 LAA Regiment (Br) (–1 Btry)
751 Tank Bn (–assault guns)
434 AAA Bn (–Det)
34 Infantry Division Artillery.

Missions.

a. *107 AAA Group*

(1) Relieve 168 Infantry during night of 26-27 July and 133 Infantry during night of 27-28 July.

(2) Protect right flank of Brigade, preventing any hostile penetration.

(3) Maintain contact with 91 AAA Group on left and Task Force Ramey on right.

(4) Send small reconnaissance patrols across ARNO RIVER to determine strength and dispositions.

(5) Prepare to follow up any enemy withdrawal in sector.

b. *91 AAA Group.*

(1) Relieve 135th and 363d Infantry during night 28-29 July.

(2) Protect Brigade left flank, preventing any hostile penetration.

(3) Maintain contact with 107 AAA Group on right.

(4) Send small reconnaissance patrols across ARNO RIVER to determine enemy strength and dispositions.

(5) Prepare to follow up any enemy withdrawal in sector.

c. *2 Armored Group.*

(1) Brigade reserve.

(2) Actively support Brigade by deployment of armor and by organizing Antitank defense with Co B, 805 Tank Destroyer Battalion and such other units as are available.

d. *34 Division Artillery.*

(1) Direct artillery support of Brigade.

e. (1) 536, 898, 439 and 435 AAA Battalions.
(a) Assume provisional infantry T/O at once.
(b) Assemble equipment not needed for infantry role at battalion rear echelon where only sufficient personnel will be left to provide security and maintain equipment.
(c) Continue intensive training in Infantry tactics, stressing defense of river line, scouting, patrolling and use of Infantry weapons.
(2) (a) No artillery fire will be placed on City of Pisa except on Brigade order.

Reliefs in accordance with the Field Order were accomplished with only minor incidents. Two men of one unit straggled behind and were promptly taken over by an enemy patrol operating in the area. The next heard from them was through the Red Cross from a prison camp in Germany; lessons like this were learned the hard way. At 0600 29 July, command of the sector passed to Task Force 45 and the Brigade was "in," for better or for worse.

During the month of August, the complexion of TF 45 changed rapidly and frequently. British antiaircraft units were added and converted into both provisional infantry and field artillery. Attachments and detachments took place but the over-all picture remained about the same. Close contact was maintained with the enemy who in this instance turned out to be the rugged and experienced 16th S.S. Division, a formidable foe for the new task force. The Arno River at Pisa is only about 100 feet wide. Buildings line both banks and while the Germans occupied strong

Troops of Task Force 45 commence the crossing of the Arno River on 1 September 1944.

points in houses on the north bank, TF 45 was likewise established on the south shore. Needless to say, both sides kept their shades drawn to discourage "window peeping." Frequent exchange of "calling cards" was maintained although physical accomplishment of social courtesies was extremely limited.

Other sections of the line presented a different aspect. Anchored on the left by the sea, the front wound along the river through open fields and thick woods. Patrols continuously made contact and in the resulting fire fights, casualties were received and inflicted. After walking into one enemy ambush, our patrols quickly learned the trick and set ambushes of their own which netted many prisoners. Mine fields and trip flares were installed and additional strong points constructed. Harassing the enemy was taken up with a vengeance. Between one and two thousand rounds of artillery were fired each day along with mortar and machine-gun action. The use of bazookas in destroying enemy strong points proved successful. Mortar fire was directed from Air O.P.'s, a new departure for the IV Corps.

Demonstrations by tanks and truck movements, erection of dummy bridges, and operation of bulldozers during the night were used to draw enemy fire and to keep him confused as to what was going on. A German mess line which was clearly visible from one of our O.P.'s was broken up daily. The climax occurred when one of our observers reported camels behind the German line. Investigation proved this to be correct—the camels were in a park which had been at one time part of the King's estate.

Men of the 435th AAA Battalion move through the archway of the wall around the Piazza del Duomo, location of the Leaning Tower of Pisa.

TF 45 had been instructed to be certain that no artiller fire was placed on the Leaning Tower of Pisa. We knew that the Germans were using it as an O.P. but little would be gained by its destruction. Several times daily, Fifth Army requested information as to the condition of the tower. The Brigade Commander developed strong legs in climbing hills and onto rooftops in order that he could personally reply to these queries.

Demolitions in the enemy-occupied section of Pisa were observed on the 30th and 31st of August and our demonstrations failed to invoke the usual enthusiastic response. Our patrols became exceedingly active and began crossing the Arno River in force. While the enemy was found to be still present, it appeared that his defenses had thinned. This was confirmed by civilian and partisan reports.

At noon 1 September 1944, TF 45 commenced the river crossing and the occupation of the north bank. The 100th Infantry Battalion composed of Hawaiian-Japanese troops was now attached to the task force and crossed on the right of the sector. Little opposition was met and the battalion advanced several miles. On the left, the 435th Battalion with several tanks supporting it, crossed into Pisa using assault boats and the remains of a demolished causeway. The tanks crossed at a ford which the engineers quickly improved just east of Pisa. Moderate artillery, with one particularly troublesome self-propelled gun and numerous mines and booby traps were the only opposition. The self-propelled gun was silenced by our tank destroyers which moved up in front-line support. By 1600 on 2 September positions in Pisa were fully occupied and the balance of the task force moved over. Much to our delight, the Leaning Tower was found intact. In true American fashion, a young lieutenant proceeded to raise our flag to the top of the tower as soon as he reached it. Thus was completed the first successful river crossing of TF 45. It should be remembered that although little opposition was encountered, this maneuver was accomplished by troops, most of whom had never before set foot in an assault boat. High praise was received from the commanders of both the IV Corps and the Fifth Army, who were very prompt in visiting our new command post in the University of Pisa. A small replica of the tower with a card suitably inscribed was sent to the Commanding General, IV Corps to report the mission successfully completed.

It became apparent that the withdrawal from the Arno River line was part of the German plan to occupy the Gothic Line for the winter. Numerous reports were received of the large scale construction of positions in the hills. However, the enemy was in no hurry and he seemed content to fall back slowly as pressure was applied and to inflict as many casualties on our forces as possible. Our artillery kept him under cover a greater part of the time and hindered his movements. He retaliated by shelling the TF 45 Command Post with a 280mm railway gun. This became very disconcerting especially when the huge shells commenced to bracket the Command Post.

A repetition of the Arno River crossing was effected at the Serchio River on the night of 8-9 September, and by the 12th, patrols had reached the southern part of Viareggio. A canal on this edge of town presented a major obstruction since all bridges had been destroyed. Temporar

Reinforcements move up the ridge into line against the enemy who was hurled from Mt. Belvedere. In the background is the summit of the mountain.

crossings were established and the occupation of the town began on 15 September. The Command Post of TF 45 was moved up and all personnel were very happy to get away from the shelling of the 280mm gun. Progress was made for a few miles north of Viareggio until the outposts of the Gothic Line were reached. Here we discovered that the Germans had decided that we were to go no farther. Frequent attempts to occupy forward positions were met with determined resistance and the Brigade received instructions to hold what it had. Existence in this area was extremely hazardous. Constant shelling was received from the German positions on the Gothic Line; mine fields were thicker than in any other locality in which we had been; patrol action was sharp and eternal vigilance was essential.

From 1 October to 3 October, TF 45 operated with the Brazilian Expeditionary Force as part of Task Force Dutra under the command of the present President of Brazil, Major General Enrico Gaspar Dutra. General Dutra was at that time the Brazilian Minister of War. Advance elements of the 92d Infantry Division arrived in the sector during this period and in the course of the next two weeks, TF 45 was replaced piecemeal until all elements had been relieved and command had passed to the Commanding General 92d Division. TF 45 was inactivated and all troops were detached.

A well earned rest was being enjoyed when the Corps Commander decided to reconstitute TF 45 in the San Marcello area. The mission consisted of holding positions in a sector in the Apennines from Bagni de Lucca to Campo Tizzoro. Troops consisted of the 107th AAA Group with the British 39th, 47th and 74th Light AA Regiments acting as infantry and the British 80th Heavy AA Regiment as artillery. American AA units together with the 2d Armored Group were also made available and the sector was extended to the right. Coordination of partisan activities in this area added to the complexity of operations.

The Germans had executed their demolitions here with a vengeance. Hardly a road was passable and bridges were almost nonexistent. Movement of vehicles was restricted to a standstill and it was necessary to employ pack mules to supply food and ammunition to many positions. An Engineer force was constituted using Italians for laborers. They accomplished miracles in the construction of roads and bridges with improvised materials and a paucity of tools.

By mid-November, the sector had been organized to such an extent that the Corps Commander decided to stage an offensive against Mount Belvedere, a critical terrain feature which afforded the Germans direct observation of our positions. Four battalions with supporting troops were made available to accomplish this mission. These were the 435th AW Battalion; the 2d Battalion, 370th Infantry and two battalions of Brazilians from the Brazilian Expeditionary Force. Light and medium tanks plus some tank destroyer units were also attached. The attack moved at 0600 24 November 1944 under the direct control of the 2d Armored Group. The morning was cloudy and misty which prevented anticipated air support and limited artillery observation. By evening, the 435th Battalion on the left had reached its objective, the 2d Battalion, 370th Infantry had made some progress in the center, but stiff resistance on the right had prevented the Brazilians from making any advance. Positions were consolidated and about midnight a German counterattack was launched on the positions of the 435th AW Battalion.

A well known figure by the name of Captain Straube

participated in this counterattack. Reliable information indicated that he was taking every opportunity to demonstrate his fitness for promotion and to acquire decorations. His zeal in leading counterattacks had gained him the admiration and respect of some of our best troops. On this occasion, the maneuver was executed at about company strength with Captain Straube urging on his men with pistol, hand grenades, and shouts of "Heil Hitler." Our positions held, however, with fourteen Germans taken prisoner, six killed and ten wounded. The enemy withdrew and on the next day, our advance continued with the 435th reaching the crest of Mount Belvedere. Similar progress was not attained in the center or on the right so the 435th was instructed to dig in to hold their positions while assistance was given along the rest of the line. Several attempts to push up the hill were frustrated by intense German resistance.

A counterattack in battalion strength was launched on the 435th positions during the night of 28 November. The enemy used large scale artillery support and tanks to force the 435th out of its positions. Heavy casualties were suffered and the battalion was forced to withdraw to its original positions after giving an excellent account of itself against superior odds.

During the Mt. Belvedere operations, the central and left sectors of TF 45 had not been without activity. Artillery duels and patrol clashes were frequent. Antiaircraft artillery officers, both American and British, became adept in leading patrols far into the enemy territory. Prisoners were obtained and much valuable information acquired on the condition of roads and trails. Italian partisan activity was also notable. On numerous occasions, results of our artillery firing were reported in localities where direct observation was impossible, by partisan bands equipped with portable radio.

Information of a Christmas offensive by the Germans was received as the holiday season drew near. For TF 45, the holidays were taken up with various demonstrations to simulate major activity throughout the sector; demolitions were prepared and plans for stopping the expected offensive were developed. The situation became increasingly tense and a regimental combat team from the 85th Infantry Division was moved into the area. However, nothing unusual developed and a major portion of the time was spent in extra patrolling and preparation of defensive positions. When the threat of large scale action had waned, the 85th Division troops were released and returned to their normal sector.

Plans for inactivation of the 45th Brigade Headquarters had been delayed for some time by the Corps Commander. Early in January, however, the arrival of the 10th Mountain Division made it possible to relieve the Brigade and command of the sector passed to the 10th Mountain Division on 9 January. Members of the Brigade Headquarters continued on duty with the division for several weeks pending the receipt of inactivation orders. For security reasons, the Task Force 45 designation was retained by the 10th Mountain Division but the Brigade was formally inactivated on 13 February 1945 at a ceremony conducted by the Corps Commander.

Task Force 45 was a polyglot task force of American and British antiaircraft gunners acting as infantry, with Italian Partisans, Brazilians and colored American troops fighti by their side. Its artillery were the antiaircraft guns point earthward, the guns of tanks and of tank destroyers and captured German weapons. Its engineers were Italian civ ians who were not afraid to work within the sound of gu and who built well. Much was done with little. Britis Tommies who rode forward on American tanks, wi American mortars behind and American engineers ahe and the Yanks who stepped out of their foxholes wi British artillery pounding protection behind, with Italia at their side and out ahead and with Brazilians on the flanks, learned that different peoples can fight well togeth

During its operation, Task Force 45 had at varying time 3000 to 8000 men attached from the following units:

AMERICAN UNITS

AA Units

45th AAA Brigade, Headquarters and Headquarters Batte
45th AAOD
91st AAA Group
107th AAA Group
Battery C, 351 AAA Searchlight Battalion
403d AAA (G) Battalion
434th AAA AW Battalion
435th AAA AW Battalion
439th AAA AW Battalion
Battery C, 450th AAA AW Battalion
536th AAA AW Battalion
898th AAA AW Battalion
900th AAA AW Battalion

FA Units

194th Field Artillery Group
424th Field Artillery Group
Battery C, 194th Field Artillery Battalion
338th Field Artillery Battalion
598th Field Artillery Battalion
Battery C, 697th Field Artillery Battalion
910th Field Artillery Battalion

Tank & AT Units

2d Armored Group, Hq & Hq Co
1st & 2d Platoon, Company D, 13 Tank Battalion
2d Platoon, Company B, 13 Tank Battalion
751st Tank Battalion
755th Tank Battalion
805th Tank Destroyer Battalion
894th Tank Destroyer Battalion
91st Cav Rcn Squadron
Troop A, 81st Cav Rcn Squadron

Miscellaneous Units

84th Chemical Battalion
179th Chemical Company
34th War Dog Platoon
62d Signal Battalion (4 crews)
1st Plat, Co C 310 Engineer Battalion
Company C, 310th Medical Battalion
671st Medical Collecting Company
672d Medical Collecting Company
673d Medical Collecting Company
615th Medical Clearing Station

Infantry Units

00th Infantry Battalion
39th Infantry Regimental Combat Team
70th Infantry Regimental Combat Team
5th Mountain Infantry Regiment
6th Mountain Infantry Regiment

Brazilian Units

d Battalion, 6 Regiment
d Battalion, 6 Regiment
st Battalion, 1 Infantry Division
econnaissance Troop, 1 Infantry Division

British Units

AA Units

9th LAA Regiment
7th LAA Regiment
l Troop, 167/56 LAA Regiment
1st HAA Regiment
3d HAA Regiment
4th HAA Regiment

Italian Units

3rd Artier Regiment (Engr)
th Mule Pack Co

It covered fronts of from 12 to 25 miles, both mountainus and on the coastal plain and it advanced its initial front venty miles from the line of the Arno River and Pisa to he Gothic Line. It suffered these casualties:

	Killed	*Wounded*	*Missing*
ULY	12	22	1
UGUST	23	124	2
EPTEMBER	23	107	17
CTOBER	3	16	4
OVEMBER	17	137	69
ECEMBER	4	23	18
NUARY	5	23	..

The scope of the Task Force's operations was epitomized the Corps Commander's official commendation of 10 ebruary 1945:—

HEADQUARTERS IV CORPS
THE COMMANDING GENERAL

10 February 1945

UBJECT: Commendation.

O : Commanding Officer, 45th AAA Brigade, APO 464, U. S. Army

1. Upon the occasion of the inactivation of the 45th AAA rigade, I consider it a duty as well as a privilege to enter pon the records my official commendations for the distinuished contribution it has made to the Allied war effort in aly. During the eight months period in which the 45th AAA Brigade has been a part of the IV Corps, it has successfully executed a wide variety of missions over varied terrain and under all conditions of weather.

2. Although not organized, trained and equipped to do so, it has nevertheless functioned in a role similar to that of a combat division in battle. The changes and improvising necessary to facilitate the use of an Antiaircraft Artillery Brigade Headquarters in the capacity of a division headquarters were accomplished with efficiency and dispatch while in constant contact with the enemy.

3. During the time the 45th AAA Brigade Headquarters fought as a part of the IV Corps, it operated not only as an Antiaircraft Artillery Brigade Headquarters in a fast moving situation, but also assumed the duties of a Task Force Headquarters which through meritorious performance has established an enviable reputation among the allied troops in Italy.

4. The wide scope of its effectiveness is best indicated by the success of its distinguished commander, Brigadier General Paul W. Rutledge, in directing operations involving technical employment as antiaircraft; and command of ground troops engaged in the pursuit of the German Army north along the Tyrrhenian coast, the occupation of a defensive line along the Arno River, the subsequent crossing of that river, the capture of Pisa, Viareggio and other Italian cities, and the more recent winter operations in the Apennine Mountains.

5. The flexibility and commendable performance of this headquarters is also indicated by the fact that the troops available to it constantly changed, and included both British and American antiaircraft units operating initially in their characteristic role and later as infantry; tanks, tank destroyers, infantry, engineers and all types of artillery.

6. The conversion of American and British antiaircraft units from their antiaircraft duties to the role of infantry and artillery in support of ground troops, which conversion was accomplished while in contact with the enemy along the front lines and without any preliminary preparations, can be recorded as a noteworthy example of American ingenuity and improvisation.

7. In every way this organization has lived up to the high traditions and standards of the United States Army. It is therefore with considerable gratification that I look back on this successful and very satisfactory association of the IV Corps with 45 AAA Brigade Headquarters in the campaign of Allied armies in Italy in 1944-1945.

8. As they go forward to other duties, all personnel, enlisted and commissioned, who have been on duty with the 45th Brigade Headquarters during its participation in the IV Corps pursuit of the enemy from North of Rome into the Apennines, can have a justifiable pride in the part they have played in the success of the Allied Armies In Italy.

WILLIS D. CRITTENBERGER,
Major General, U. S. Army,
Commanding

THE EARTH'S ATMOSPHERE

By Dr. R. J. Havens

Owing to the recent great development of high speed, high altitude, jet propelled missiles, more and more demand has arisen for information on the properties of the atmosphere up to altitudes of 100 miles or more. Although the density of the atmosphere is very low above 30 miles, it is still high enough to affect the trajectory of long range supersonic missiles in addition to the effect of the ionization above 30 miles upon the radio control of such missiles. For these and other reasons, the armed forces are making an extensive study of the upper atmosphere.

We are today comparatively well informed about the mean state of the atmosphere up to about 20 miles. Pilot balloons released at the surface of the Earth and observed with theodolites give (by means of radio signals from the balloon) temperature, pressure and wind velocities up to about 20 miles. However, until recently, information about the atmosphere above 20 miles was obtained only by indirect experiments, such as the observation of meteorites. Since the interpretation of the data obtained from indirect experiments is open to argument, the recent use of the V-2 rocket in upper air research is considered very important. The pressure and temperature data shown on the chart were obtained from a V-2 flight and from balloon flights made on March 7, 1947. *These values may be considered as average pressures and temperatures.*

The following is a summary of the present knowledge about the Earth's atmosphere and its effect on aircraft:

Composition

The Earth's atmosphere is composed of about 77% nitrogen, 21% oxygen, 1% argon and 0.03% carbon dioxide. Helium, hydrogen and neon are present in small and relatively unimportant quantities. Although the average amount of water vapor is less than 1%, it varies between 0.01% and 10%, depending upon locality, temperature and altitude. Except for water vapor, the relative amounts of various gases in the atmosphere do not change by an appreciable amount in the first 100 miles. However a small but very important per cent of the oxygen is in the form of ozone (O_3) between 15 and 40 miles, while at much higher altitudes, it is believed that molecules of oxygen and perhaps nitrogen break up into atoms of oxygen and nitrogen.

The composition of the atmosphere is not only important because all of the major constituents are essential to life on this planet, but because of the effect of composition on the Earth's temperature.

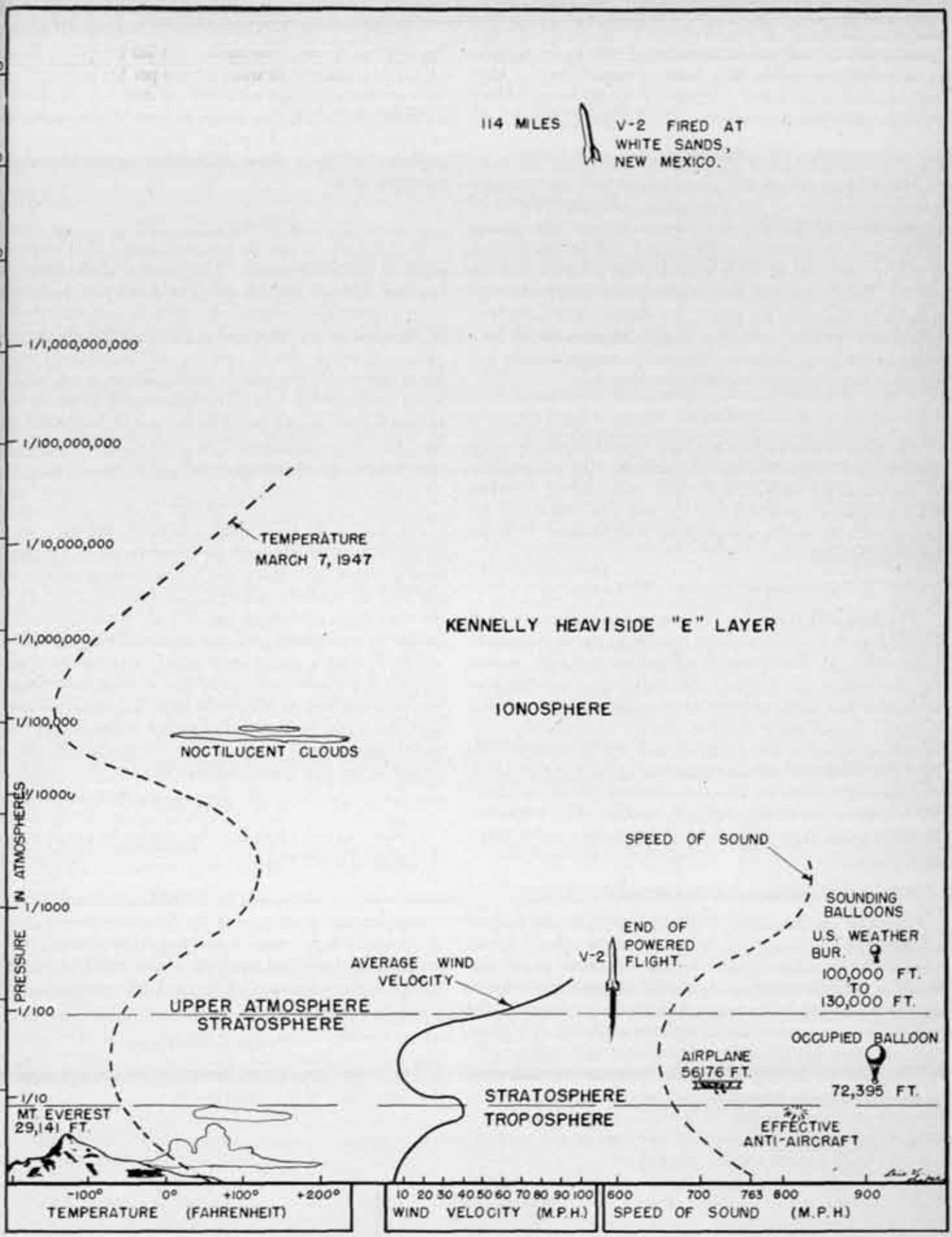
Temperature

The temperature of the moon will vary from about 250° F. in the daytime to several hundred degrees below zero at night. On the Earth the variation will range from a few degrees in some localities to as much as one hundred degrees in other localities. In contrast with the moon, the Earth's atmosphere acts as an insulating blanket, tending to minimize the daily variations in temperature. However, the *average* temperature of any planet depends primarily upon the radiation received from the sun. The radiation falling on one square inch of the Earth's surface at normal incidence is 0.86 watts. Most of this energy is in or near the visible spectral region. The Earth's surface and atmosphere reflect part of this energy and absorb the rest, which is then reradiated in the long, infrared region of the spectrum. If the reflectivity of the Earth were the same in the infrared as in the visible, then the average temperature of the Earth would be 40° F. The variation of the reflectivity and absorptivity with spectral region of the clouds, ozone, water vapor, carbon dioxide and the Earth's surface will change the above calculated temperature. Since the average temperature of the Earth is 60° F., the atmosphere is responsible for a relatively small but very important increase of 20° F. in the Earth's temperature.

Although the average temperature of the Earth is 60° F. there are large daily, seasonal and geographical variations from this temperature. The presence of water vapor and clouds in the air reduces the daily variations, while the circulation of the atmosphere (winds) reduces the seasonal variations. The change of the temperature with altitude is explained as follows:

Since the air is quite transparent most of the sun's radiation is absorbed at the surface of the Earth, where the air is warmed by convection, rises, and cools by expanding at the higher altitudes. At 100° F., saturated air at the Earth's surface will be 6% water vapor, while at 32° F. this will decrease to 0.6%. Consequently water will condense out of saturated rising air currents forming clouds of tiny water drops. These water drops will fall back to Earth unless the rising air currents are strong enough to keep them suspended. As long as the temperature decreases with altitude, rising air currents and consequently clouds can exist. (*By noting the temperature curve, it is apparent that clouds may form between the altitudes of 0 to 15 miles and 35 to 50 miles.*) However, at about eight miles altitude, the absorption of the sun's ultraviolet radiation by ozone becomes strong enough to heat the air appreciably, so that the temperature gradient becomes less negative (see chart) above eight miles. Without strong vertical winds, clouds rarely form in the region between 8 and 15 miles, and never form between 15 and 35 miles where the temperature increases with altitude. The noctilucent clouds at 50 miles are supported by the strong vertical currents in this region. Above 50 miles the absorption of short ultraviolet radiation by oxygen apparently increases the temperature.

Although the temperature of the air surrounding the Earth is high at certain altitudes this does not mean that



CHARACTERISTICS OF THE EARTH'S ATMOSPHERE

would be uncomfortable to travel at these altitudes. At high altitudes, the density of the air is so low that the actual temperature of any body will be determined only by the amount of radiation received by that body. Temperatures at high altitudes (above 35 miles) are important only in explaining other physical phenomena.

Pressure

The air pressure on any planet varies with the temperature, composition of the atmosphere, the acceleration of gravity and the altitude. On a warm planet, other things being equal, the pressure at the surface will be less than on a cold planet and at high altitudes the pressure will be greater. On the average, the air pressure on the Earth drops a factor of ten every ten miles (see chart). If the acceleration due to gravity were ½ as large, the drop would be a factor of ten every 20 miles. Where the temperature is low the pressure drops more rapidly (see chart).

Sound

The speed of sound in a medium depends upon the composition and temperature of the medium. The composition of the Earth's atmosphere changes only slightly between sea level and 50 miles so that the speed of sound will increase with increasing temperature and decrease with decreasing temperature.

Kennelly-Heaviside "E" Layer

The Kennelly-Heaviside "E" Layer is a region in which charged particles exist in large numbers. At an altitude of sixty miles the absorption of ultraviolet radiation ionizes the atmosphere (*i.e. it causes electrons to be separated from molecules and atoms thereby leaving them with a positive charge*). An effective electron density of about 3×10^5 electrons per cubic centimeter in this region is responsible for the reflection of ordinary radio waves back to the Earth. At about 100 miles an effective electron density of about 10^6 electrons per cubic centimeter exists. The ionization in these layers varies with time of day, season and sunspot activity.

Airplane Altitudes

The "lift" on the wings of an airplane is directly proportional to the air density and the square of the velocity of the plane. At 10 miles altitude the density of the air is one-tenth as great as at sea level. At this altitude the velocity of the plane must be about three times as large as the velocity necessary to maintain flight at sea level. If a plane has a landing speed of 50 miles per hour, it should be able to maintain an altitude of 10 miles at about 150 miles per hour. Its ability to maintain this speed in the thin atmosphere is a question outside the confines of this discussion.

A plane powered by a rocket motor and capable of traveling 2000 miles per hour could maintain itself at 20 miles (100,000 ft.) if the landing speed was 200 miles per hour. This assumes that the equation for "lift" is the same for supersonic speeds as for subsonic speeds, although this is not exactly correct. However, it is expected that rocket airplanes will fly at about 80,000 feet at speeds near 2000 miles per hour.

Balloon Altitudes

In a balloon it can be assumed that inside pressure is equal to outside pressure. The density of air at sea level is about 0.06 lb. per cu. ft. The density of hydrogen is 1/16 as great and a lift of over 0.05 lb. per cubic foot can be expected at sea level and a lift of .00005 lb. per cubic foot at 30 miles. At 30 miles, a 100-ft. diameter balloon has a lift of 50 lbs. and a 50-ft. balloon a lift of 6 lbs. Since the materials in a 50-ft. balloon will probably weigh at least 6 lbs., an altitude of 30 miles is probably the upper limit for sounding balloons. In practice, sounding balloons have reached an altitude of around 25 miles.

Rockets

For rockets to reach high altitudes, the ratio of fuel weight to total weight must be large. In the V-2 rocket this ratio is about 0.7. Since the V-2 was designed to carry a pay load of one ton compared to a total weight of 13 tons, the maximum altitude of the V-2 (114 miles) can be exceeded by rockets designed to carry smaller pay loads.

The V-2 has a maximum velocity of about one mile per second. It is theoretically possible to build a multiple rocket in which the final rocket would leave the Earth. About the most that could be expected of such a rocket is that the last rocket fired would weigh about 50 pounds if the total weight of the multiple rocket was 10 tons.

Troposphere

"Tropo" means change. The troposphere is the region of changing weather.

Stratosphere

Stratum means non-changing. Stratosphere is the region of constant temperature. It was originally assumed that the temperature remained constant above eight or ten miles, but with the utilization of the V-2 for meteorological research this theory has been proven incorrect.

Upper Atmosphere

The upper atmosphere extends from the stratosphere to the upper limit of the atmosphere.

Warheads For Guided Missiles

By Harold S. Morton

The purpose of weaponry has always been to lengthen and strengthen the arm of the user. The rock in the hand of primitive man added strength to his blows; the club or stone axe increased both striking power and reach. The bow and arrow greatly multiplied the effective striking distance of the spear.

Guided missiles constitute a new type of vehicle for lengthening the arm of the user; but the strength of the blows which they can deliver depends on the nature of the warhead, and on how accurately it is delivered to its intended target. The payload of a guided missile is its warhead, and the justification for its employment lies in the ability to deliver this payload to a point from which significant damage can be inflicted on the target. The interdependence of guidance accuracy and warhead design will be considered later after a discussion of the purposes for which warheads may be required, and some of the types of warheads which may be used.

General Classification

Missiles may be launched from ground, ship, or aircraft, against targets on land, sea, or in the air. The design of the missiles themselves is rather closely related to the source from which they are launched; but the warhead characteristics depend more on the target than on the sources. Such differences as may exist between the warheads of missiles launched from different sources, but against similar targets, will depend on the tactical conditions of employment and on the expected accuracy of guidance to target.

Warheads are classified according to the type of target, as:

a. Antiaircraft
b. Anti-ship
c. Anti-ground

Under each generic type will be found several subdivisions which, in general, present a variety of problems to the warhead designer. Some targets are more difficult to damage than others. Some can be effectively dealt with by one type of warhead, while others require an entirely different technique of inflicting damage. Antiaircraft missiles must be prepared to attack:

1.—Subsonic piloted aircraft
2.—Supersonic piloted aircraft
3.—Subsonic pilotless aircraft
4.—Supersonic pilotless aircraft
5.—Other miscellaneous airborne missiles ranging from self-propelled or glide-bombs to free falling projectiles consisting of little more than a heavily armored case protecting some type of lethal payload.

Anti-ship missiles must carry to their targets warheads suitable for damaging or destroying:

1.—Armed and armored surface fighting craft
2.—Submarines
3.—Merchant shipping
4.—Other miscellaneous craft and floating installations.

Anti-ground target missiles will be required to attack a far greater variety of targets than either of the preceding categories. Targets heretofore attacked by all types of projectiles from hand and rifle grenades to artillery shells and aircraft bombs now become targets for guided missiles. The types of warheads become as diversified as the character of the targets which must be defeated.

Certain general types of destructive elements which may be employed are:

1.—High-explosive fragmentation
2.—High-explosive blast
3.—Inert armor-piercing heads
4.—Incendiary materials
5.—Chemical agents
6.—Fissionable materials

This is not necessarily a complete enumeration of destructive agencies or methods which are applicable to special targets. For obvious reasons it is not practical to discuss here the detailed application of these principles to specific targets; but certain general conclusions as to how selections should be made will be drawn.

Correlation Between Guidance and Warheads

It is not the purpose of this article to dwell on guidance problems; but it is necessary to point out that a certain minimum degree of accuracy is prerequisite to any economically sound employment of guided missiles as weapons of destruction. The belief that indefinitely increased size and/or potency of warheads can fully compensate for misses of any magnitude is fallacious. It is true that the size and general characteristics of any particular warhead design must be chosen on the basis of the expected guidance accuracy; but it turns out that for any expected miss distance there will be an optimum warhead size above which it is not profitable to go. Rather elementary studies show that we usually reach a point where for the same expected accuracy of guidance, two smaller warheads give a higher over-all probability of damage than a single one twice as large.

It therefore appears that it is just as bad to make the warhead too big as it is to make it too small. If it now turns out that even the optimum warhead for the expected accuracy has such a low probability of damage that a pro-

hibitively large number of missiles is required to achieve the required results, improvement must be sought through better guidance which leads to smaller average misses.

Efficiency of Guided Missiles

The evaluation of guided missiles and their comparison with other projectiles which may compete with them in particular functions is based, in the last analysis, on logistic considerations. We undertake the destruction of certain targets at a cost which may be calculated in any one or all of the following terms:

1.—tonnage of missiles expended
2.—ton-miles of transportation required to support this expenditure of missiles
3.—man-hours of productive capacity required to produce the missiles expended

The relative importance of these factors will be given appropriate weighting in any evaluation in accordance with the prevailing tactical and strategic situation. For example, on shipboard, number one is an important factor. On a foreign shore, number two is critical, but becomes less important on home territory. In an all-out war of attrition, number three may be the final determining factor. In deciding whether a particular design of guided missile is the preferred solution to a given problem of target destruction, the above yardsticks must all be used.

General Design Considerations

The design of the warhead starts out as a terminal ballistics problem in which one evaluates all possible means, or combination of means, of inflicting damage on a particular target from a point adjacent thereto and at a probable distance which must be assumed as one of the design factors. At this point the nature of the missile which carries the warhead to destination is of no concern except insofar as it affects the direction and velocity of approach and the probable magnitude of the miss.

An imaginative approach to the problem is very essential in order to avoid following conventional precedents which do not necessarily lead to optimum designs. One must be prepared to take advantage of the low launching accelerations of guided missiles, which give a freedom not enjoyed by the designer of artillery or mortar shells. The characteristics of targets must be re-examined to determine whether their evolutionary development is making them more or less vulnerable to conventional methods of attack, and whether they are developing any potential weaknesses to heretofore unexplored techniques for damage. The velocities of both missiles and targets (in cases where the latter are mobile) must be studied to determine whether constructive use can be made of the closing speed in augmenting the warhead's effectiveness.

The foregoing discussion applies particularly to the antiaircraft problem. This is one of the earliest uses for which the development of guided missiles was initiated. The purpose is to extend the range of effective antiaircraft fire beyond the useful limits of artillery shells or other unguided projectiles. The outstanding advantage which the guided missile enjoys is the elimination of dead time and time of flight of the projectile as sources of error. It can correct its course during flight to match the motion of the targe whereas the unguided missile is committed to a precalc lated course before it is launched, and cannot correct fo subsequent target maneuvers.

The antiaircraft targets of the immediate future will fo a while continue to consist principally of more or less con ventional types of subsonic piloted aircraft; but in the futur we may expect piloted and unpiloted aircraft in both sub sonic and supersonic speed ranges, plus many new types o missiles, guided or unguided, self-propelled, gliding, o free-falling. Each presents its particular problem to th warhead designer, and makes it necessary to investigat many techniques for target destruction.

Naval warfare during World War II was characterized from the beginning by the frequency and marked success o attacks on ships from the air. Techniques for such attack against vessels of all kinds are well developed. The genera character of sea-borne targets is not changing nearly a rapidly as air-borne targets. Guided missiles will delive payloads similar to those carried in the past by piloted air craft, and will attack vessels with hull-piercing missile above the water line, with high-explosive charges below th surface, and with the various other devices which have proven their worth with piloted aircraft. The difference will be that the delivering vehicle need not necessarily re turn from its mission.

It is difficult to define the scope and character of war heads for use against ground targets, since the latter are so diverse in character. Every objective heretofore attacked by any type of land, sea or air-borne weapon may con ceivably become a legitimate target for air-borne guided missiles. The list ranges from personnel and lightly ar mored mobile military equipment to the most massive for tifications. It embraces industrial production centers and transportation facilities, sources of strategic materials and of food supplies. Both tactical and strategic targets must be sought out and neutralized.

In this group of targets more than any other the desig of a particular warhead is truly a problem in terminal bal listics. Whether it reaches its objective traveling on the ground or in the air is incidental; it must be designed to inflict maximum damage to the target if delivered within a specified probable distance therefrom, using whatever method seems best fitted to the particular conditions.

It is not practical at this time to discuss specific applica tions in detail or to draw any comparisons between different principles of operation in cases where two or more are ap plicable to the same target. Suffice it to say that these de tailed studies and comparisons are being made, and the economics of guided missiles is being most carefully com pared with that of other existing or potential weapons which can be used against any of the same targets. For example one critically examines the relative usefulness of guided missiles vs. bombs dropped from conventional aircraft when either can be used. Of course the ultimate guided missile will reach targets which no other weapon can reach. In such cases the only yardstick is an appraisal of the absolute expected cost of obtaining the expected results.

In conclusion, it is again pointed out that the warhead and the results which it can achieve at the target, constitute the only justification for building and flying guided missiles

THE FUTURE OF THE COAST ARTILLERY

By Colonel D. W. Hickey, Jr., CAC

It appears that the various artilleries of the United States Army may soon be merged into one artillery corps. From 1907 until today the artillery has been divided into the Field and Coast Artilleries, and since the beginning of World War II, the Coast Artillery has been unofficially divided into the Antiaircraft Artillery and the Seacoast Artillery. The pending merger, along with the probability that orthodox cannon may be outranged by a new type of weapon, brings up the question: "What is the future of the Coast Artillery Corps?"

There is little question as to the future of the Antiaircraft Artillery. That branch will continue to fire primarily against airborne targets. The Field Artillery will continue to support the Infantry. The question is whether or not the Seacoast Artillery will continue to provide protection for the harbors and vulnerable coast line of this country. Will it continue its planning for frontier defense in future wars as it did prior to 1941?

The questions posed above must be answered in the affirmative if several other more obviously pressing questions are also to be answered in the affirmative. For example, we ask, must we provide protected harbors for our Navy, in which it can refit, refuel, rest and take refuge in case of need; must we provide strong points along the seaward frontiers around which mobile forces can be brought to repel invasion; must we provide means for striking an enemy above and below the surface at long ranges; must we deny a harbor to an enemy intent upon invading our land? If the answer to this compound question is to be yes, in whole or in part, then it appears that the Seacoast Artillery is still a vital part of our system of national defense.

The Coast Artillery Corps has always been ready when called upon to attempt the new and unusual. It has met and solved problems involving the submarine mine, antiaircraft artillery and other most intricate mechanisms of warfare as they came along to be dealt with. It will be ready again, when its capacities must be tried against the tougher and even more specialized problems sure to be a part of any future war.

The principle of seacoast artillery firing has been the placing of a volume of fire upon a moving and maneuvering target, located on the surface of the water, with a minimum number of guns. The nature of this problem has been such that precision of fire was of necessity the first consideration. Because the Coast Artillery Corps cannot have as many guns as it would like to have, and because it must be able to fire upon more than a single target at one time, the objective of fire is maximum result with minimum equipment. Hence the stressing in the Coast Artillery Corps of the development of precision. Hence also a concentrated effort toward the delivery of maximum fire per gun.

In France, during World War I, the Coast Artillery Corps handled mobile artillery of 155mm caliber and greater. In addition it handled the antiaircraft artillery and trench mortars. Precision methods in that war, and to a greater extent in World War II, made it possible, with a few mobile guns, both seacoast and antiaircraft, to execute artillery missions satisfactorily, quickly and with a minimum use of ammunition. Since World War I, the Coast Artillery Corps has dropped its work with trench mortars, but has developed antiaircraft artillery to such an extent that during World War II it had the best in the world.

Applying the principles of automatic fire control, which it learned in developing antiaircraft artillery, to the problem of seacoast firing, it has succeeded in producing gun data computers which appreciably increase the precision of seacoast artillery fire.

The Coast Artillery Corps has taken a prominent part in the development and use of general surveillance and fire control radar. The radar-director combination, applied to the antiaircraft problem resulted in unbelievable numbers of enemy aircraft shot down. It has applied the new medium to search, location, fire control and the spotting of shots.

The Seacoast Artillery has fired at hostile seacraft in various parts of the world. Corregidor, of course, is the classic example of the worth of seacoast defenses. By its stubborn resistance, using its antiaircraft, seacoast guns and submarine mines against the enemy in whatever form of attack he chose to adopt, the flag was kept flying over the Philippine Islands for many months longer than it otherwise would have been. Because of our readiness for combat, our ability to fire with effect upon hostile air, land, surface and subsurface craft, enemies have avoided our harbors.

Throughout history and throughout the world, harbors have, when properly defended been taken only from the rear. Singapore, Port Arthur, Corregidor, Brest and Le Havre, all were taken by combined arms from the rear. The denying of our harbors alone would be sufficient reason for the maintenance of harbor defenses in some form.

A merger of the artilleries is sensible. The Artillery, as a single corps or branch, can do better the work which has in the past been done jointly by the Field and the Coast Artilleries. For the past forty years there has been cooperation between the branches, but it is logical to assume that a single artillery, under a single leader, would further promote the internal harmony essential to the accomplishment of any task in which many must work toward a single end. Under such a plan there would be no contingency of independent research and development. There would be no duplication of production or procurement. There would be integration of thought and opinion.

The mission of the Artillery will, for the time being, remain very much as it has been. There will be the problem of fire in support of the Infantry, which will include the location of targets and the adjustment of fire using radar and other means. There will be the task of firing upon objects moving through the air at supersonic speeds. There will be the job of firing upon water targets at greater and greater ranges, and upon targets which approach under the surface. There will be the responsibility of assisting in the development of new type weapons and, later, in the working out of techniques for the operational use of such new weapons. All of these tasks will be primarily those of the Artillery.

As the work becomes more and more technical, it will be less and less possible for troops to learn all the techniques necessary to the Artillery. In the lower ranks, officers will *initially* become expert in only a part of the whole. Later these same officers will learn to command units trained in any of the specialties of the Artillery. Our educational trend lies in such a direction. A young officer at this time starts his educational career by attending the school at Fort Sill. He goes also to Fort Bliss for training in antiaircraft. He will naturally gravitate toward whichever of these arts most appeals to him. Later, he may attend the school at Fort Winfield Scott and learn the techniques of seacoast artillery.

A few other questions are being asked by those who are thinking of the future role of the artillery in national defense. What should be done with Coast Artillery gun batteries? Should they be retained or scrapped? If and when we get a new weapon, able to challenge an enemy vessel equipped with similar new weapons, will there be a place for what we have termed orthodox cannon?

In antiaircraft firing we have recognized that there are zones in the air surrounding the defended area which require different types of cannon. For the longer ranges, heavy cannon have been considered necessary. For inner zones the cannon are too cumbersome and machine guns on multiple mounts had to be used. An intermediate zone, in which neither cannon nor machine guns were ideal, was taken care of with the 40mm automatic cannon. Similarly in the engagement of an enemy fleet there will be zones of action for different types of weapon. It appears from the accuracies which we now get from experimental types of weapons that, for the close-in engagement, a weapon of great accuracy and hitting power may still be necessary. We have such a weapon in the present modern seacoast gun. Would it not be wise to retain the present armament until such time as it is certain that they can be replaced by a better in-fighting weapon?

It is presumed that in future wars, the harbor defenses will be manned almost entirely by troops of the civilian components. Such a plan will work if, during peacetime, these troops have the opportunity to train properly. Not only must they be trained in the firing of guns, rockets, submarine mines, guided missiles, or whatever the weapon to be used, but the higher commanders must be taught the tactical handling of troops in a seacoast artillery role. Let those who are in the harbor defenses today not repeat the error of permitting the higher commanders and staffs of the civilian components to enter upon their wartime assignments without having had suitable training beforehand. We must war-game our war plans in time of peace, with the future wartime commanders and staffs taking their proper places. Only with such preparation will these troops handle their jobs without confusion.

The question, then, of "What is the future of the Coast Artillery Corps?" seems to have answered itself. The combined artillery corps of the United States Army must, to accomplish its mission, retain the skills, arts and abilities of every present-day artillery branch and technique. It must consider itself one corps with a multitude of tasks, the accomplishment of which will require the deepest thinking, the greatest application to advancing techniques, and the most intensive study of current and future problems. With such a corps of officers and men, the Artillery will do its job even better than it has done it in the past—and who will deny that the Artillery has, in past wars, played its part well and fully justified its existence?

"Technology (knowledge and skill in science and manufacture) does not eliminate the need for men in war. . . . Men learn to fire a rifle or machine gun quickly, but it takes long hours of . . . maneuver before the firing of the rifle is coordinated with the activities of (the) other men on the team. All men who might someday have to fight for their Nation must have this team training. . . . Peace can only be maintained by the strong."—GEORGE C. MARSHALL.

Damage Analysis In Antiaircraft Artillery*

By Major Franklyn J. Michaelson, Field Artillery

"Captain Jones," exclaims Major Brown, "this method of firing that I have just devised will improve the effectiveness of your battery tremendously!"

The average antiaircraft artilleryman has heard similarly bold statements all through his military career. The first question that comes to his mind after hearing such a statement is, "How does Major Brown know?"—truly an important question. Being alert, Captain Jones will ask himself what methods are available for determining the truth or falsity of such bold claims. So it behooves all antiaircraft artillery officers to become familiar with methods of determining the effectiveness of their units and evaluating developments in technique and matériel.

This article sets forth methods that may be applied to determination of effectiveness and evaluation of developments. Damage analysis concerns itself with these methods. Before discussing methods of damage analysis, it is valuable to consider the basic term used in such analysis. This term is *"single shot probability,"* or *the probability that one round fired will destroy one aircraft, or target, in flight.* This destruction will be referred to hereafter as a "kill." A kill is distinguished from a hit in that it refers to actual destruction of a target as a direct result of antiaircraft fire, whereas a "hit" has many connotations. A hit can be interpreted as a fragment merely piercing some part of an aircraft; it may be interpreted as a round bursting within a given volume about the target; in short, it may mean anything the individual using the term wants it to mean. To avoid ambiguities, the term "kill" is used in discussions of damage analysis. In other words, then, single shot probability (SSP) may be defined as the probability that one round fired will *kill* one aircraft, or target, in flight.

To clarify single shot probability, an example is cited. Suppose an antiaircraft weapon, 90mm for example, were set up in firing position and engaged all targets within range on a particular day. At the end of the day's firing, the number of empty ammunition cases could be counted in order to determine how many rounds were fired that day. A count also could be made of the number of aircraft destroyed by the firing of that particular gun. Assuming that three hundred rounds were fired, and that two aircraft were destroyed as a result of firing the three hundred rounds, we could say that on the basis of that firing it would take one hundred fifty rounds to destroy (or kill) one aircraft. If it took one hundred fifty rounds to destroy one aircraft, then each round fired contributed 1/150, or .0067, of a kill. Sixty-seven ten thousandths can then be referred to as the probability that one round would kill one aircraft, or as the single shot probability for the conditions under which the targets were engaged.

There are many conditions which affect single shot probability. Certainly it is more difficult to kill an aircraft farther from the gun than one closer to the gun, so we can say that *range* is one variable affecting single shot probability. Since the size of a projectile affects the lethal effect of a burst, *gun caliber* may be considered another variable. Other target conditions which affect single shot probability are *altitude, speed, type, angle of approach, etc.* Conditions pertaining to the firing weapon which affect single shot probability are *gun model, type director, type radar, type fuze, etc.* Careful consideration must be given these variable conditions when single shot probabilities are under discussion.

Since the concept of single shot probability is such an important tool in damage analysis studies, several methods of determination of SSP's are worthy of mention. In the example quoted above, SSP was determined by counting the number of rounds fired and the number of targets killed, thereby making it possible to find out the contribution of each round to the kills obtained. It might seem obvious that a good method of determining SSP would be that of analyzing combat records of the past war in order to study the number of aircraft killed and the number of rounds fired by individual batteries. On the whole, combat records are unreliable for our purpose, since firing during the war was conducted under more or less uncontrolled conditions. Also, if an enemy aircraft were destroyed by antiaircraft fire, there was always an element of doubt regarding the battery actually killing the aircraft, when more than one battery engaged it. Adding to the uncontrolled features of combat firing is the element of prejudice which, even with the most objective observers, was always present.

Another method of determining single shot probabilities might be to set up a gun battery, fly friendly aircraft in such a manner that they could be engaged by the battery, and

*The figures used in this article are wholly fictitious, there being no relation between them and actual figures. These figures herein were chosen for demonstration of principles and arithmetic simplicity.

shoot to kill as many aircraft as possible. The obvious difficulty with a method of that nature is that so many friendly aircraft and pilots would be killed. It has been suggested that a modification of that method be applied by using radio-controlled aircraft, and firing to destroy those. The difficulty with radio-controlled targets lies in the fact that they do not approach target speeds attained by present-day combat airplanes, and that they might be killed by some means not lethal to actual airplanes. For example, a shell burst might put the radio controlling mechanism out of action, resulting in a kill that would not otherwise have occurred with a regular combat airplane.

Actually, the most useful method of determining single shot probabilities for heavy antiaircraft guns has been the device of a carefully controlled experimental situation in two phases.

The first phase deals with determining *firing accuracy* of a battery. A battery is set up much in the same way as it would be set up for a normal target practice, but the target aircraft fly courses on which exact altitude, direction, and speed are known. There are two ways of collecting data for this phase, both of which have been used profitably. The first of these collection methods is that of firing actual ammunition at sleeves towed by target aircraft, and processing burst deviation data in a similar manner to computing results of a target practice. The second of these methods involves measurement and recording of firing data computed by the director each second and true present position data as computed by phototheodolite data. When all these data are recorded, firing data are compared to present position data on the basis of a time of flight element, so that deviations of a burst from the target may be computed even though no live rounds were fired. The latter method is very fruitful, since the assumption and accompanying data simulate a live round's being fired every second that the target aircraft is on course.

Several assumptions must be clarified when dealing with the first experimental phase of determining single shot probabilities. First of all, the conditions as to range, altitude, caliber, etc., set forth above, must be specific, so that results obtained will pertain to those conditions and no other. In order to furnish an up-to-date analysis of results, it should be assumed that VT fuzes are used all the time. For data collected by firing live ammunition, VT fuze conditions are obtained by applying a time of flight correction both to the shell burst and to the target. For data collected by the comparison of firing data and present position data, it is assumed that VT-fuzed ammunition was fired, and that bursts occurred in a plane passing through the target, perpendicular to the line of aim. Therefore, only lateral and vertical deviations are considered.

It might be asked just what information is desired from this seemingly complicated phase of the experiment. The object is to determine from a large number of courses flown and rounds fired, the frequency of bursts at each distance from the target. After having that information, an estimate is made of how much damage each burst, occurring at various distances from the target, will do. This estimation is dealt with in the second phase.

So then, the first phase of the experiment is the measurement of battery accuracy, in terms of frequency of miss distances. These measurements have been made for some weapons by means of tests carried on at Fort Bliss, Texas, under the supervision of the Research and Analysis Department, Antiaircraft and Guided Missiles Branch, The Artillery School. Such measurements are vital to the application of damage analysis, since *battery accuracy* is one of the two entities involved in determination of single shot probabilities.

The second experimental phase involved is the determination of the *lethal effect* of bursts occurring at various distances from the target. This effect can be termed *conditional probability of damage*. It can be defined as the probability that a kill will occur *on the condition* that a shell bursts at a specified distance from the target. Conditional probabilities are mainly a function of caliber, since a heavy shell bursting a certain distance from a target will have a greater probability of killing the target than a lighter shell bursting at the same distance. This second phase of the single shot probability experiment was conducted by the Ordnance Department at the University of New Mexico, where certain values for conditional probabilities have been determined. Refinements of these data are being made currently by other agencies. In general, the methods used in determining conditional probabilities concern firing rounds at actual aircraft on the ground, simulating flight conditions as nearly as possible. After firing, shell fragments are counted as to number and location in the aircraft, and lethality of fragments is assessed by persons familiar with damage effects to aircraft and personnel of fragments in various positions. Obviously, a fragment found in the dummy representing the pilot of a single-engine aircraft, in a part of his body that would cause death, in all probability will result in destruction of the aircraft. Similarly, fragments found in other parts of the aircraft or its personnel are assessed as to their probabilities that aircraft destruction will result.

The combination of *accuracy* and *lethality* produces single shot probability. If a number of rounds are fired during an experiment, the number of resultant bursts at various miss distances recorded, and the lethal effect of each burst noted, the determination of single shot probability reduces to a problem in arithmetic. To illustrate the combination of accuracy and lethality to produce single shot probability, an example is furnished. Consider the following table:

A TABLE FOR USE IN THE COMPUTATION OF A SINGLE SHOT PROBABILITY

I Miss Distance (Yards)	II No. of Rounds (Accuracy)	III Conditional Probability (Lethality)	IV Expected No. of Kills
0	1	1.0	1.0
10	3	.7	2.1
20	7	.3	2.1
30	15	.1	1.5
40	20	0	0
50	35	0	0
60	19	0	0
	Total: 100		Total: 6.7

Column I merely lists the miss distances, in yards, of bursts occurring. The numbers in the column represent groups of distances, so that zero represents bursts occurring between zero and five yards from the target, ten represents bursts occurring between five and fifteen yards from the target, twenty represents bursts occurring between fifteen and twenty-five yards from the target, and so on.

Column II shows the distribution of the total of one hundred rounds fired, or the *accuracy* of the firing battery. From this column we see that of the hundred rounds, one burst zero yards from the target, three burst ten yards from the target, seven burst twenty yards from the target, and so on, until all the bursts are accounted for. In this example, it is assumed that no bursts occurred farther away from the target than would fall in the sixty yard group.

Column III contains conditional probabilities of damage, or measures of *lethality*, for bursts occurring at various distances from the target. Each figure indicates the probability that a single round bursting at each distance will cause a kill.

Column IV shows the expected number of kills from rounds bursting at the various distances from the target. Values for Column IV are obtained by multiplying values in Column II by corresponding values in Column III. For the round bursting zero yards from the target, one kill can be expected, since the probability of a kill resulting from one such round is 1.0. From the three rounds bursting ten yards from the target, 3 x .7 = 2.1 kills can be expected, since the probability of a kill resulting from one such round is .7, and so on down the column.

To determine the single shot probability, *for the conditions under which data in the table were collected*, first the total number of expected kills for the hundred rounds fired is obtained by adding up the entries in Column IV. Dividing that total by the number of rounds fired produces single shot probability. For the case presented in the table, the total number of expected kills is 6.7, which, divided by the total number of rounds (100), gives .067—the single shot probability. In other words, each round fired in the experiment contributed .067 of a kill, under the specified conditions. It must be kept in mind that if any of the variable conditions are changed, single shot probability is subject to change. To emphasize the dependence of single shot probability values on these variable conditions, it can be said that single shot probability is a function of range, altitude, target speed, target type, angle of approach, caliber of gun, model of gun, type of director, radar, fuze, and many other variables which affect accuracy or lethality.

With each round fired contributing .067 of a kill, as determined above, it can be expected that about 14.9 such rounds will be required to produce a kill. The figure 14.9 is determined by dividing .067 into 1.0: the reverse procedure of dividing the number of rounds fired into number of kills to obtain single shot probability. The number of rounds required for a kill can be used to measure the effectiveness of a firing organization. Certainly the greater the number of rounds required for a kill, the less effective is the organization.

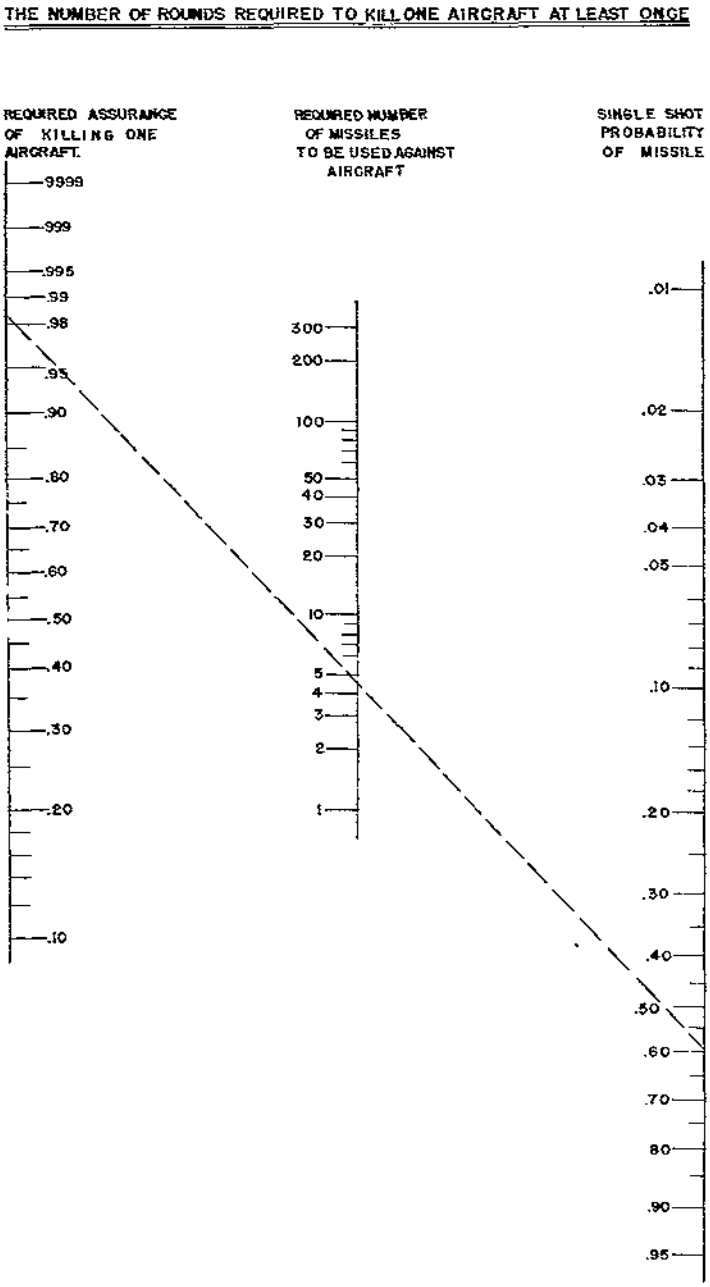
Before discussing further the uses of single shot probability, the concepts of *expectancy* and *engagement kill probability* should be considered. Let us say that we have a situation in which the single shot probability is .2. If ten rounds were fired in such a situation, we could *expect* to get ten times .2, or two kills. However, such an expectation might lead to absurdity when only one target is engaged, since it is impossible to kill the same target twice in the same engagement. In considering expectancy, it would be better to assume that ten different targets were exposed to one round each, with the single shot probability equal to .2—then it can be said that we can expect two of the ten planes engaged to be killed.

When only one target is engaged, and a certain number of rounds fired, the concept of *engagement kill probability* is valid. Taking the same situation as in the above paragraph, we can say that if the probability of *killing* the target with one round is .2, the probability of the target's *surviving* one round is 1—.2 = .8. Assuming that rounds were fired independently of each other, the probability of a target's surviving *two* such rounds is .8 times .8 = .64. The probability of killing a target with the two rounds is 1—.64 = .36. The probability of a target's surviving *three* such rounds is .8 times .8 times .8 = .512, with the probability of killing the target with the three rounds being 1—.512 = .488. It can be seen that the probability of surviving a number of rounds is equal to the probability of surviving one round raised to a power equal to the number of rounds fired. If ten rounds were fired with a single shot probability of .2, the probability of surviving ten such rounds is equal to .8 raised to the tenth power, and the probability of the target's being killed with the ten rounds is equal to one minus .8 to the tenth power. With our ten rounds, then, the survival probability equals $1-.8^{10}$, or .107, and the probability *that the target will be killed* with the ten rounds is .893. We can see that as the number of rounds fired is increased, kill probability goes up, while the probability of survival becomes smaller—a logical conclusion.

It is interesting to note in passing that prewar antiaircraft target practices were scored on the basis of *expectancy* rather than *engagement kill probability*. If a battery fired on ten courses, obtaining no bursts within the established lethal volume on nine of them, but obtaining ten bursts in that volume on one of the courses, the battery was given credit for ten "hits." Such a battery would be scored higher than a battery obtaining one "hit" each on only five of the ten courses flown. It appears that such a scoring technique sometimes is not indicative of battery effectiveness, since more aircraft would be killed in the latter case than in the former.

In determining effectiveness of a unit firing a certain number of rounds against one aircraft, the concept of *engagement kill probability* should be employed rather than that of *expectancy*, although either may be used for certain purposes of comparison. Since a considerable amount of computation is required for solution of kill probabilities for a given number of rounds fired, a nomographic device has been developed by the Guided Missiles and Air Defense Division, Assistant Chief of Air Staff-3, United States Air Force, capable of giving pertinent information. This device is reproduced on the following page.

The only item needed to obtain information from this device is a straight edge. For example, a straight edge placed on a value of single shot probability in the right-hand scale and



on the number of rounds to be fired in the center scale will give the kill probability read from the left-hand scale. The dotted line is placed on the nomograph as an illustration. It shows that if the single shot probability is .60, and if the number of rounds fired is about five, then the kill probability is between .98 and .99. The combination of values from any two scales will give the value on the third scale, simply by application of the straight edge. As an example, if the single shot probability is known (.60), and a certain required assurance of a kill is desired for an engagement (.98 or .99), the number of rounds required can be read from the center scale (4 or 5).

Now that we have discussed probability and expectancy in general and single shot probability in particular, let us look into some of the uses of the concepts. The easiest way to show an application in this case is by use of an illustration. Suppose that a method of controlled firing has been devised for a 90mm battery that improves the accuracy of the battery, but reduces the rate of fire from eighty rounds per minute to sixty rounds per minute. We wish to determine whether this controlled method or the normal method of fire is more effective on a given engagement. If the single shot probability for each of the two methods is determined and multiplied by the total number of rounds fired for the same period of engagement, the result would indicate the expected number of kills and thus a comparison of the effectiveness of two methods.

There are many other ways to use the single shot probability concept, and these are being employed currently by the Research and Analysis Department of the Antiaircraft and Guided Missiles Branch, The Artillery School. By methods of damage analysis, the department is determining the efficacy of present antiaircraft doctrine, or suggesting modifications to that doctrine. Among studies conducted are included determination of optimum number of heavy guns per director, the best ground pattern for guns within a battery, single shot probabilities for many conditions, effectiveness of 90mm and 120mm gun batteries, and effects of increased target speeds upon effectiveness of fire.

In addition to studies directly pertinent to antiaircraft organizations, studies are being made to determine efficient methods of analyzing antiaircraft defenses from the Air Force point of view. Since it is of vital importance to the Air Force to know directions of approach to various objectives that will subject aircraft to a minimum of fire, much effort has been expended along that line. This effort also will assist antiaircraft commanders in displacement of heavy gun batteries to furnish the most effective defense of an objective.

To summarize then, we have seen that the principles of damage analysis are important to the antiaircraft artilleryman. The basic concepts of damage analysis have been outlined: accuracy, lethality, and the combination of accuracy and lethality to produce single shot probability. Methods of determination of single shot probabilities have been sidered, showing that the best method is to set up a carefully controlled experiment and to be objective concerning the findings. Finally, the uses of damage analysis have been set forth.

Now, when some bold claim is made that this or that method of firing or technique will increase effectiveness to a large extent, we have the means at our disposal to determine whether or not the method or system advanced is worthwhile.

Meet The U.S. Air Force

By Orville S. Splitt and Murray Green

Americans have always been concerned with questions pertaining to the effective, efficient and economical organization of the U. S. military establishment. They have often sought—hitherto unsuccessfully—to effect a cure for ills discovered by the analysis of war-taught lessons. These efforts culminated in the National Security Act of 1947, enacted by a Congress which had made a diligent evaluation of the lessons of World War II and a painstaking study of present military trends.

Many considerations affect our national well-being. Among the greatest of these is security from military aggression. National security is measured to a large degree in terms of air power. World War II provided conclusive evidence that air power has become a major military factor. The new security legislation takes full cognizance of this fact and establishes air power as a co-equal partner with land and sea power. Further, it vindicates the judgment of those who grappled with the problems posed by the first flight of the Wright Brothers and predicted the tremendous military advantages which might accrue to any nation which would properly evaluate this event in terms of its ultimate military significance.

There is at present no requirement for all military instruments of air power to be concentrated exclusively in a separate air arm. Certain elements will continue as auxiliaries of land and sea power. The major intent of Congress, however, was to clear the way for the development and employment of *fundamental air power* under the over-all direction and control of a branch of the military service having this as its major responsibility.

The establishment of a co-equal air arm is not a new concept in our military history or, for that matter, our legislative history. It has been advocated for some 30 years by men who foresaw the power and independent mission of the air weapon. The subject has been a frequent topic for debate in Congress. Since 1921, there have been at least 60 bills introduced which were concerned with the reorganization of our armed forces. During this same period, at least seven Congressional committees investigated the subject and submitted reports. Though parity for the air arm was not always recommended, most of the proposals did include the requirement for a single directing head of our military establishment.

In 1944, the Senate War Investigating Committee called for legislative action to meet the demands of World War II. In the words of its chairman, Senator Harry S. Truman, it called for "the integration of every element of America's defense into one department under one authoritative, responsible head." . . . "Call it the War Department, or the Department of National Security or what you will," said Senator Truman. "just so it is one department."

During the war, the Joint Chiefs of Staff appointed a committee composed of experienced Army, Navy and Air Force officers to study the reorganization of our national defense system. The committee found that a great majority of the leaders in the field favored a unified system of organization.

In 1944, President Roosevelt established the United States Strategic Bombing Survey. With Mr. Franklin D'Olier as Chairman, Survey personnel included civilian leaders in the scientific, business and educational fields of our nation. As an immediate objective, an attempt was made to evaluate the effects of our strategic bombing of Germany with a view toward utilizing our resources more advantageously, if possible, in the strategic bombing campaign against Japan. At that time, our B-29 force was still in its infancy and the atomic bomb, awaiting its first test at Los Alamos, still an unknown quantity.

The Survey expressed a unanimous recommendation that our military establishment be integrated into a department of common defense "which provides unity of command, and is itself oriented toward the air and new weapons."

It concluded that our capabilities in the air could be exploited only by "a third establishment," equal and coordinate with the Army and Navy. To this establishment (an independent Air Force), "should be given primary responsibility for passive and active defense against long-range attack on our cities, industries and other sustaining resources; for strategic attack, whether by airplane or guided missile; and for all air units other than carrier air and such land-based air units as can be more effective as component parts of the Army and Navy."

The first major move made by the Army and Air Force in carrying out the provisions of the National Security Act of 1947 was the drafting of a report outlining more than 200 specific agreements reached between the two services relative to the separation of the Air Force from the Army. This report was submitted to the Secretary of Defense, James V. Forrestal, on September 15, with the request that the agreements be approved and that Mr. Forrestal direct their implementation by the Department of the Army and the Department of the Air Force. In a memorandum accompanying the report, it was stated that both Secretary of the Army, Kenneth C. Royall and Secretary of the Air Force, W. Stuart Symington believed that "the agreements solve in a practical manner the initial problems attendant upon separation, and that experience will prove that they are fundamentally sound and sufficiently flexible to meet changing conditions that may develop in the future."

According to the joint report, agreements reached on basic policy matters provided that service support of the Air

Force by the Army will continue substantially as is now being done, with each department utilizing the facilities of the other in all cases where economy, consistent with operational efficiency, will result. The report stated that service units, which are an "organic part of an Air Force group or wing, will, in general, be Air Force units." Service units which are not considered an organic part of the Air Force (although they perform services for that department) will, in general, be Army units. Such units—engineer battalions or signal companies, for example—would remain Army units although attached to the Air Force for duty. Similarly, chaplains and medical personnel will remain with the Army.

It was agreed that 20,000 Regular Army commissions would be allotted to the Air Force for Regular Air Force officers. The Army will be allotted 30,000 commissions, which will include those of officers who are attached for duty with the Air Force. The initial USAF troop allotment will be 401,362 of the 1,070,000 personnel allotted originally to the War Department. This allotment will be adjusted as functions and responsibilities are transferred.

Among the agreements reached on personnel and administrative matters, perhaps the most important is that pertaining to the transfer and detail of personnel. It was agreed that all officers holding commissions in the Air Corps, Regular Army; Air Corps, Reserve; and Air Corps, Army of the United States, would be transferred to the Department of the Air Force. Warrant officers and enlisted men now under AAF command, authority, or jurisdiction, would be similarly transferred, with the exception of those individuals who perform services common to the Army and the Air Force.

It was agreed also that any individual assigned to the Army in accordance with the above provisions, but whose original enlistment was for assignment to the Air Corps or AAF, may submit a written request to the Chief of Staff, USAF, prior to July 1, 1949, requesting transfer to the Department of the Air Force. Individuals transferred to USAF in accordance with the policy outlined in the preceding paragraph who do not desire such a transfer may submit a written request to the Chief of Staff, U. S. Army, for return to the Department of the Army.

USAF personnel now on duty with the Army will be relieved from such duty and transferred to Air Force assignments during a two-year period ending June 30, 1949, until the number remaining with the Army is equal to that agreed upon by the two departments. Similar action will be taken for Army personnel now with USAF.

Enlisted and officer personnel of the WAC on duty with the Air Force will remain assigned to the Army until appropriate legislation is enacted establishing procedures for the appointment and enlistment of women in the Air Force.

The Air Force will continue to receive a proportion of each graduating class of the U. S. Military Academy until such time as an Air Force Academy may be established.

There were no changes made in the agreements now in effect concerning command and operational employment of ground-launched guided missiles. Tactical surface-to-surface missiles—exclusive of pilotless aircraft—remain assigned to the Army, while strategic surface-to-surface missiles remain assigned to the Air Force. Surface-to-air missiles used for support of Army tactical operations remain assigned to the Army, while surface-to-air missiles, employed in area air defense, remain an Air Force responsibility.

No changes were made in agreements now in effect concerning the responsibility for antiaircraft artillery. The Army retains responsibility for the activation, training and control of all antiaircraft artillery units and their personnel with the following exception: the Air Force will train and control all antiaircraft artillery units and personnel assigned or attached for air defense purposes. The Army will provide the necessary units and personnel to accomplish the air defense requirements of the Air Force and, also, personnel and units needed for integrated air defense training.

The report stated that the Army will retain responsibility for civilian component Army units while the Air Force will assume responsibility for civilian air units.

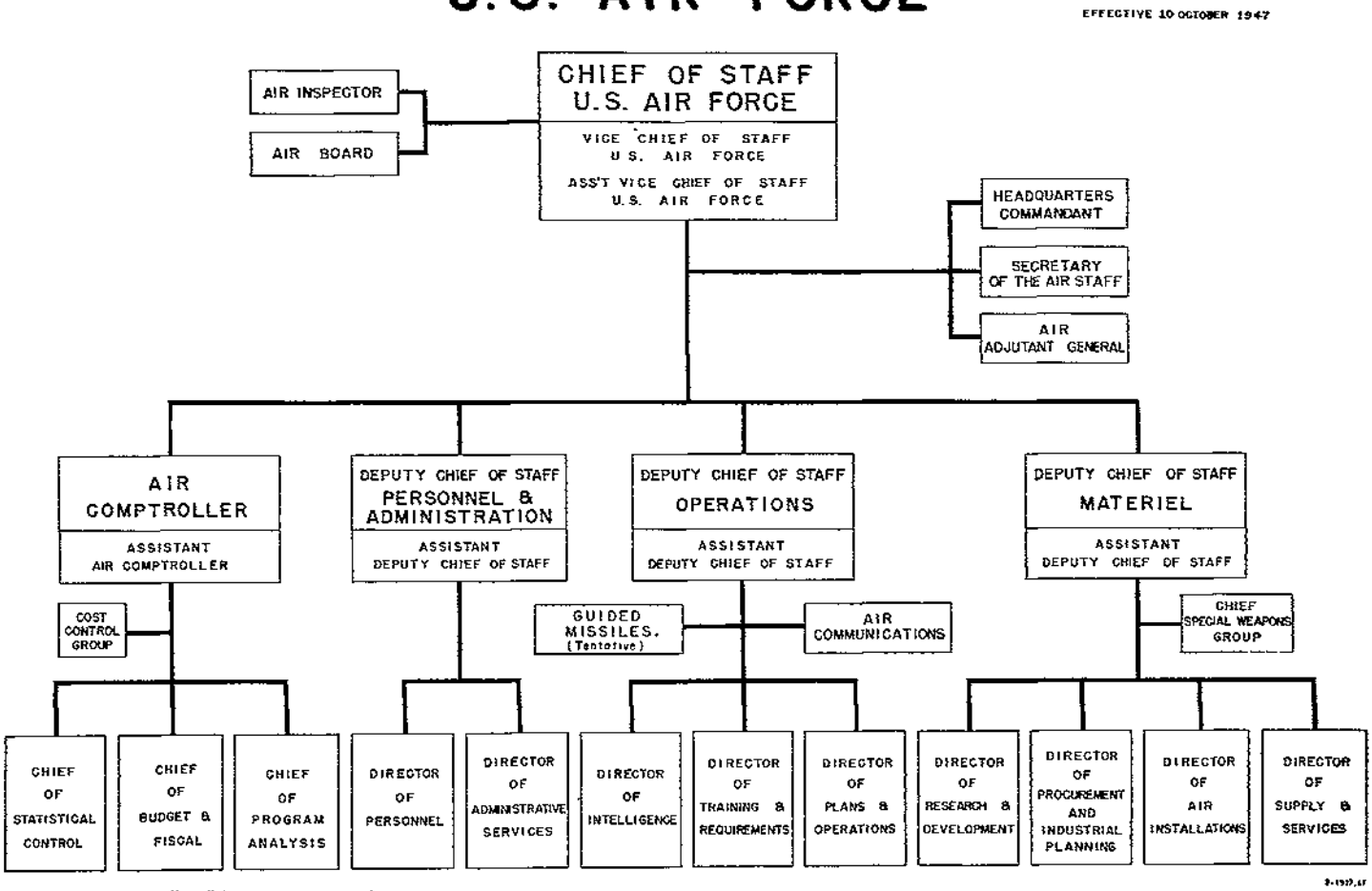
With the exception of meteorological ballistics data, the Air Force will take over all responsibility in providing a weather service for both services.

Under the agreements reached pertaining to planning and operational functions, USAF will be responsible for the aviation training of foreign nationals as well as the implementation of the aviation aspects of air programs for foreign countries. State Department liaison will be handled by the Army.

The Air Force will obtain additional independence in many research and development functions. A lengthy section of the report was devoted to outlining the many aspects of the research and development program which the USAF can now undertake without approval of the Army's Research and Development Division. These involve the preparation and conduct of programs covering matériel, methods, and techniques for which the Air Force has research and development responsibility, together with the establishment of the military characteristics for matériel used exclusively by the Air Force as well as recommendations for military characteristics of other matériel used or intended for use by USAF. The Air Force will continue its responsibility for research and development activities pertaining to guided missiles.

In the special section of the report devoted to budgetary functions, Mr. Royall and Mr. Symington recommended that a single Army-Air Force budget be submitted for the fiscal year 1949. Each budget program making up the total budget will indicate the amounts which are included for the support of the Air Force. This budget will be reviewed by the present Budget Advisory Committee and their recommendations will be made jointly to Chiefs of Staff of the Army and Air Force. If any disagreements arise they will be worked out by the two Secretaries. Representatives of the Air Force and Army will both appear before Budget Bureau and Congressional Committee hearings. Funds appropriated for USAF will be administered in a manner recommended by both departments and approved by Mr. Forrestal.

The new Air Force is concentrating on the rebuilding of its demobilization-wrecked organization. Air Force leaders have pointed out that when demobilization was completed they did not have a single squadron immediately capable of action with wartime efficiency. Today, the U. S. Air



The New Command Organization and Assignment of Headquarters Officers of the U.S. Air Force

Force, together with the U. S. Army and the U. S. Navy, is proceeding slowly but surely along the road back.

The program of reconstruction has been well mapped out. The goal: an air-force-in-being which will guarantee the air security of the United States.

Careful planning has shown that the minimum force-in-being necessary to guarantee our air security must consist of seventy combat air groups together with their supporting units. These groups must be maintained at peak effectiveness at all times, and must be capable of sustained operations against an aggressor.

This 70-group Air Force-in-Being must be backed by a well-trained civilian Reserve and an industrial program capable of immediate expansion into wartime production.

Current appropriations have allowed the Air Force funds for a 55-group program. It is expected that this force will be manned and ready by January 1, 1948.

A continuing program of research and development is, of course, one of the major efforts being undertaken by the Air Force. The recent assignment of Major General Laurence C. Craigie, one of the Air Force's ablest technicians, as Director of Research and Development in USAF Headquarters, and General Joseph T. McNarney, one of the five 4-star generals in the Air Force, as head of the Air Matériel Command, illustrates the importance attached by the Air Force to the adapting of our military doctrines to the lessons of science. General Carl Spaatz, USAF Chief of Staff, has emphasized that under no circumstances would reduced appropriations be allowed to curtail vital research and developments projects.

The Air Force has completed a reorganization of its headquarters, replacing the Air Staff with a new type of organization which is, according to Secretary Symington, "comparable to a modern business administration." A chart of the new command organization and the present assignment of headquarters' officers is shown on this page.

While the American people have never lacked moral fiber in meeting a crisis, the provision of material strength requires planning ahead. It requires a mature acceptance of responsibility for guarding against any crisis by timely preparation long before danger threatens.

Public understanding and support is the primary requisite if the U.S. Air Force is to assume once again world leadership in the air. General Spaatz emphasized this recently when he stated that "public support is as essential to effective air power as industries, airplanes and airmen."

The National Security Act of 1947 has opened new horizons to America's Air Force.

It now moves forward with new strength and renewed spirit, fully cognizant of its obligations to the American people who have expressed their conviction that the ability to control the air is essential to victory in time of war, and, of greater importance, a strong weapon for the maintenance of peace.

GUIDED MISSILES AND FUTURE WARFARE*

By Major General John L. Homer

If you are planning the Grand Strategy for tomorrow's war, you must consider seriously the impact of guided missiles. Potentially, a war can be started by a long-range guided missile attack. It is now apparent that this weapon may be developed to strike any portion of the globe from any geographical position. It is true that there remain some unsolved problems of design and control, but these are purely mechanical limitations that research and development may overcome in the future.

Consideration must be given to both offensive and defensive aspects of the problem. Offensively, the striking power of a well placed guided missile attack may seriously destroy a nation's industrial potential, and it is offensively that the weapon possesses the great threat today. The reason for this is that the offensive use of V-2 missiles is far ahead of the defensive development. Further, the employment of guided missiles with atomic warheads offers probably the greatest single weapon of destruction known to mankind.

None but the stronger nations, rich in industrial wealth, and possessing sufficient foresight to use this wealth and knowledge wisely, can expect to compete successfully in a grim contest for world military leadership. The cost of rocket research and development is necessarily great. Few countries can afford such an outlay over an extended period of years.

The smaller nations can only hope that they do not lie in the path of an aggressor, and that they are fortunate enough to be aligned with the side that will win, or resign themselves to the fate thrust upon them because of geographical position. But a strong nation, acting too late, will be in no more fortunate position than the weaker nations.

What conditions will obtain prior to initiating this type of warfare? An aggressor nation will hesitate to attack unless its leaders are relatively certain that the victim's stock pile of weapons is smaller, or that the initial attack will so reduce this stock pile that the victim cannot strongly counterattack, if he can attack at all. The primary objective of the initial onslaught will be to destroy the will of the victim to resist, either by annihilating large masses of people, or by pulverizing the nation's industrial potential. An argument has been set forth that fear of retaliation prevented the use of poison gas in World War II. That is probably true. The same argument is *not* valid for guided missiles with atomic warheads. The tremendous destructive power and long-lasting effects of a well directed atomic attack can almost insure that countermeasures will be feeble.

A new weapon generally does one of three things: it increases effective range over previous weapons; it renders maximum destructive effect with increased accuracy; or it reduces the probability of effective countermeasures. The guided missile definitely increases effective range. When the Allies marched into Germany they found on the drawing boards a project for a guided missile with a range of 3,000 miles.

An atomic warhead in a guided missile unquestionably creates increased destructiveness. When we read a statement by Albert Einstein that the atomic bomb is now capable of 500 times the destructive effect of the first atomic bomb dropped, the world may well shudder at the destructiveness of this weapon. As to increased accuracy, the guided missile has not yet achieved this goal. The V-2 had a lateral probable error of about 2½ miles and a range probable error of about 7½ miles. This problem of accuracy is receiving considerable research attention. The control of the guided missile in flight is another major problem which today has not been satisfactorily solved, but under the assault of scientific research a solution should be forthcoming. As to decreasing the probability of effective countermeasures, the only defense to the guided missile is a counter-guided missile. The problem of detecting a missile such as the V-2 at long range and in time for effective defensive action is a matter of great concern and extensive study. Unquestionably, the attack will be superior to the defense when guided missiles are employed.

Offensive Considerations

What weapons used in World War II furnish a basis for improved weapons which might be used in event of a future war? The V-1 type weapon used by the Germans was highly effective initially, but when antiaircraft defenses were properly positioned and massed, better than ninety per cent were shot down. It was, however, a relatively slow-moving, short-range weapon which flew a rectilinear path that made it easy for the Allied antiaircraft defenses to destroy. The future V-1 type weapon will probably be powered by a ramjet motor and will fly better than a thousand miles an hour; will have a range of perhaps 1,500 miles and

*Reprinted, courtesy *Military Review*.

may carry an atomic warhead. This future V-1, flying very close to the ground on a maneuvering course, will be extremely difficult to detect and engage with present equipment. One deficiency of the V-1 type weapon has been its low degree of accuracy. This problem is presently receiving considerable research attention. Other potential means of destruction carried by this weapon could be radioactive waste, worrisome by-product in the manufacture of fissionable material. At the present time, this material is usually stored underground in tanks because of the extreme difficulty of safe disposal. It is conceivable that it can be loaded in any type of guided missile.

In the latter stages of World War II, the Germans employed the V-2 rocket. This fourteen-ton giant had a speed of about 3,500 miles per hour, and a range of 200 miles, carrying a one-ton warhead. The Germans were reported to have fired a total of 3,600 of these missiles against both London and Antwerp. *The Allies were never able even to fire against this type of weapon.* Its tremendous speed and high angle of fall made it immune to existing defenses. The future V-2 type of missile may be unlimited in range; that is, it can be expected to reach any point on the surface of the globe. It will probably be a two- or three-step rocket. It would probably fly under control and have a combination of one or more homing devices plus a proximity fuse. The present day tactical weaknesses in the V-2 are the lack of a guiding system and the need for longer-range homing devices in order to bring us within the limits of required accuracy. The long-range rockets, that is, those traveling more than 200 miles, will probably be of the wing-type and will glide in the atmosphere for long distances at a speed of perhaps 1,500 miles an hour. The V-2 type weapon can be launched from a very simple ground platform. Liquid fuel rockets can be developed to be launched from ships at sea from a gyro-stabilized platform; and relatively long-range solid fuel rockets can be launched from submarines. Imagine the possibilities of bringing a fleet of submarines close to enemy shores at night and releasing a rocket attack employing atomic warheads! This weapon, in addition to carrying ordinary explosives or an atomic bomb, could also carry radioactive waste. There is no defense against this type of attack today.

A pilotless aircraft is another form of guided missile. It could be launched from a ship, from a mother plane, from a ground installation, and even from a submarine. It can be completely controlled in flight, although its expected slow speed makes it vulnerable to the conventional type of antiaircraft defenses. With mother planes flying high above the target, the accuracy of the pilotless aircraft can be closely controlled. It is capable of carrying any of the previously mentioned lethal devices. It is doubtful that it would be armed with an atomic bomb because of its susceptibility to destruction by antiaircraft. One scientist has promoted the idea that a pilotless aircraft containing a light radioactive pile could, by merely flying over areas, or close to formations of enemy planes, or over ships create sufficient radioactivity to affect seriously the area, planes or ships. Of course, this type of pilotless aircraft could not be retrieved.

The delivery of the latest type of conventional bomber, the B-36, to the armed forces was coupled with an announcement that this plane could deliver an effective bomb load to any point on the globe, and return. If it were to drop conventional gravity bombs, it would have to come within the range of fire of conventional but improved AA artillery. Towards the close of World War II, a series of accurate glide bombs was developed. One type, equipped with a radio command set, could be controlled by a mother plane for both azimuth and range, and in addition, had a type of homing device. A second type was equipped with a radar set which could be directed toward any target selected by the radar of the mother plane. A third type of bomb was equipped with a television screen which would televise to the control operation a picture of the controls in the missile or of the target area below. Any of the above bombs could be jet-powered, making it possible for them to be launched well outside of any defended area, perhaps as far as one hundred miles. These bombs could, of course, carry any of the previously mentioned lethal devices.

To summarize, we may expect to see used offensively:

1. A supersonic, long range, low flying V-1 type of guided missile.
2. A supersonic, extremely long range, guided missile, flying above the atmosphere and coming in at high angles of fall and under complete control.
3. Medium range, medium altitude, low speed, pilotless aircraft controlled by a mother plane.
4. The conventional long range bomber equipped with controllable bombs capable of being released at great distance from the defended area.

No one can question the contribution of the artillery to victory in World War II. It is not expected that the present mobile artillery can be materially improved so as to give great increases in range and muzzle velocity without tremendous increases in weight and consequent loss of mobility. However, it should be borne in mind that accuracy limits of rockets and guided missiles do not yet approach accuracy requirements of good artillery. The guided missile or rocket, by its lightness, fire power, mobility and unlimited range will extend the range of conventional artillery to cover the entire battle area. Some military experts believe that rocket artillery and guided missiles may eventually replace the conventional guns.

Defensive Considerations

This country is a democracy and, as such, can never be an initial aggressor. When we are attacked, we can only hope that our people will be prepared to take prompt and speedy measures for reprisal. In the past, this country has been very fortunate. We have been able to mobilize in time to meet any threat. However, in both World War I and World War II, the gift of time was presented to us by our Allies. In World War II, it was about fourteen months before our initial offensive could be started in the Pacific, and about a year before we could take any action in the European Theater. If and when this country is directly attacked by a nation employing guided missiles with atomic warheads, and other weapons similar to those discussed, *we will not have time to mobilize.* Many military experts feel that the power and destructiveness of the initial offensive will determine the outcome of the next war—which places this country in a very unenviable position. The

vital necessity for intensive research and development so as to keep well ahead of any other nation; adequate provisions for a highly trained, extremely mobile and air-transportable professional army, capable of swift retaliation, and a trained disciplined reserve is clearly indicated.

What weapons exist today that can stop a supersonic V-1 type of weapon? At the present—none. Indications are that in the future this will be the most difficult type of attack to stop. Guided counter-missiles, improved detecting devices, antiaircraft guns possessing much greater muzzle velocities and capable of tracking at many times their present rate, and improved electronic directors may furnish the solution.

At the present time we have no defense against the V-2 type of weapon. The only projected defense appears to be a guided counter-missile capable of out-maneuvering and out-speeding any incoming guided missile. The problem of controlling and accurately guiding such a missile is engaging the attention of many of the research laboratories of this country. The solution to the problem needs no new discoveries, but merely the perfection of known techniques. Until that perfection has been obtained, the offensive continues to have a tremendous advantage over the present-day defensive. At White Sands, the Ordnance Proving Ground, we have been firing German stocks of V-2s with some minor modifications of our own. Undoubtedly, before the year is over, we can expect to see some American-made weapons of similar design incorporating many refinements, and possibly a more nearly perfect guiding system.

The most highly developed German weapon designed to overcome Allied air superiority was the *Wasserfall* rocket. This was a four-ton winged projectile utilizing radio command for control and a homing device. Although many experimental *Wasserfalls* were fired, its development came too late to be used in the past war. Many experts expressed a belief that had the Germans been given a little more time, perhaps a year, they would have been successful in destroying Allied air superiority by the employment of this guided missile. A United States technical mission studying the problem in Europe stated, in effect, that such a weapon might conceivably have driven the Allies out of the sky over Germany.

If this is true, then the conventional aircraft as a weapon of attack is doomed. If the conventional plane is used, it is expected that it will act in the capacity of a mother plane launching and controlling a guided missile from high altitude at a great distance from the target area. This would outmode the conventional AA artillery defense against this type of attack. Conventional AA artillery would still continue its present role against all subsonic targets; including glide bombs, medium altitude bombers, pilotless aircraft and strafing fighters. Although these targets can be engaged, the problem of early detection would require improved radar techniques and weapons to handle greater target speeds. The solution of this problem can readily be foreseen. However, to detect supersonic missiles in sufficient time to employ indicated counter-measures remains an important problem for future study and development. Search or target acquisition radars, and fire control radars, will have to be employed on a tremendous scale to prevent too great a concentration of fire on a single target, and to prevent oversaturation of the defenses by multiple raids.

After the start of any future war it will not be possible to build the weapons needed to fight back, as the war is expected to be brief and devastating. The following minimum preparations must be made in advance:

a. New and improved antiaircraft and guided antimissile weapons must be developed to combat the V-1 and V-2 types of attack.

b. Plans for defense against actual invasion must be provided.

c. Plans for the dispersing of the population must be considered.

d. Vital industries must either be scattered or placed in secure underground installations.

e. Critical military supplies such as stocks of guided missiles, fissionable materials, and atomic bomb stock piles should not be kept in any single area.

f. Research will have to continue to devise means of protection against radioactivity.

g. Continued study and research will be required to devise means of combating chemical and bacteriological attacks.

In World Wars I and II we had the benefit of time for preparation. There is a way of obtaining this element of time to prepare for a possible future war, and that is by organization and maintenance of a highly skilled intelligence network throughout the world. Such an organization has generally been frowned upon in this country, thus making it difficult to obtain funds to support such an organization. However, it is known that only by determining what is going on in other countries can we have advance information as to probable intentions of a potential enemy.

The adequate defense of our national territory presents many problems. The perimeter of this country is so great that it would not be economically or militarily feasible to have detecting units so accurately covering the entire country as to detect *any* guided missile approach in time to employ counter-measures. The problem of centralized control so as to designate specific targets to firing units in multiple attacks, would be gigantic. All that we can hope to do is to construct elaborate installations about our most vital areas for detection and defense. Even this would be perhaps an item of prohibitive cost.

What, then, is the solution to the military defense of this country?

If an organization like the United Nations, or a World Government, can demonstrate the ability to handle any situation, then the world can consider disarmament on a broader scale. This ability has not yet been demonstrated. Therefore, the military policy forced upon us is to remain militarily powerful and ahead of the rest of the world in research and development.

Corregidor Again Changes Hands

By Lieutenant Clarence F. Craw, CAC

A new flag flies over Corregidor and Sunday, 12 October 1947, has been added to the historic dates for that famous island. "The Rock" is no longer an American military installation. Known to many as "The American Gibraltar" and as the spot where the most stubborn American resistance of World War II took place, the island changed hands from the United States to those of the Philippine Republic. Thus was brought to a close the fifty-year use by the United States of one of its most famous Coast Artillery installations.

Had the many officers and men who were stationed on the "Rock" prior to the war been able to attend the ceremonies on 12 October 1947, and had they not previously seen the devastation caused by war and nature, the sight of Corregidor would have been an unpleasant shock. Today Corregidor is no longer a well-kept fortress, famous for the might of its guns and the impregnability of its defense, but a wasteland of devastation and destruction. The island has gone back for the most part to dense jungle and the once beautifully landscaped grounds and terraces are now a maze of undergrowth and shrubs. Tall grass grows where once crack American and Philippine Scout troops drilled on "topside" parade ground. The mighty batteries are still in place but crippled.

Not one of Corregidor's buildings remains intact. The famous "longest barracks in the world" on "topside" are a mass of broken concrete and twisted steel, mute evidence of the pounding the island took during the last war. The hospital and barracks on "middleside," the headquarters, theater and other buildings on "topside" and all other buildings lie in ruins, with the jungle creeping in to claim the island again.

It was indeed fitting that Major General George F. Moore, an able and efficient Coast Artillery officer who commanded the island at the time of the Japanese invasion and had the sorrowful task of ordering the American flag struck to the invaders, should be on hand October 12th to see the American flag come down again—this time to be replaced by the flag of a sister Republic, a move wrought by peace and not by the fortunes of war.

"Some of the happiest years of my existence have been spent here," the General stated in his speech at the ceremony. "It was also on this very spot that I suffered the most bitter experience of my life. Certainly I can say that my years as a soldier in the service of my country have been spent on Corregidor. At this time I find myself once more in command of Corregidor and about to witness a change in flags which will again terminate my command."

General Moore is still stationed within sight of his Corregdior prewar command, for today he commands the Philippines-Ryukyus Command, with headquarters near Manila, and has command jurisdiction over all U. S. Army troops in the Philippines and Ryukyus Islands.

Approximately 600 people were on the island to witness its transfer from the United States to the Philippine Republic. Among these were President Manuel A. Roxas and Vice President Elpidio Quirino of the Philippines,

Major General George F. Moore bids an official farewell to the Island as he joins President Manuel A. Roxas and U. S. Ambassador Emmet O'Neal in a salute to the Philippine flag during the ceremonies.

For the second time in a half century, the American flag is lowered on Corregidor, this time to be replaced by the one of the Philippine Republic.

U. S. Ambassador Emmet O'Neal, U. S. Minister Nathaniel Davis, Major General Albert Jones of the U. S. Army Advisory Group, Major General Eugene Eubanks, Commanding General, 13th Air Force, Brigadier General Jonathan W. Anderson, Chief of Staff, Philippines-Ryukyus Command, Major General Rafael Jalandoni, Chief of Staff, Army of the Philippines, Admiral H. H. Good, commanding U. S. Naval Forces in the Philippines and members of the Philippine House and Senate. Fifty of the American and Philippine Scout veterans who had fought to the last on the gallant island were at the ceremonies as special guests of General Moore.

After Ambassador O'Neal, Minister Davis and General Moore had spoken of Corregidor and the part it had played in American history, Mr. Davis handed President Roxas the paper which formally transferred the island to the Philippines. At 1235 hours, to the strains of the "Star Spangled Banner," the American flag was lowered for the last time and the Philippine flag was hoisted as the band played the Philippine National Anthem to indicate the new ownership of the famous island. Vice President Quirino and President Roxas made the closing speeches.

Thus the island which the Spaniards had taken in 1795 to establish a naval hospital and dockyard, which had served as a penal colony, a station for ships to stop for correction of their papers before entering Manila Bay (hence the name of the island—"Corregidor" the Spanish name for "corrector"), a Spanish garrison and then an American Coast Artillery fort "par excellence" on which more than $50,000,000 was expended for fortifications, and finally the scene of one of the most bloody and stubborn battles of World War II, passed back into the hands of the people of its native soil.

The history of Corregidor is so well known to most Americans that little mention of it need be made here. It first came into the news of the world prominently when Admiral George Dewey sailed into the mouth of Manila Bay on April 30, 1898 just prior to the capture of Manila Harbor and the destruction of Spanish Admiral Montojo's fleet the following day. Corregidor's garrison at that time consisted of 280 Spanish and Filipino marines.

After the signing of the treaty of peace at the end of the short-lived Spanish-American war, the United States recognized the strategic importance of Corregidor and its surrounding islands of Caballo, Fraile and Carabao. The island of Corregidor was renamed Fort Mills and the other islands named Forts Hughes, Drum and Frank, respectively. Once fortified, little change took place on the island Corregidor throughout the years. Due to treaties and economy, it was practically in its 1900 condition and strength on the eventful date of December 7, 1941.

According to their topographical location on Corregidor, sections of the island were known as "Bottomside, Middleside and Topside." The south of Bottomside was used as a Navy beach. Here also was located the civilian village of Barrio San Jose. On the north side were the Army docks and on the south side of the "Tail" was a Navy hydroplane hangar. Large barracks were on Topside, as were Batteries

The Philippine flag flies for the first time over Corregidor after the formal transfer of the island to the Philippine Republic by the U. S.

Wheeler and Cheney, each with two 12-inch guns; Battery Crockett with two 10-inch disappearing guns; Batteries Smith and Hearn, each with one 12-inch disappearing gun; Battery Grubbs, with two 10-inch guns; Battery Ramsey with three 6-inch guns; Battery Morrison with two 6-inch guns; Battery Geary, with eight 12-inch mortars; Battery Way, with four 12-inch mortars; Battery James, with four 3-inch guns; Batteries Cushing, Keyes and Hanna, each with two 3-inch guns; Battery Sunset, with four 155mm guns and Batteries Hamilton, Rock Point, Wright, Ordnance Point, Keyser, Stockade and Monja, each with two 155mm guns. An 8-inch gun on a railway mount was mounted in concrete east of Malinta Hill during combat and Battery Rose had one 155mm gun.

On Topside also were the headquarters, barracks and officers' quarters. Other barracks for the noncoms and the hospital were located on Middleside and there were also underground ordnance shops and other buildings characteristic of any regular army post in the United States.

On May 6, 1942, after ferocious and heroic fighting against great odds, the island was surrendered to the Japanese with General Wainwright representing the United States and the invaders represented by General Homma. Almost three years later, on February 16, 1945, two long trains of Army C-47 transports flew over the rock and paratroopers drifted downwards toward the lighthouse, golf course and parade grounds on the middle of the island and American troops were once more on the island. At the same time troops of the 34th Infantry Regiment landed near the San Jose docks. The Japs continued suicidal resistance for nearly two weeks but towards the end, a series of explosions on the island revealed that the Japs had destroyed the tunnel system and themselves with it. An estimated total of 4,215 Japs were killed on the island and an unknown number blown up.

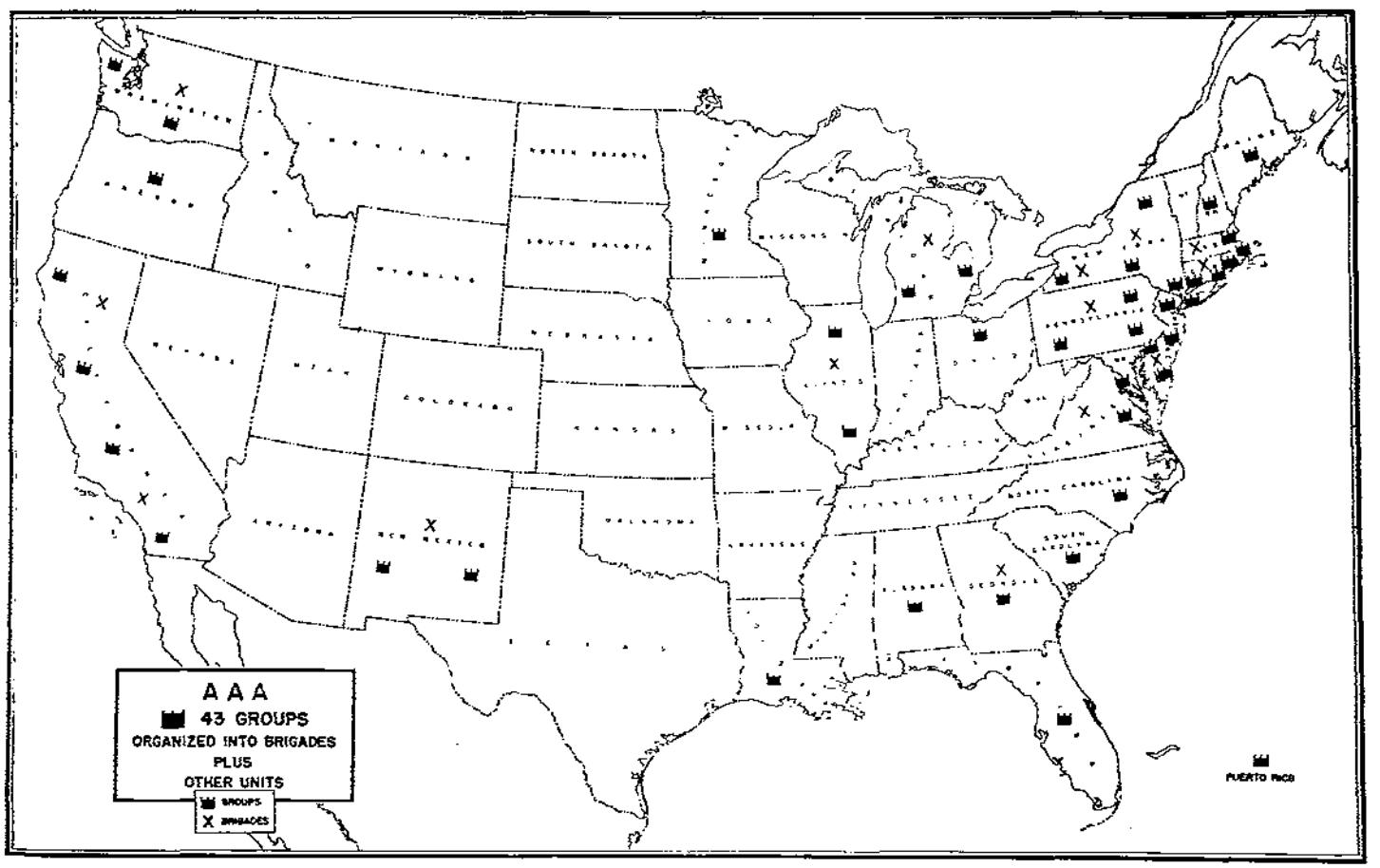
Future plans for use of the island by the Philippine Republic have not yet been announced, although it has been revealed that the island will probably be made a memorial site by both the Philippine and U. S. Governments.

It has also been suggested that the Philippine Military Academy, now located at Baguio, be established on the island.

So today the Philippine flag flies over Corregidor, flying with the best wishes of the world, expressed by General Moore during the turnover ceremonies when he said: "Today the American flag will be lowered on this island for the second time in half a century. As the flag of the Philippines rises in its place with it will go the warmest wishes of all Americans, and it is our sincere hope and firm belief that until the end of history no flag other than that of the Republic of the Philippines shall ever fly over the hallowed ground of Corregidor."

DISTRIBUTION OF NATIONAL GUARD AAA

The following chart shows the geographic distribution of National Guard AAA when full strength has been attained. A total of 84 battalions will be organized and the entire strength of AAA troops will be approximately 75,000 men.



Rockets And Their Fuels*

By Willy Ley

Part One

Introduction

Although the rocket was invented a little over seven centuries ago and experienced, in the course of that long history, repeated periods of high acclaim as a weapon of war, the scientific inquiry into rocket propulsion is just about fifty years old. While the turn of the century does not precisely mark the date of the beginning of scientific inquiry, the year 1900 may well be used as a convenient landmark. Everything prior to that year belongs under the chapter heading of artisanry. It was, on occasion, quite skilled and ingenious artisanry, but it was neither scientific inquiry nor technological research.

During the long period of artisanry, all rockets were alike except that they came in assorted sizes, but since the advent of scientific inquiry and technological research many different types have been designed for a variety of specific purposes so that classification has become unavoidable.

Any classification will depend, of course, on the purpose for which it was made but in the case of rockets the most obvious and most common classification is that according to the intended use. It will read about as follows:

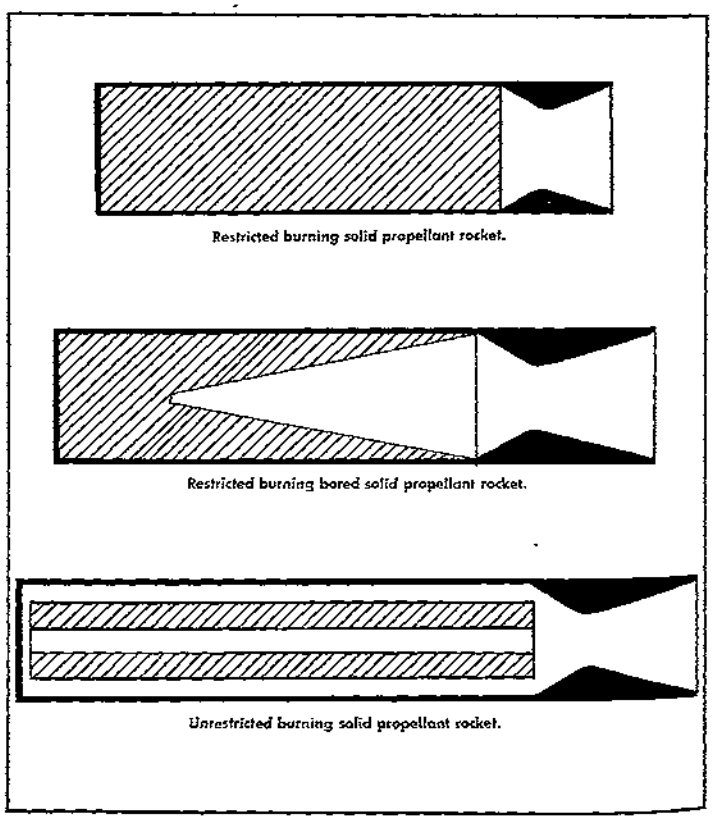
(1) Signal rockets (including flares)
(2) Bombardment rockets
(3) Instrument Carriers (e.g. *WAC Corporal* and *Neptune*)
(4) Long range rockets (e. g. V-2)
(5) Take-off help for aircraft
(6) Power plants for (A) unmanned missiles
(B) manned (piloted) aircraft.

In this classification it is unimportant, whether the bombardment rockets are airborne, shipborne or ground batteries; it is likewise unimportant whether the ground batteries fire against ground or aerial targets, etc. It is also unimportant whether the long range rockets are used as long range artillery or as mail carriers, etc., etc.

But since the performance of a rocket and most of its design detail depend on the type of fuel burned, a classification according to fuels is also perfectly justified. Even if that classification were as rough as distinguishing just two types of rockets, those with solid and those with liquid fuels, the above list of uses would be split up in a very interesting manner. (1) and (2) are in the exclusive domain of solid fuels; (4) and (6B) are wholly in the domain of liquid fuels; (5) and (6A) may be either solid or liquid while (3) is a case where the choice depends on specifications, for example the altitude to be attained or the weight of the instrument load to be carried.

As regards the classification of rockets according to their fuels, all newspapermen, the major portion of the general public, and even a good number of service personnel are convinced that rocket fuels fall into three classes: solid, liquid and secret.

Actually the classification is slightly more complicated than that: we have two main groups with sub-classes, the precise arrangement of which is again largely up to the classifier. The first group is that of solid fuels which form two main sub-classes: the blackpowderlike mixtures and the modern solid fuels which are based on nitrocotton, nitroglycerine (or both) and similar chemicals. The second group of liquid fuels can be most conveniently subdivided into mono-propellants and bi-propellants, depending on whether the fuel contains oxygen or whether combustion has to be sustained by oxygen supplied separately in the



Solid Propellant Rockets.

*Part II of this article will discuss liquid fuels and future fuels.

form of an oxidizer. In order to avoid any question in the reader's mind it should be stated right here that gaseous fuels are classified under "liquids" because they are carried in the rocket in the liquid state.

Blackpowder Mixture

Historically the first rocket fuel was a relative of the old black gunpowder, a mixture of saltpeter, sulfur and charcoal. It is interesting to note that this rocket powder preceded "gunpowder" for the very simple reason that the first documentary evidence of the use of rockets dates from the year 1232 A.D. while guns (in the sense of firearms) are mentioned for the first time in 1313 A.D. The first mention of rockets is Chinese, the first mention of guns is Dutch but with reference to Germany. It is therefore a generally accepted theory by now that rockets were invented somewhere in the Orient, while guns are a European invention.

When looking at the composition of the early rocket powder and of the early gunpowders—armed with the modern knowledge of what it should be—we see that the early blackpowder mixtures were far more suitable for rocket propulsion than for use in firearms. Good blackpowder has about the following composition: 75% (by weight) saltpeter, 15% charcoal and 10% sulfur. But such powder would have been too strong for the early firearms and too fast-burning for use in rockets. The later device to use blackpowder for rockets was to add charcoal to it (fireworkers referred to that process as to "making the powder lazy"). The early "gun" powders were "lazy" enough.

All blackpowder rockets were of the type which are now called "restricted burning" rockets, where the composition can burn only on an exposed surface. This was accomplished by hammering the composition into the prepared rocket tube (consisting mostly of pasteboard and only in the very large sizes, of metal). The center hole which was to enlarge the burning surface was either bored out of the finished rocket or provided for by hammering the composition around a "thorn" which was withdrawn afterwards.

Such blackpowder rockets were virtually the only type of rockets in existence until 1925; improvements consisted merely in accomplishing a higher compression of the mixture than mere hammering could produce. Sir William Congreve, in about 1804, had substituted a drop hammer for the hand-wielded mallet and succeeded in compressing the mixture to an average density of about 1.6 while hand-hammered rockets showed only an average density (of the powder mixture) of 1.3. In order to prevent self-ignition of the rocket while loading, since the air in the powder mixture heats up during compression, Congreve had to moisten his blackpowder with alcohol. That prevented self-ignition but required drying periods of weeks and even months.

The peak of the development of the blackpowder rocket was attained by the German engineer Friedrich Wilhelm Sander in 1926-1930 who had special facilities at his disposal since he was a commercial manufacturer of signal and lifesaving rockets for seacoast use. Sander used hydraulic presses and had developed a number of *techniques* which remained his secret. His rockets had an average density of 1.8 and were encased in high-strength steel alloy tubing.

But while it was possible to handle the problem of self-ignition during loading and while mass-production problems could probably have been worked out, the blackpowder rocket had a main drawback which could not be overcome,—the inherent brittleness of a compressed blackpowder charge. This brittleness became worse as the density was improved and highly compressed powerful rockets became unsafe after much handling or even after a sudden change in temperature. Any mechanical or thermal shock produced cracks in the mixture which caused explosion of the rocket when the flame had progressed to the crack.

Because of this major and unavoidable drawback, the use of blackpowder rockets is now limited to fireworks where a high compression of the mixture is not required and which therefore are reasonably safe both in manufacture and handling.

Modern Solid Rocket Fuels

The absence of military rockets, other than signal rockets, in the First World War is usually "explained" by the statement that rockets were not used because of their inherent lack of accuracy. While it is indubitably true that bombardment rockets are less accurate than field artillery, the real reason was probably founded on logistics and production. Blackpowder rockets, the only type then existing, are hard to adapt to mass-production methods, are still harder to keep to any but very loose specifications, and are never quite trustworthy. The bombardment rocket had to await the adaptation of smokeless powder to stage a comeback.

The thrust of a rocket is equal to the product of the exhaust velocity of the gases multiplied by the amount of fuel consumed per second.

The measured exhaust velocity of the blackpowder charge in a fireworks rocket is on the order of 2000 feet per second. Highly compressed blackpowder charges produced about 3000 feet per second, Sander's best models seem to have produced about 3600 feet per second. Smokeless powders, having a higher energy content, could be expected to produce exhaust velocities of about 6000 feet per second. In addition, smokeless powders are not brittle and have a far lesser sensitivity to mechanical or thermal shock than highly compressed blackpowder charges.

Most of the operationally used bombardment rockets of World War II were propelled by a development or rather an adaptation of the old "double-base" powders first compounded by Alfred Nobel. These powders are somewhat loosely called "ballistite" or "cordite" after early representatives of the group of double-base powders but the composition of the charge is neither that of the original ballistite nor of the original cordite.

The two "bases" are nitroglycerine and nitrocellulose and the main characteristic of manufacture is really that the nitrocellulose is gelatinized.

In this country, the first request for a high power rocket arose from the desire to obtain an airplane bomb with higher downward acceleration than gravity would provide by itself. The request was made in 1940 and the first modern American rocket was designed to accelerate such a bomb. Actually that bomb was never used or even completed but the rocket for it was ready by late Spring of

1941 and operated on a double-base powder consisting of about 60 per cent of nitrocellulose and 40 per cent of nitroglycerine, with a small quantity of diphenylamine added as a stabilizer.

Since a bombardment rocket should have high acceleration for reasons of stability, the entire propelling charge should be consumed quite rapidly. The burning times of bombardment rockets range from one-tenth of one second to a maximum of about two seconds and for this reason modern bombardment rockets are of the "unrestricted burning" type. This means that the grains are freely suspended in the steel tube that serves as a combustion chamber and that a tubular grain, for example, burns from the inside out as well as from the outside in. The amount of gases generated during each time interval are therefore very nearly equal so that both the thrust time curve of the rocket and the internal pressure time curve are "flat topped."

In designing the U.S. and the British bombardment rockets, the designers saw to it that, as far as feasible, the whole propelling charge of each rocket was also a single grain.

The German solid fuel rockets, like *Nebelwerfer* and *Schweres Wurfgerät*, also used double-base powders of similar composition to the U. S. and British rockets. The main difference was that the Germans did not use nitroglycerine but used a liquid known to chemists as diethylene glycol dinitrate. The main reason for this change from the old-established double-base formula may have been that Germany was short of fats and glycerine is derived from fats. But as it often goes when an ersatz material has to be used, the substitute proved superior to the short-of-supply original in several respects. Diethylene glycol dinitrate is a better gelatinizer for nitrocellulose than nitroglycerine. It also is less sensitive than nitroglycerine and therefore safer in handling.

Modern Solid Fuel Rockets of Long Burning Time

The rocket designer has just one major choice in establishing his rocket's performance when the amount of fuel is given. He can either obtain a high thrust with short duration of burning, or else work for a longer duration with a correspondingly lower thrust.

In bombardment rockets high acceleration and hence high thrust are required, but long duration is not essential. But in the case of take-off assistance for aircraft, a longer duration is essential. In that case, thrust requirements have to be adjusted to the demand for a long burning time rather than the other way round. A rocket which is to furnish take-off help has to burn for at least ten seconds and may be required to burn for as long as forty seconds. For such rockets, designers returned to restricted burning rockets.

In this country the development of take-off help rockets for aircraft was largely in the hands of Jet Propulsion Laboratory of the California Institute of Technology. The engineers of the JPL seem to have considered ballistite first but were not too well pleased with it for their purpose Ballistite burns with a very high temperature which made rocket design difficult. The steel tube which would withstand this high temperature for two seconds as a bombardment rocket, would not stand it for 20 seconds as a take-off rocket. And since the take-off help was required mainly for aircraft carrier use, the effects of the hot exhaust blast on the carrier deck had to be considered. Another major drawback was that ballistite is rather sensitive to circumambient temperatures in its performance. A rocket unit which will deliver 1000 lbs. thrust at 90° F. would deliver only around 600 lbs. at 40° F.

One of the earlier developments had been designated GALCIT 27 (from Guggenheim Aeronautical Laboratory of the California Institute of Technology) but this powder was not found to be storable. In particular the powder stick underwent shrinkage, thus transforming the restricted burning rocket into an unrestricted burning rocket which would explode since it was not designed as such. GALCIT 53, while one of the most modern rocket propellants, turned out to be the smokiest "powder" ever, far overshadowing the old smoking blackpowder except that the smoke produced is a neat white.

GALCIT 53 consists of potassium perchlorate, a white powder which provides the oxygen for the combustion. The fuel is a special variety of asphalt, mixed with a small amount of oil with an asphalt base. The asphalt and the oil are heated in a mixing kettle to about 350 degrees Fahrenheit and then the perchlorate is stirred into the hot liquid. After it has cooled to some extent it is ladled into the rocket units which are then set aside to harden.

> "In its finished form GALCIT 53 is a black plastic, at ordinary temperature resembling stiff paving tar. It can be detonated with difficulty, if at all. Only with patience can it be ignited with a match flame; but once ignited it burns fiercely, emitting a white light and dense white smoke. Burning in a combustion chamber under a pressure of 1800 lbs. per sq. inch the propellant gives an average exhaust velocity of 5300 feet per second at an average burning rate of 1.25 inches per second. The new asphalt-base propellant had several advantages over all the earlier ones. It was easier to prepare, and ingredients were more readily available; it could be stored at wider temperature limits, and within those limits it could be stored indefinitely without deteriorating. . . . Units loaded with the new propellant were recommended to be fired at temperatures between 40° F. and 100° F. Much above the recommended temperature it became viscous and flowed." (Quote from Cal. Tech. JPL Report)

Probable Development of Solid Fuels

In spite of the great strides made in the development of liquid fuel rocket motors there is a definite field from which solid fuel rockets will not be displaced by liquid fuels. This field is predominantly although not exclusively military. The applications reserved for solid fuels are those where storability is a major factor. They are:

(A) Bombardment rockets used like field artillery, especially for area fire, for ranges up to 8000 yards.
(B) VT fuzed rockets for antiaircraft fire for altitudes up to 20,000 or 25,000 feet.
(C) Engineering and peacetime applications such as distress signals, take-off assistance, emergency message transportation (especially ship to shore), line-throwing (including anchor throwing for small

craft and the laying of telephone wires), posthole digging, etc., etc.

It may be surprising to some readers that this table does not mention direct fire, (e.g. antitank fire) but it seems likely that this special application will fall to recoilless artillery which combines the lightness of the rocket launcher with the accuracy of the fieldpiece.

An "ideal fuel" for all these uses is likely to be in the line of development pointed out by the GALCIT fuels. The main requirements for such a fuel would be that it is storable indefinitely, compounded of cheap and available raw materials, safe, non-brittle, unaffected by temperature, moisture resistant and mold resistant. Its performance characteristics should not vary much between the likely natural limits of — 40° F. to + 110° F. It would be useful if it were of high density. The exhaust blast should be smokeless. A high energy content is, of course, desirable, but a very high exhaust velocity is not the prime requirement since the over-all efficiency of a rocket depends to a large extent on the ratio between rocket velocity and exhaust velocity, and rockets of short burning times cannot attain very high velocities.

C. A. Association Executive Council Holds Conference

In an effort to ascertain the attitudes and desires of Coast Artillerymen throughout the country with reference to a merger of the Field Artillery Association and *Journal* with the Coast Artillery association and JOURNAL, the Executive Council invited representatives from the various Army areas to a meeting of the Council on 10 November 1947 in Washington, D. C.

One Reserve and one National Guard officer was selected from each Army area upon recommendations made by the respective Army commanders.

Prior to meeting in Washington, each officer conducted a representative survey among officers of his own component in his Army area to ascertain the consensus of opinion regarding the merger of the associations and journals.

General LeR. Lutes, President of the Association, presided until the latter stages of the meeting at which time an important conference necessitated his departure. Brigadier General Aaron Bradshaw, Jr. then presided.

In addition to General Lutes and General Bradshaw, the following members of the Executive Council were present: Brigadier General John C. Henagen, Colonels Joe Moss, Charles M. Boyer, Andrew P. Sullivan and W. I. Brady.

Below listed by Army areas are the Reserve and National Guard officers who attended:

FIRST ARMY

National Guard—Brigadier General K. F. Hausauer
Reserve—Colonel H. R. Browne, Jr.

SECOND ARMY

National Guard—Colonel James Galloway
(Alternate for Brigadier General C. C. Curtis)
Reserve—Colonel John M. Welch

THIRD ARMY

National Guard—Lieutenant Colonel Rodney S. Cohen
Reserve—Colonel Thomas C. Huguley

FOURTH ARMY

National Guard—(No representative—General Charles G. Sage was unable to attend.)
Reserve—Colonel Wilburn V. Lunn

FIFTH ARMY

National Guard—Lieutenant Colonel Frank X. Meyer
(Alternate for Colonel C. T. Pulham)
Reserve—Colonel Robert L. Donigan
(Alternate for Colonel Thomas F. Mullaney)

SIXTH ARMY

National Guard—Brigadier General David P. Hardy
Reserve—Colonel Bedford W. Boyes

In addition to the above named officers, the following named Regular Army officers were present:

Major General L. L. Lemnitzer
Major General Robert T. Frederick
Brigadier General William S. Lawton
Brigadier General C. V. R. Schuyler

The following recommendations were agreed upon by the delegates:

(1). That no immediate merger of the Field Artillery Association and *Journal* with the Coast Artillery Association and JOURNAL be effected.

(2). That when the two branches are legally merged, or when the actual merger becomes imminent, the Executive Council at what it considers to be the appropriate time, and subject to agreement on what it considers to be satisfactory financial and administrative arrangements, will initiate the necessary action to effect the consolidation of the Associations and Journals.

(3). That if the merger of the Associations and Journal is effected, all assets of the Coast Artillery Association and JOURNAL be transferred to the new combined association and journal unless, under the conditions then existing, the Executive Council considers another course of action advisable, in which case the assets of the Field Artillery Association and *Journal* should be matched and the balance disposed of as the Coast Artillery Association may direct.

(4). That pending action pursuant to the foregoing recommendations, the present financial and editorial policies of the JOURNAL be continued and that its losses, if any, continue to be subsidized by the Association.

AGF Guided Missile Activities At Fort Bliss, Texas

By Lieutenant Colonel Peter S. Peca

Guided missiles are on the way.

The guided missile is a weapon that will be adaptable to the needs of the Army, Navy and Air Force. No one agency will have sole use. Just as an airplane, a truck, or a gun finds its appropriate use in the three services, so will the guided missile.

In anticipation of the future uses of the new weapon, Headquarters Army Ground Forces established the Antiaircraft Artillery and Guided Missile Center at Fort Bliss, Texas on 1 July 1946. Under the command of Major General John L. Homer, the Center coordinates all Army Ground Forces activities connected with guided missile agencies in the Fort Bliss area. The Antiaircraft Artillery and Guided Missile Center is intensifying its efforts so that the Army Ground Forces will be thoroughly prepared to fulfill its mission in the operation of guided missiles.

The Antiaircraft Artillery and Guided Missile Center presently has several agencies which are actively engaged in guided missile activities. These agencies include the Antiaircraft and Guided Missile Branch of The Artillery School, the 1st Guided Missile Battalion and Army Ground Forces Board No. 4 with its Guided Missile Service Test Section. Through these three organizations the Antiaircraft Artillery and Guided Missile Center is making great strides in the guided missiles picture for Army Ground Forces.

The Antiaircraft and Guided Missile Branch operating under the assistant commandant of the Artillery School, Major General Homer with Brig. General C. E. Hart as its director, is conducting a 37-week course of instruction in guided missiles for qualified officers from all branches of the armed forces. The Guided Missile Department of the school is headed by Lt. Colonel Lawrence W. Byers, who is assisted by a staff of eight U. S. Army Officers and by four U. S. Navy Officers headed by Commander Keith E. Taylor.

The guided missiles course gives the students a background in the technical aspects of guided missiles, to include propulsion, launching, guidance and control, and a broad foundation in tactics and techniques for the utilization of guided missiles based on the capabilities and limitations of missiles under development. With this school background, this group of officers will be trained to fulfill assignments as guided missile staff officers with higher commands, instructors at schools, as test officers of Army Ground Forces Board No. 4, as Army Ground Forces Liaison Officers with Development Projects, as officers for future guided missile units, and for further technical education under the Army Ground Forces civilian school program.

Officers presently attending courses in guided missiles at service or civilian institutions will normally receive guided missiles assignments upon graduation. They will usually be deferred from overseas assignments until two years after graduation.

The 1st Guided Missile Battalion, commanded by Lt. Colonel George F. Pindar, is the Army's tactical organization engaged with guided missiles. This Battalion is receiving considerable experience by active participation in a variety of guided missile programs. At White Sands Ordnance Proving Ground, the battalion is assisting the Ordnance Department in the preparation, firing and instrumentation of all missiles fired there. Included among the missiles are the WAC Corporal and V-2. With all of this work, this Battalion is undoubtedly participating more actively in guided missiles development than any other single unit.

For the service test of guided missiles by Army Ground Forces Board No. 4, the 1st Guided Missile Battalion will furnish the necessary troops. The troops to be used are now growing up with some of the development projects. By the time the missiles are ready, trained troops will be available. The on-the-job training is most satisfactory, both from the point of view of Army Ground Forces and the development agency.

Army Ground Forces Board No. 4 with General Homer as President and Colonel Lester D. Flory as Deputy President is actively engaged in guided missiles activities.

The mission of the Board with respect to guided missiles is to carry out for Army Ground Forces, a number of functions, some of which include:

a. Evaluation of new and modified equipment.
b. Review and study of foreign equipment.
c. Preparation of military characteristics.
d. Performance of user's tests.

These functions are carried out by the Guided Missile Service Test Section of the Board.

To carry out its mission, the Guided Missile Service Test Section is developing a thorough background on the development of Surface-to-Air and Surface-to-Surface missiles that have applicability for Army Ground Forces use. It is preparing itself with the trained personnel, and specialized equipment, incident to carrying out the service tests.

In the service test of conventional Antiaircraft or Field Artillery equipment it is not too difficult to secure experienced personnel who are capable of conducting a service test from the user's point of view. With guided missiles the picture is different. Since it is a new field of endeavor it is necessary to train personnel by a variety of means to secure the required experience.

By maintaining constant contact with development tests at several proving grounds, by studying project reports and by assisting technical agencies in various problems involved in guided missiles work, the Board is developing considerable valuable experience. This, together with the assignment of graduates of the guided missile course of the Antiaircraft Artillery and Guided Missile Branch of the Artillery School and graduates of the Army Ground Forces Civilian Schooling Program, will give Board No. 4 the necessary experience and trained personnel to make it ready to undertake the service test of guided missiles now under development.

The Board has membership on several panels of the Research and Development Board of the National Military Establishment. Through these memberships it is keeping abreast of the development of guided missiles, proving grounds, and the procedures and instrumentation necessary in the service tests. Board representatives attend meetings which are held periodically.

Army Ground Forces Board No. 4 has prepared and is operating a permanent guided missiles exhibit. The missiles on display provide excellent examples of different propulsion systems, launchers, and presently available guidance and control equipment. This exhibit consists of a number of missiles on display as complete items and also breadboard displays of components. Included in the exhibit are a V-2, JB-2, a number of glide and vertical bombs utilizing various control systems, and a radio controlled OQ Antiaircraft Artillery Target display. The exhibit is used primarily for study and instructional purposes for students at the Antiaircraft Artillery and Guided Missile Branch of The Artillery School, members of Army Ground Forces Board No. 4, troops, and for official visitors to Fort Bliss. Additional equipment is being secured as rapidly as possible. To date the exhibit has proved to be a most valuable adjunct to the guided missile training facilities available at Fort Bliss.

The Antiaircraft Artillery and Guided Missile Center is assisting in the dissemination of guided missiles information to interested units of the Army, including the civilian components. Speakers are furnished to service schools, and to ORC meetings. The Center has literature, material and films available to agencies desiring same for lectures or instructional purposes. Fairly complete information on all guided missile matters is available at some agency of the Antiaircraft Artillery and Guided Missiles Center. This material is a tremendous factor in keeping the Center agencies abreast of the guided missiles field, and in the instruction of the students in the guided missiles course.

Aside from the developmental problems concerned with guided missiles, the center is anticipating future requirements in order to avoid the impact similar to that which occurred when Radar was developed and standardized for Army Ground Forces.

Problems which are being considered by the various agencies of the Center include the following:

a. Tables of Organization and Equipment for guided missiles under development.
b. Tactical doctrine for each type of missile based on its capabilities.
c. Logistical support required for various types of guided missiles.
d. Training of officers and enlisted specialists.
e. Training aids.

Tentative tables of organization and equipment have been prepared for guided missile organizations. With the Department of the Army being charged with operational cognizance of Surface-to-Air and Surface-to-Surface tactical missiles at least two general types of organizations are indicated. Each general type can be made to conform with specific missiles which are applicable to Army Ground Forces use. The status of Tables of Organization and Equipment must be kept abreast of the development projects. When a particular missile becomes ready for operation the T/O & E requirements will have been solved.

Tactical doctrine is being developed based on the capabilities and limitations of the missiles. Generally, the Antiaircraft guided missile will follow conventional Antiaircraft Artillery role requirements and Surface-to-Surface guided missiles will supplement Field Artillery. All doctrine in this field is quite tentative, since cost will play a big part in the operational use and since military characteristics have not been fully realized. Here again the future operational use of the missile is being linked up with each project as it develops.

Even though the guided missile will be a great improvement over some conventional weapons, it will not be as widely used as commonly believed. One factor in its future use will be that of economics. Will we use a guided missile costing $25,000-$50,000 to destroy a target that can be destroyed by a number of 155mm rounds? Will we use an antiaircraft guided missile against aerial targets when several 90mm guns can accomplish the same thing? When and where to use these specialized weapons will require considerable study.

Guided missiles, like most good things, will have inherent disadvantages that will place certain limitations on their operational use. Antiaircraft guided missiles will normally be launched at high accelerations and must be roll, pitch and yaw stabilized prior to being guided regardless of the guidance system used. All of these steps in preparing a missile for guidance will take several precious seconds. The net result is that within certain minimum ranges no guidance will be possible. This will present a definite requirement for conventional type Antiaircraft Artillery weapons. To utilize a guided missile within these minimum limits would be a useless expenditure of an expensive weapon.

In the case of Surface-to-Surface weapons a number of limitations can also be expected. In general, conventional weapons will still play an important role.

The logistical support required for guided missile operations appears as a major problem. To anticipate these requirements, studies are now being performed.

Training of Specialists must begin now. The complexity

of components of guided missile equipment indicates a great need for enlisted and officer specialists. Subjects to be taught will include operation, maintenance and repair of propulsion systems, gyroscopes, radars, radios, servos, computers, telemetering equipment and power plants. The need for new MOS's and an increase in the number of existing MOS's must be determined early so that future requirements may be anticipated and fulfilled.

Training aids will play a large part in the development of guided missile organizations. The high cost of missiles will require that many of the operational features be simulated. Specialized trainer devices will have to be developed. It will take time to produce these items. For the benefit of the using units, appropriate training devices should be available prior to the arrival of guided missiles.

To carry out the policies and directives of Army Ground Forces the Antiaircraft and Guided Missile Center is utilizing all the guided missiles agencies at its command. Through proper coordination, the Center is keeping abreast of guided missiles development and is conducting studies of the problems which have been mentioned previously in this article.

The work now underway at the Center will contribute in large measure to the successful accomplishment of the mission of the Army Ground Forces in the operational use of guided missiles when that time arrives.

General Devers Cites Army Career Opportunities

The Army's new preselected school plan and leadership training program provide exceptional opportunities for intelligent and ambitious young men to qualify for career service in the Infantry, Artillery, or Armored Cavalry, according to Gen. Jacob L. Devers, Commanding General of the Army Ground Forces.

The preselected school plan, General Devers said, makes it possible for a man between the ages of 17 and 34, inclusive, with a high school education or its equivalent, to select one of the Army's 60 specialist training courses before actually enlisting.

He explained that a prospective recruit may choose his two favorite fields of interest from among the Army's many career opportunities, such as construction, crafts, mechanical, scientific-medical-technical, machine shop, or electrical and radio. In each of these two fields he may indicate two specialist training courses he would like to take. If he is accepted for enrollment in one of the four courses he chooses, and is satisfied with the course, he may then enlist in the Regular Army for three, four, or five years with positive assurance that he will be assigned to that course.

Designed to increase the educational value of Army service to young men and to provide additional incentives for career service in the Army, the preselected school plan is open not only to recruits who want to serve in the Infantry, Artillery, or Armored Cavalry but to men who would like to enter one of the administrative or technical services.

"The privilege of enlisting in the Regular Army specifically for training in one of these specialist courses is one of the greatest career incentives we can offer young men," General Devers said. "These courses include not only military specialties but technical trades which a man can follow in civilian life whenever he retires from the Army."

General Devers explained that in addition to this opportunity to choose his field of specialist training, the Army recruit who meets prescribed qualifications may also qualify for enrollment in one of the Potential Leaders' Courses now conducted by the Army Ground Forces.

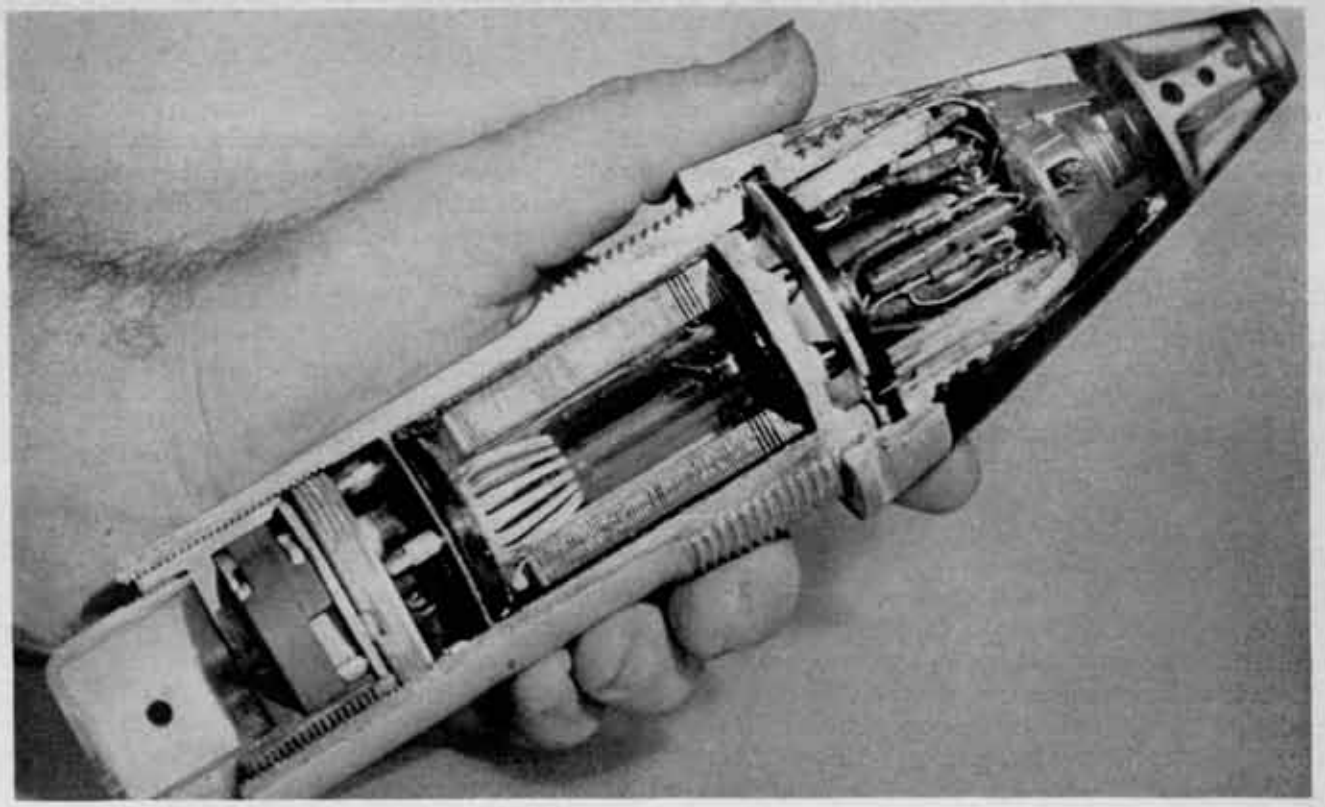
This leadership training program, he said, serves not only to train enlisted men for the responsibilities of noncommissioned officers but to prepare outstanding men for enrollment in officer candidate school and advancement to commissioned status. The six-week leadership courses are open only to men who show potential leadership ability and have average or superior intelligence.

General Devers said the preselected school plan is open to men between the ages of 17 and 34, inclusive, who are high school graduates or can show that their practical experience has given them an equivalent education. Army Ground Forces schools in which courses are now available under this plan, he said, are the Artillery School, at Fort Sill, Okla.; the Seacoast Branch of the Artillery School at Fort Winfield Scott, Calif.; the Armored School at Fort Knox, Ky.; and the Army Ground Forces Physical Training and Athletic Directors School at Camp Lee, Va.

Typical Army Ground Forces courses in which prospective recruits may request enrollment, according to General Devers, include the Motor and Track Vehicle Maintenance Course at the Armored School; the Liaison Airplane and Engine Mechanics Course at the Artillery School; and the Submarine Mining Operations Course at the Seacoast Branch of the Artillery School.

The Army Ground Forces commander emphasized that although only high school graduates or the equivalent can take advantage of the preselected school plan, men who have not completed high school may enlist immediately in the Army and, after completing basic military training, apply for enrollment in any Army Ground Forces school. In addition to the schools listed above, the Army Ground Forces also operates the Infantry School at Fort Benning, Ga.; the Ground General School at Fort Riley, Kans.; and the Antiaircraft Artillery and Guided Missiles Branch of the Artillery School at Fort Bliss, Tex.

General Devers added that men who want to continue their high school or college education while they are in the Army may do so during off-duty hours by means of the facilities provided by the United States Armed Forces Institute. USAFI not only offers correspondence and self-teaching courses to individual students by mail, at negligible cost, but provides group instruction material for classroom use in Army Education Centers at more than 700 Army installations throughout the world.



New Weapons–New Tactics*

The VT Fuze Has Created Vast Problems Of Protection

By Lieutenant Colonel F. P. Henderson, U.S.M.C.

"The never-ending quest for more efficient or more deadly weapons and techniques is always paralleled by the search for the proper countermeasure."

American science and industry, in conjunction with the Army and Navy, produced two new and revolutionary weapons in World War II—the atomic bomb and the VT fuze. Both have a tremendous potential effect upon the organization and equipment of armed forces and the conduct of future wars.

Civilian and military writers have provided us with a rich diet of information and speculation concerning the far-reaching effects of the atomic bomb upon the Nation's armed forces and the civilian economy necessary for their creation and support, but what of the VT fuze?

Since the brief flurry of publicity attending the announcement of the new fuze it seems to have fallen into obscurity, completely overshadowed by the world-wide interest in the more dramatic atomic bomb. Yet the VT fuze poses problems to the military field forces as difficult to solve as does the bomb. Furthermore, the VT fuze is a weapon of today and will be present on the battlefields of the future whether the atom bomb is there or not. It seems logical, therefore, that we should have a high priority to solving some of the difficulties that are already with us, as well as those that will be present in the atomic future.

The never-ending quest for more efficient or more deadly weapons and techniques is always paralleled by the search for the proper countermeasure. One of the oldest and most absorbing of these military feuds has been between artillery and the individual. Whether the individual was a rifleman, a member of a weapon's crew, or attached to some command or service group, the artillery has been his greatest enemy.

Countermeasures

Early in World War I artillery weapons and technique reached a state of development where they could dominate the battlefield. The countermeasures of the individual soldier were ones that changed the nature of war more than any previous developments in military history.

First, he got a shovel and dug a hole in the ground, where

*Reprinted, courtesy of *Ordnance*.

he lived and fought, leaving it only when necessary and returning to it at the first warning of danger. For a second countermeasure, he finally abandoned the closed formation that had changed but little from Caesar's day and put space between himself and the next individual.

What had the soldier learned? He learned that if he was below the surface of the ground he was relatively safe from artillery fire, except for a direct hit. He also learned that when he had to be out in the open in the enemy's sight, a group of men scattered about over a considerable area were much less likely to be fired upon than if they were crowded together. And thus were born the protective field fortifications and deployed formations of modern warfare.

Need for a New Fuze

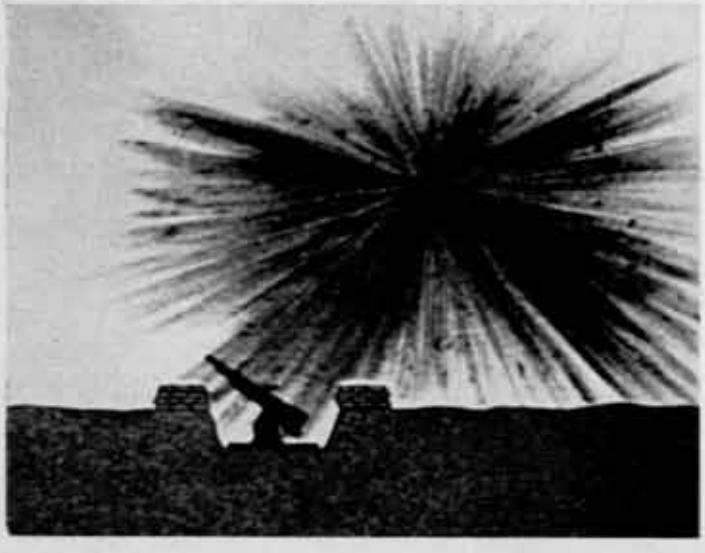
In order to defeat these measures of self-preservation, the artillery needed only one small item—a fuze that would unfailingly detonate a shell at the optimum height above the target. Such a fuze would nullify the protection of the open foxhole of crew emplacement by spraying shell fragments down into it. It would also take a heavier toll of casualties from a deployed formation than would the percussion-fuzed shell.

The answer was simple to see but solving the problem to obtain the result was difficult. It took us almost thirty years to get the answer finally screwed into the nose of a shell and to learn how tremendously effective it was.

Fortunately, since our recent enemies did not have the VT fuze, we were not under the lash of urgent necessity to find means of protecting against it. Any future enemy will almost certainly have it, however, so that now we are not spared the necessity of examining its effects and providing against them.

What we must provide is complete splinterproof protection against VT fire from artillery, mortars, naval guns, or close-support aviation to all elements of a military force, whether it is defending or attacking. To provide this protection without hampering the mobility of our troops will be one of the most knotty problems that science, industry, and the armed forces will be called upon to solve in the years ahead.

The VT-fuzed shell makes the conventional gun emplacement obsolete.



The first and most difficult element to provide for is the infantry, the primary target of most of the shells fired in combat. The rifleman has now been robbed of the protection his foxhole or irregularities in the ground formerly gave him; he is in greater danger than ever before when he moves in the open. Yet he can't be laden with very much splinterproof protection.

As an individual, the best we apparently can do for him now is to develop an ultralightweight body armor (not necessarily metal) that will protect as much of him as the weight limit will allow.

Protecting the Rifleman

As a member of a group, protection for the rifleman seems to lie in the splinterproof troop carrier. In the attack he should be moved to, or into, the enemy's position in such vehicles. This will avoid exposing him in the open to observed artillery and mortar fire, and thereby eliminate the necessity for a further dispersion of troops on foot to avoid excessive casualties.

For the infantry's crew-served weapons such as the mortar, machine gun, recoilless rifles, etc., a lightweight, splinterproof, self-supporting shield large enough to cover the standard open emplacement seems to offer a temporary solution.

The VT fuze has vastly increased the effectiveness of counterbattery fire and makes the conventional gun emplacement obsolete since it no longer offers protection to either crew or gun. The ultimate countermeasure will probably be a self-propelled field artillery mount with complete splinterproof protection for both gun and crew.

Antiaircraft artillery in its deep, revetted emplacements has been relatively safe from air attacks. This security vanishes, however, when attacking planes are armed with VT-fuzed bombs and rockets. Complete splinterproof protection, similar to that given naval antiaircraft guns, is now necessary. Light automatic antiaircraft weapons should turn to the self-propelled splinterproof mount.

An increased use of engineer troops employing excavating machinery and prefabricated overhead cover is visualized in the construction of a defensive position, even a temporary one. The old hasty defense with its hand-shovel construction, open foxholes and emplacements, no longer offers protection to a defending force.

Amphibious and airborne operations offer special problems in protection. In the former, buoyancy is a critical problem; in the latter, weight and portability. Landing craft for assault troops must have adequate splinterproof protection.

Problem of Logistics

In airborne operations, the additional weight added to the equipment of a military force by providing splinterproof protection poses a difficult logistic problem.

However, only when we are unfailingly able to locate the enemy's weapons rapidly and accurately will we be able to offer secure protection against VT fire to all our troops.

To ensure success of our field forces in the future we must begin now to protect them against VT fire. The atomic bomb, like war gas, may never again appear in combat, but the VT fuze is here to stay.

The New Army Extension Courses

By Colonel A. E. Kastner, FA

What credit toward promotion requirements do I get if I complete extension courses?

Will I really learn something from the courses or will I just be putting in time?

These questions among others are frequently asked at extension course conferences with members of the Reserve and National Guard refresher courses at The Artillery School. It is the purpose of this article to present the answers to questions regarding the new Army Extension Courses.

Mission

The mission of the Extension Courses is to provide a progressive, nonresident course of military instruction for personnel of all components of the Army of the United States. Although Regular Army personnel are eligible to take these courses, they are designed primarily for the civilian components of the Army.

History

To appreciate the development and execution of the mission, a short resume of the background of the Extension Course Programs is appropriate.

In 1922, the Army Extension Courses, known then as the Correspondence Courses, were established to further the military education of officers by providing for them a carefully planned, progressive, and extensive course of study. The Extension Courses were divided into four groups of subcourses, called the 10, 20, 30, and 40 series. These were intended for qualifications, respectively, for appointment as second lieutenant and for promotion to first lieutenant, captain, and major. For field officers the Command and General Staff School subcourses were available. Special texts were prepared for use with the subcourses.

In 1939, changes were prescribed in the subject matter of the series and in the texts used. The subject matter of the series was changed from promotion requirements to knowledge-in-grade requirements. For example, where formerly the subject matter of the 20 series was designed to qualify a second lieutenant for promotion to first lieutenant, it now furnished the knowledge required by a second lieutenant. War Department publications, rather than the special texts, were to be used. The revision of subcourses was proceeding when the war interrupted the program.

The work involved in Army Extension Courses has always consisted of two phases. The first phase is the preparation of all subcourse material, both lessons and instructional matter used with them. The second phase is the administration of the subcourses. This phase includes the enrollment of students, assignment of instructors, distribution of instruction material, and the grading of lesson papers.

During the period from 1922 until courses were discontinued in 1942, the Artillery Schools were concerned only with the first phase of the work—the preparation of material and texts. The administration of the courses was charged to Corps Area Commanders.

The disadvantages of this system were many.

Courses were not well coordinated because chiefs of arms and services selected and approved their own courses with little regard to similar courses conducted by other arms and services.

Courses were not perfected because schools had no way of validating the courses by a study of the results of administration and student reaction.

Grading was non-uniform and unreliable because it was not performed by instructors skilled in teaching the subject matter.

There was a considerable waste of printed material resulting from the necessity of maintaining stocks in Adjutant General depots, Corps Areas, Reserve Districts, and other subordinate locations.

In April 1946, the Army Extension Courses program was reestablished. Both the preparation and the administration of the subcourses are now accomplished at the service schools.

This system corrects the disadvantages of decentralized administration.

Supervision and coordination by Headquarters, Army Ground Forces, and the War Department avoids duplication and insures strict adherence to doctrine.

Courses are kept up to date as service schools are charged with that responsibility and, therefore, can discover errors while grading and administering the subcourses.

Uniform grading by specially qualified instructor personnel is assured.

Administration by service school avoids the possibility of favoritism and any suggestion of unfair practice.

Maximum economy results from the maintenance of only one stock of materials for each school.

Some appreciable reduction in personnel engaged in administration of extension courses is made because of centralization of grading and administrative functions at service schools.

After observation over a year of operation, The Artillery School believes that the administration of the courses at the School has established the courses on a firm basis and has resulted in an over-all economy of effort.

The nature of the new system provides great flexibility

★Reprinted, courtesy *The Field Artillery Journal*.

toward expansion. The present courses have an enrollment now of about 20,000 with a forecast for the year of about 50,000. The majority of the civilian component officers in the postwar Army will receive military education through Extension Courses. The magnitude of the task is, therefore, readily apparent.

On April 15, 1947, the administration of the Extension Courses of The Artillery School and its branches—Antiaircraft and Guided Missiles, and Seacoast—was centered at The Artillery School. Courses are prepared at the Branch Schools and reviewed and approved by The Artillery School.

Scope

These new courses provide progressive military instruction, appropriate to the grade and military education of the student. The courses also parallel the resident instruction of the respective service schools. The 10 series is designed for basic military instruction, the 20 for second lieutenants, the 30 for first lieutenants, the 40 for captains, the 50 for majors and the 60 for lieutenant colonels.

Command and General Staff College subcourses are integrated into the 50 and 60 series of subcourses of the service schools.

Preparation

The subjects and the scopes of the subcourses are recommended by the schools of the arms and services concerned. After their approval by Headquarters, Army Ground Forces, for the ground forces, and the War Department for the technical services, they are returned to the schools for preparation of the actual subcourses. A "preparation officer" is assigned to prepare and monitor a course from start to finish. Extreme care is used to insure that the course will have a genuine teaching value. Close liaison is maintained with all the academic departments resident at the School. All material must conform to approved doctrine, avoid duplication, be treated in a logical and progressive manner, and be presented in a simple and direct form. The selection of subjects is predicated on the basis of training the student for his specific wartime assignment rather than to give an all around familiarization. Approximately 75% of the material deals with matter appropriate to the grade of the student, while the other 25% is to fit him for his next higher grade.

Throughout the preparation the guiding principle is to design exercises which will require the student to use and apply principles, rather than perform mere memory or copy work. In general, objective type exercises—that is, multiple choice, true and false, or short answer type—are used. This not only saves times for the student and the grader, but also permits more subject matter to be covered than is otherwise possible. Many students felt that the teaching value of the old Extension Courses was not high. The student could merely turn the pages of the text until the answers to the questions appeared. The new Extension Courses avoid this fault by providing exercises which can be solved intelligently only if the student understands thoroughly the subject matter of the text.

When the "preparation officer" has completed his work, the subcourse is reviewed carefully for content, level of instruction, teaching value, and form. It is then checked for conformity to the latest doctrine, procedures, and techniques by the School's academic department charged with that type of instruction.

After the necessary changes and revisions, the subcourse is forwarded to Army Ground Forces for approval. When it is returned, comments and changes are incorporated, and it is then printed and made ready for distribution.

Administration

The student who desires to enroll in a series of subcourses submits an application through channels on WD AGO Form 145.

An officer may require instruction in a particular subject only. In that event he should apply for enrollment in an appropriate subcourse without regard to series. If he desires, The School will select and furnish the proper subcourse.

After approval of the application, one or more lessons of a subcourse are sent the student. Certain subcourses use continuing situations in which one lesson is dependent on the solution of the preceding lesson. In such cases only one lesson is furnished at a time.

When the student has completed a lesson it is returned to the School for grading and processing. A rigid department policy requires that a lesson be processed, graded, and placed back in the mails within 24 hours of receipt. All grading receives the personal attention of an officer specialist. This, usually, is an officer of field grade. It is in this stage that special techniques are necessary to create the desirable student-instructor relationship. If papers are machine processed and the student feels that he is simply a number, results will be comparatively poor. If, however, the student realizes that the instructor understands his problems and is endeavoring to help him as an individual, the results will be much more gratifying. The instructor not only marks an exercise as right or wrong, but also furnishes detailed comments to aid the student in comprehending the principles involved. The personal factor is emphasized to the greatest possible degree. There is, of course, a vast difference between merely grading a correspondence course paper and genuinely teaching by mail.

After the paper is graded and results recorded, it is returned to the student together with solution sheets. Numerical grades are recorded at the school and the appropriate word grade is marked on the paper on the usual basis of superior, excellent, satisfactory and unsatisfactory.

When all lessons have been graded the examination is mailed to the student. Fifty per cent of the average rating attained on the lessons plus fifty per cent of the rating on the examination constitutes the final rating. Upon the satisfactory completion of a subcourse the student is advised of the rating attained through the proper channels. When the student has completed a course series satisfactorily, a Certificate of Completion is furnished through channels. For National Guard students copies of this Certificate are furnished the Chief, National Guard Bureau, Washington, D. C., and the State or Territorial Adjutant General concerned. For Organized Reserve students, one copy is provided the unit instructor, who makes appropriate entries on the WDL AGO Form 66 of the student and files the

other copy in the field file 201 of the student concerned.

Texts, maps, compasses, franked return envelopes and other materials are furnished the student, in general on a loan basis. Everything is done to remove administrative obstacles from his path no matter how seemingly small. It is appreciated that while the student is doing extension course work, his primary concern is in earning a living and that his military studies represent time taken from his leisure activities.

After a subcourse is printed formally it is not regarded as final and unchangeable. Revisions necessary because of changes in doctrine and results of analysis of teaching value are immediate and continuous. The grading officers maintain a revision file on each subcourse to insure that all possible improvements are incorporated in revised printings.

Effectiveness and Capabilities

What is the effectiveness and what are the capabilities of Extension Courses in general? A recognition of their proven value has come only after a long and difficult period. In the early days, colleges and universities commenced correspondence teaching with considerable misgiving. After a reasonable trial, however, teaching by mail soon proved itself, and today it is universally accepted by leading educators as a very effective form of teaching. It is realized, of course, that we cannot produce well-trained officers by correspondence methods alone, and that there are certain subjects which cannot be taught by mail at all. However, it is clearly established that theoretical training must precede any practical application. The maneuver is an excellent form of practical training, but before it can be conducted each participant must know exactly what he is to do in that maneuver. Anyone who has taken these courses or who has instructed with them can appreciate readily that most of the tactical and technical matters of military training are covered by them and that the instruction they furnish encompasses a thorough background of military knowledge.

Extension Courses not only constitute an unusually effective method of teaching, they are also a very economical one. As an example, during one prewar period $17,000 was spent on extension courses, whereas 2¼ millions of dollars, or 132 times that amount, was spent on the short summer camp training period for fewer students and covering much narrower fields.

The Army Extension Courses form the backbone of the inactive status training program for the civilian components. Here are some of their specific accomplishments:

They familiarize the student with virtually the entire scope of military subjects appropriate to his level, and thus provide him with a groundwork for active duty periods and for future training, ultimately fitting him for his wartime assignment.

They keep the student up to date with the newer trends and techniques, and maintain his interest in military matters.

They provide an opportunity for enlisted men in preparing themselves for Officers' Candidate School.

They provide an opportunity for officers to increase their knowledge of the higher grades and thus advance their individual careers.

The question of promotion credits naturally arises with respect to the courses. The postwar promotion policies have not yet become firm. Under present National Guard Regulations, completion of extension courses is not a prerequisite for promotion. However, the courses are of great value in aiding the student to acquire the military knowledge qualifications necessary for promotion. Regarding promotion in the Officers' Reserve Corps, regulations direct that full consideration will be given by the examining board for Extension Courses completed, for active duty performed and for inactive duty training.

Summary

Viewing the Extension Course Program broadly certain factors are worthy of summary.

The Extension Courses are designed primarily to train the peacetime army for mobilization duties.

The preparation and administration of the courses is conducted by the schools of the appropriate arms and services, in a carefully supervised and coordinated program.

And, finally, the Extension Course Program will be a principal means of attacking a problem of great magnitude —that of training the many thousands of civilian component officers.

If it operates in a gravitationless vacuum, the behavior of a rocket can be expressed exactly by a simple statement of the conservation of momentum; namely, that during an infinitesimal period of time, the rocket is increased in speed by an amount equal to the fraction of its weight ejected as a gas in the jet multiplied by the average velocity of the jet gas with respect to the rocket.—Dr. R. W. Porter.

Extracts From "Rockets And Jets"*

By Herbert S. Zim

Pages 14-16

You yourself can make a workable "rocket" in less than one minute. All you need is a rubber balloon. Blow up the balloon, hold its mouth shut with two fingers, and you have a rocket.

Before you get the idea that this is silly, stop and consider the thing you are holding. The balloon is a container of gas (in this case, air) under pressure. Gases being what they are, this pressure is exerted equally in all directions. The enclosed gas presses alike on the top, bottom, and all sides of the balloon. Because this pressure is equal, its total effect on the balloon is nil. To make the discussion a bit easier, let us consider the balloon as two halves: a top and a bottom, with the stem, through which you blew up the balloon, at the center of the bottom half.

The pressure against the top half of the balloon exactly balances the pressure against the bottom half and the balloon lies motionless on your hand. But it is not inert. The balloon possesses the energy of the compressed gases within it, just as a rifle shell possesses the energy of its gunpowder. In both cases, when the energy is released, motion results. So relax your two fingers and watch the balloon. As soon as you let go the balloon, it darts off your hand and, if it has been blown up sufficiently, may travel across the room or turn a few loops in the air before it finally collapses on the floor. To all intents and purposes you have seen a rocket in flight.

Until the moment of release, the pressure against the top of the balloon was exactly balanced by the pressure against the bottom half. When you let go, some of the compressed gas escaped through the opening. This disturbed the balance of pressure. Now the pressure against the top half was greater than the pressure against the bottom half by an amount equal to the pressure of the gas being forced out through the hole. Hence the balloon, now subjected to unequal pressure, moved in the direction of the greater force and continued to keep moving till the internal pressure reached the same pressure as the external air and the difference dropped to zero. If you had some kind of automatic pump to keep the balloon filled with air, its motion would be continuous.

The movement of the "rocket" is due to the internal differences in pressure because a stream of the compressed gas is being forced out through a narrow orifice. The same principle that applies to the balloon applies to skyrockets, bazookas, and liquid-fuel rockets. It will apply to space ships when they are made. The principle is a universal one that has wide application. It is known as the principle of reaction.

Pages 18-20

A modern experimental rocket using liquid fuels has as its core a combustion chamber that is the engine of the rocket. Here fuels, such as gasoline and oxygen, are burned to produce gases under pressure. In the rocket motor, as in all other internal combustion engines, the purpose of burning is to produce expanding gases. The volume of gases produced increases with the temperature and, since the temperature in the combustion chamber is hot enough to melt steel, this results in a corresponding increase in the pressure. There are a number of factors involved in achieving the final pressure: the completeness of the combustion, the heat value of the fuel, the insulation of the combustion chamber, and the extent of confinement of the gas. All things being equal, the greater the pressure in the combustion chamber the greater the velocity of the rocket.

The size of the orifice through which the compressed gases escape is directly involved in the rocket's forward thrust. The larger the opening, the greater the thrust, provided the pressure in the combustion chamber stays constant. That provision is important: if the opening is too large, the gas is no longer confined sufficiently and pressure in the combustion chamber drops.

There are two ways in which the lift of a rocket may be increased. First, by increasing the diameter of the nozzle while maintaining the pressure in the combustion chamber. Second, by increasing the pressure in the chamber. Both these methods are dependent on the fuel used in the rocket and the rate of fuel consumption.

The combustion chamber itself is the heart of the rocket. Here the fuels burn with almost explosive violence, producing tremendous heat and high pressure. This heat and pressure create a number of problems for the experimenter with rockets. Since the pressure in the chamber is high, the fuel must be put under even greater pressure or it will not flow into the combustion chamber. The size of the chamber presents a problem, too. If made too large, heat will be lost and hence pressure will be lowered. Size of the rocket increases weight and, if there is anything a rocket experimenter earnestly desires, it is to keep the weight of his rocket to a minimum. The combustion chamber must be just large enough to permit the fuel and oxygen to mix and burn completely. Complete combustion is essential for maximum efficiency. If it is not obtained, fuel will be wasted and the unburnt gases will cool the final mixture.

Pages 139-151

Dr. Oberth, known for his early contributions to experimental rocket work in Europe, experimented with liquid hydrogen, and reported that the difficulty of obtaining the chemical and its extreme cold (boiling point – 423 degrees

F.) made it unsatisfactory as a fuel despite the fact that when combined with liquid oxygen it produces the highest heat output of any fuel combination.

While both carbon and liquid hydrogen seem unsatisfactory, chemical compounds containing both these elements are the best liquid rocket fuels known. These chemical compounds might be prepared artificially from the elements carbon and hydrogen. But they are abundant in coal, natural gas, oil, and in plant material and hence are cheap and plentiful, with an assured constant supply. The process of extracting these compounds from coal and oil is well known, and since all of these chemicals have other industrial uses, a great deal of valuable information about each is already available.

Some of the more important compounds of carbon and hydrogen that have been tried as liquid fuels for rockets include:

Acetylene, C_2H_2—a gas at room temperature, but can be liquefied
Ethylene, C_2H_4—a gas at room temperature
Benzene, C_6H_6—colorless liquid
Methane, CH_4—a gas at room temperature
Ethane, C_2H_6—a heavier gas, easily liquefied
Hexane, C_6H_{14}—a typical compound in gasoline, which is a mixture of related chemicals
Dodecane, $C_{12}H_{26}$—a typical compound in kerosene, also a mixture of chemicals

Two other chemical compounds are used as liquid fuels. These differ from those just listed as they contain oxygen as well as carbon and hydrogen. They are:

Ethyl Alcohol, $C_2H_{50}H$—grain alcohol, a colorless liquid.
Methyl Alcohol, $CH_{30}H$—wood alcohol, a poisonous colorless liquid.

You may recognize some of these chemicals as common everyday liquid fuels. But they are just as suited to rockets as they are for autos, heaters, blowtorches, or stationary engines. Each of these fuels will yield nothing but gaseous products when completely burned with liquid oxygen, and the products are always carbon dioxide and water. You must keep in mind that at the temperature of a rocket combustion chamber, water is a hot invisible gas. Each of these fuels liberates heat when burned. But some, because of their chemical composition, give up more heat than others. This difference in the heat content of fuels is often the deciding factor when selecting one liquid fuel or another.

The heat value of fuels is measured in British Thermal Units per pound of fuel. A British Thermal Unit (B.T.U.) is the heat required to raise one pound of water at room temperature, one degree F. To raise the temperature of five quarts of water (approximately 10 pounds) 100 degrees would require the expenditure of 1,000 B.T.U. of heat.

Burning a pound of average wood produces about 7,000 B.T.U. This is enough heat to raise about 9 gallons of water from sink temperature (50°) to bath temperature (150°), sufficient to provide a nice hot shower if one doesn't stay in too long. A pound of coal will give about twice the heat of wood: 14,500 to 16,000 B.T.U.; and a pound of crude oil (a pint) will produce from 20,000 to 22,000 B.T.U. When a pound of pure carbon is burned in oxygen, 14,600 B.T.U. of heat are released, but when a pound of pure hydrogen burns, the heat given off comes to 62,000 B.T.U., nearly five times as much as from carbon. That is why hydrogen would be a perfect fuel if it were not so light and difficult to handle. Liquid fuels relatively rich in hydrogen produce more heat than those richer in carbon.

One B.T.U. of heat is the equivalent of 778 foot pounds of work. In other words, the heat necessary to raise the temperature of one pound of water one degree, if completely converted into mechanical energy, would be sufficient to raise a one-pound weight 778 feet against the pull of gravity or a 100-pound weight 7.78 feet. Heat energy expended at the rate of 42.4 B.T.U. per minute or 2,545 B.T.U. per hour is the work equivalent of one horsepower. Thus, if 50,900 B.T.U. were required to run a gasoline engine for one hour the work output, under perfect conditions, would be twenty horsepower.

These heat values and their work equivalents indicate the importance of using fuels with high heat content, since heat can be converted directly into motion in a rocket. They also indicate how rocket designers, knowing the characteristics of their fuel, can predict the speed, thrust, and range of a rocket while it is still on the drawing board.

Perhaps this is also the place to introduce a strong word of warning about these figures. They are all theoretical and assume a complete conversion of fuel into heat and heat into mechanical energy. Unfortunately, that never happens and in the conversion process two-thirds, three-quarters, and sometimes up to nine-tenths of the heat is wasted. In heating your water for the shower, instead of one pound of wood perhaps, seven, eight, or nine pounds would be needed because of the heat loss in the stove and pipes. The gasoline engine, to produce twenty horsepower, needs more than 50,900 B.T.U. per hour. The gasoline consumed is probably sufficient to supply four times that much heat—and about three-quarters of it is wasted due to incomplete combustion and heat losses in the motor.

It is also possible to be misled by the mere listing of B.T.U. totals for different fuels. It is true that one pound of hydrogen yields about 62,000 B.T.U. But to obtain this heat, it must be burned with eight pounds of oxygen—and this oxygen is part of the rocket fuel load. So actually the use of liquid hydrogen as a rocket fuel yields only 5,760 B.T.U. per pound for the nine pounds of hydrogen and oxygen necessary to release the heat. Gasoline yields about 19,000 B.T.U. per pound but it requires 3.5 pounds of liquid oxygen, making the heat yield for 4.5 total pounds a matter of 4,220 B.T.U. per pound. On the other hand, when smokeless powder is used as fuel it yields only 1,870 B.T.U. per pound, but since no oxygen is required the final yield is still the same.

John Shesta, an active member of the American Rocket Society, points out that the heat value per weight of fuel is often not as significant for rockets as the heat value per volume of fuel. Since larger fuel tanks mean a bulkier and heavier rocket, Mr. Shesta argues for the use of the fuel that is the heaviest per unit volume. He points out that while a pound of hydrogen will yield about 62,000 B.T.U., hydrogen is very light and a pint of liquid hydrogen would only yield 3,850 B.T.U. In contrast, benzol only gives 17,300 B.T.U. per pound. But because it is almost as heavy as water, a pint of benzol gives 15,860 B.T.U. or the

equivalent of approximately four pints of liquid hydrogen.

The table below gives some of the better known liquid fuels and the heat yield per pound and per pint of fuel:

Fuel	B.T.U. Per Pound	Pounds Oxygen Needed	Total Weight	B.T.U. Per Lb. Total Weight	B.T.U. Per Pint	Pints Oxygen Needed	Total Pints	B.T.U. Per Pint Total
Hydrogen	62,000	8.0	9.0	6,880	3,850	.5	1.5	2,580
Acetylene	20,700	3.1	4.1	5,060	11,200	1.4	2.4	4,700
Benzol	17,300	3.1	4.1	4,330	15,860	2.4	3.4	4,730
Methane	21,400	4.0	5.0	4,280	10,400	1.6	2.6	3,970
Gasoline*	19,200	3.5	4.5	4,230	13,200	2.0	3.0	4,360
Kerosene*	18,700	3.5	4.5	4,170	15,000	2.3	3.3	4,510
Ethyl Alcohol	12,100	2.4	3.4	3,520	9,960	1.7	2.7	3,740

*Approximate.

Besides the heat characteristics, the specific limitations of each type of liquid fuel must be considered by the rocket experimenter. Acetylene is a colorless gas that burns with a smoky flame in air but with a hot blue flame when supplied with the right amount of oxygen. It is the fuel used in the acetylene torch where the flame is so hot that it cuts through steel like butter. One pound of liquid acetylene burns with three pounds of oxygen and the total fuel yields a bit over 5,000 B.T.U. per pound. But acetylene has little future as a rocket fuel because liquid acetylene which boils at – 121° F. is highly unstable and may explode violently without warning.

A pound of ethyl alcohol burns with about two and a half pounds of liquid oxygen, giving 3,500 B.T.U. per pound. Though this is not as powerful as some fuels, it is satisfactory, and alcohol is commonly used in experimental rockets. However, no rocket experimenter could afford to use pure alcohol.

This chemical has a strong affinity for water and to prepare 100 per cent alcohol requires expensive and time-consuming operations. The experimenter must resign himself to the fact that all alcohol contains at least 5 per cent water. This is not a serious handicap but it is a factor that must be considered. Some of the other fuels are gases at ordinary temperatures and must be liquefied under pressure and at low temperature before they can be used. And when the trouble is taken to prepare them, there is also the difficulty of storing and handling these cold liquids.

Perhaps these little differences are the reason why many experimenters have turned back to our most common liquid fuel for their work. Experimenters in both Europe and America have found that plain ordinary gasoline is as practical a rocket fuel as any, and while its power is not tops it is not too bad either. Gasoline yields about 19,200 B.T.U. per pound, but since it requires 3.5 pounds of oxygen for combustion, the yield from the total fuel drops to 4,230 B.T.U. per pound. On a volume basis, gasoline gives about 13,200 B.T.U. per pint and requires 2.1 pints of liquid oxygen for combustion, yielding 4,360 B.T.U. per pint of total fuel. One cannot speak exactly of the heat yield of gasoline since gasoline is a mixture of a number of related chemical compounds, all containing carbon and hydrogen. The figures given are roughly average. At any rate, gasoline is distinctly more powerful than alcohol which is its only competitor.

It was officially reported on December 9, 1944, that the fuel of the German V-2 rocket was alcohol and liquid oxygen. The fuel tanks of the giant rocket carry 7,500 pounds of alcohol and 11,000 pounds of liquid air. The rocket takes only about five minutes for a trip of about 200 miles, but fuel is burned for only the first minute or so. The rocket gains such speed during this minute that its momentum carries it on to its target.

Rocket experimenters have one advantage over motorists. They do not have to worry much about gasoline brands and grades. Present-day rockets use only a quart or so at a time, and from the energy angle a low grade gasoline will give about as many B.T.U. per pint as high grade. There is no knock problem in rockets so there is no need to use tetraethyl lead or any other special ingredients in the fuel.

Experiments have been conducted with many liquid fuels: liquid methane, ether, liquid propane, alcohol, alcohol and peroxide mixtures, kerosene, etc. The net results, in the words of Dr. Goddard, are that, ". . . the most practical combination, however, appears to be liquid oxygen and gasoline." Dr. Goddard used gasoline in his first liquid-fuel motor test in 1923 and used it again when his first liquid-fuel rocket flew in 1926. The American Rocket Society has used this same fuel in the successful flights of all its experimental rockets and in a large number of tests of rocket motors in testing stands. Though the future may see better fuels available in the gasoline-liquid-air combination, experimenters have found a practical solution to the present fuel problem, one that will enable them to go far in developing experimental rockets.

While on the subject of rocket fuels, a word must be said about atomic or subatomic power. The words have been loosely tossed around for some time now, and many people have the feeling that atomic power is something imaginative, like Buck Rogers' space ships. But there is more to atomic power than even the pages of the comic strips would lead one to believe.

To start at the beginning, it was Albert Einstein who first worked out the very simple mathematical equation showing the relationship between matter and energy. It shows very clearly that the energy that could be obtained from one gram (1/25 of an ounce) of wood is enough to run a 37-horsepower motor, sufficient for a small automobile, for one million hours. Oddly enough, the equation also indicates that you could get the same energy from a gram of coal, iron, carbon, tin, or any other substance you care to name. This may sound a bit confusing unless one clearly sees the difference in obtaining energy this way as compared to methods we are now using.

If one charged a rocket with one pound of gasoline and 3.5 pounds of liquid oxygen and ignited the mixture, the rocket would sail aloft, powered by the energy of combustion. The union of gasoline and oxygen produces carbon dioxide and water vapor and releases 4,200 B.T.U. of heat. This heat expands the gases in the combustion chamber and the pressure of these expanded gases produces the reaction that drives the rockets. At the end of the flight the fuel and oxygen tank will be empty, but the gases produced have not disappeared. If one had connected a large bag to the nozzle of the rocket and caught all the gases leaving in the exhaust, it would be easy to show that the pound of gasoline and 3.5 pounds of oxygen had been transformed into

4.5 pounds of carbon dioxide and water vapor. Not a fraction of a gram of the weight of the ingredients was lost: the liquid chemicals had merely been transformed into gases which quickly mixed with the air. In the same way a chemist can prove that when a candle burns, the weight of the total products formed is greater than the weight of the candle, because oxygen from the air has united with the carbon and hydrogen of the paraffin.

This is what happens in ordinary combustion. It's true that the ashes left in the pit of the furnace weigh less than the coal burned, but if you could add the weight of the gases that have passed up the chimney, the total weight of the products formed by combustion would be equal to the weight of the coal and oxygen used.

But Einstein is not talking about ordinary combustion. He is talking about the change of matter into energy. If one knew how to transform a pound of gasoline into energy as Einstein considers it, no oxygen would be needed. When the process was over there would be no question of what the products would weigh—there would be no products. The gasoline would have disappeared. It would no longer exist as matter. It would literally disappear. There would be no possible way to recover the gasoline or any of the elements that were in it. The energy derived from the annihilation of one pound of gasoline (or any other substance for that matter) would reach the enormous figure of 16.7 billion horsepower hours, and since one horsepower hour is equivalent to 42.6 trillion B.T.U. or almost exactly one hundred billion times as much energy as could be obtained by burning the same amount of gasoline with oxygen.

Unfortunately, no one has yet found the way of extracting this enormous energy from matter, nor does there seem any immediate prospect of driving ships across the Atlantic with the energy from a pinch of sand, or running trains on a few grains of sugar. Yet other scientists have enough information to make them believe that Einstein's equation has a basis of fact, and there are a few isolated cases of the release of trickles of atomic energy that keep alive the hope that some day this energy may serve mankind.

Not so long ago newspapers carried the almost fantastic story of uranium 235—a most unusual chemical. Uranium is a chemical element closely related to radium in its properties. Uranium 235 is a form of uranium that exists with ordinary uranium (or uranium 238) in about one part of the former to 1,000 parts of the ordinary variety. This uranium 235 can be "bombarded" in machines like the cyclotron. When this occurs, two new elements are produced whose total weight is about one per cent less than the bit of uranium 235 used. This means that about one per cent of the uranium 235's weight has been converted into energy. Scientists doing the experiment found that the energy released was about the amount expected. It did not destroy the apparatus, since only microscopic amounts of uranium 235 are available to be used and the energy was absorbed by the ordinary uranium with it. However, the deed has been done. The exchange of matter into energy has actually been accomplished in the laboratory—though on an infinitely small scale. Yet there is enough promise in this experiment to make more optimistic people believe that some day subatomic power will be available for rocket propulsion.

Such a solution would be most fortunate, since there is no fuel on earth than can begin to compare with atomic energy obtained from a pound of any substance. The whole weight problem of rockets would be resolved simply; the possibilities of interplanetary travel would be vastly enhanced. How soon this atomic energy will be made available nobody knows.

Till that time arrives, the liquid fuels will be the mainstay of rockets and we will have to do the best we can with the mixtures which we have been discussing earlier in the chapter.

"JAPAN WILL WIN THE WAR"

By Major John M. Wright, Jr., CAC

Corregidor—May, 1943.

"The Imperial Japanese Army has occupied Hawaii and Australia." Lieutenant Tokushige glowed and smiled and waited.

"Ah so Ka! Is that so!" Obviously he expected an answer.

"Soon the Imperial Japanese Army will occupy South America." Tokushige swelled with pride; he liked to boast of his nation's many accomplishments and victories.

Lieutenant Tokushige was camp commander of Military Prison Camp Number Nine, Corregidor, where were confined about two hundred Americans who had been overwhelmed after defending the Rock for five months. He had sent his interpreter, Superior Private Danjo, to my room and directed that I report to his quarters after supper.

I was Executive Officer of the Corregidor prison camp. In that position, I had spoken to Tokushige often—arguing for food, arguing for adequate quarters, arguing over work to be performed by Americans. I did not *know* or *understand* Tokushige. The more contact an American has with a Japanese, the more he observes the Oriental, the more he studies him—the more convinced he becomes that he will *never know or understand him.*

The night on which I was directed to report to Tokushige was just one year after Corregidor raised the white flag. That year had seen Japan extend the "Greater East Asia Co-Prosperity Sphere" over the Western Pacific. True, Japan's advance had been halted by May, 1943, but the Emperor's colors flew over many conquered islands and many subjected peoples.

Tokushige always tried my patience. I knew that his claims were seldom true; nevertheless, I invariably became so irritated as to attempt to take the offensive.

"Tokushige Chui," I asked, "did you see the Japanese aircraft carrier which passed Corregidor this afternoon?"

"Very, very big. It carried twenty airplanes," he boasted.

"Tokushige Chui, that ship was very, very small. American aircraft carriers carry several hundred airplanes and there are one hundred carriers in our Navy." That bluff stunned Tokushige. He looked at the floor. He stared at Danjo, the interpreter, to see whether he had heard correctly. He had. He countered quickly.

"After South America, we will conquer England. I will move to London and live there in my retirement."

I then attempted to give Tokushige a lesson in geography. Ten thousand miles of ocean separated him from South America. Hawaii was very strong, and close to America. It could never be taken by the Japanese. Tokushige slowly gave ground and began to concede the argument.

"You are a soldier," he said. "I am a civilian. I am an officer in the reserve. Before the war I was a banker in Tokyo."

Then Tokushige spoke words which should never be forgotten by Americans. These are the words of a well-educated Japanese civilian, not the words of Japan's military clique. Let us remember them as the words of Japan, not as those of a few of her leaders who have been or are being eliminated.

"It is true," Tokushige said, "Japan may lose this present battle. As a soldier, you know that grand strategy sometimes requires the loss of a battle for the winning of a war. This battle may last for several years and we may lose—but we have not lost the war. Twenty years from now we will fight another battle. Japan is prepared to lose a second battle, a third, and she may even lose a fourth, sixty years from now. That is all very well; Japan is prepared to lose those battles as a means to win her war. Within a hundred years from now, *Japan will win the war.*"

There was nothing more to say. I returned to my room. I reflected on Tokushige's forecast of coming battles and his concept of the long war. The impression burned into my mind—and it burns today as the United States shapes its policy towards Japan. Is that policy shortsighted? Must we fight that second battle, and the third, and the fourth? Have we come to believe that we truly *understand* the Japanese? Let us briefly analyze the true meaning of Tokushige's words—the words of Japan.

Time to an Oriental is nothing. Time to an American is much. Japan is old; America is young. Japan thinks as does a wise old man who draws upon a long life of experience and faces the coming days philosophically, casually. America thinks as does a youth who meets each problem as a new challenge and faces the future passionately, dynamically. One hundred years to a Japanese is as one change of the tide, while one hundred years to an American is the time required for his country to have grown from infancy to full adulthood.

Life to an Oriental is nothing. Life to an American is much. A Japanese lives his daily life with his ancestors, going back through generations beyond the recorded history of Japan. An American lives his daily life conscious of the unforgiving minute which, once gone, can never be recalled. In the home of a Japanese, I was taken to a shrine where, I was told, dwelled the fathers of the family from the beginning of time. In the home of an American, only the living are important to life.

Democracy to an Oriental is nothing. Democracy to an American is much. In the home, which is the foundation stone of democracy, the head of the Japanese family is supreme beyond our comprehension. Women of the family—mother, wife, and daughters—bow until their heads scrape the floor before entering a room wherein sits the master of the home. Only the son, who himself will eventually become a master in his own right, is granted any equality with the master. In an American home we know democracy, freedom of thought, equality. On such a foundation as the Japanese home can there be created a true democracy?

Honesty to an Oriental is nothing. Honesty to an American is much. A Japanese practices deceit as a means to an end, believing that the crime is not in being dishonest, but rather in being apprehended in his dishonesty. American sense of honor pitted against Japanese deceit and cunning makes Americans gullible and easy prey for Japanese.

For a moment, imagine that the United States is a conquered nation, dominated by a country which considers itself righteous. Imagine that the victor is anti-Christian. Our new overlord has determined to convert the United States to its philosophy. We are schooled in that philosophy. We are propagandized. We are told that as soon as we become anti-Christian, our conqueror will withdraw from our country. The oppression seems to us unbearable. Soon a few cunning leaders arise to convince the foreign nation that we, as a nation, have become anti-Christian. The signs are everywhere—shrines arise on street corners, a few priests are lynched, here and there a church is torn down—Christianity is rapidly stamped out. Within ten years of our defeat, the conqueror withdraws, convinced that we are now an anti-Christian nation, and we are left to exploit our regained freedom.

Can Christianity be stamped out of America in ten years? Can you, your children, your grandchildren, disown Christ? No. But the ten years of apparent stamping out was worth while if we are again free and able to rebuild what we hold most dear.

The parallel is all too obvious.

Japan's new overlord, the United States, has determined to convert Japan to democracy and peacefulness. We are schooling Japan in our philosophy. We are propagandizing Japan. We will withdraw when Japan has become a democracy. The leaders of that democracy have already arisen. The signs are everywhere—democratic elections, strikes, the stepping down of the emperor—Japan is being converted. Within ten years of her defeat, Japan sees the United States withdraw. Japan is free to prepare for the second battle of the long war.

Can Japan be converted in ten years? Can Tokushige and the sons of Tokushige disown their emperor, turn their backs on their ancestors and embrace democracy? No. But ten years of subservience and *apparent* conversion will accomplish expulsion of the conqueror—and then may well come revenge.

As long a period of time as it would require our conqueror to stamp out Christianity in the United States, at least that long a period of domination, occupation, education will be required to stamp out the embers which burn in Japan after the flame was quenched with the lifeblood of thousands of America's bravest men.

If America is gullible, if America is fooled by Japanese cunning, if America forgets the words of Tokushige, there will be a second battle with Japan, and a third, and a fourth —and *Japan will win the war.*

New R. A. Appointees, Coast Artillery Corps

(Under Department of the Army Special Order No. 17, 10 October 1947.)

Rank Indicated Is Permanent

MAJOR

Hunt, Paul M.

CAPTAINS

Comstock, Richard H.
Dolan, Joseph C.
Cauthen, William A.
Rutz, Lee J.
Neill, Samuel S.
Lampl, Maurice B.
Baltzer, Nyles W.
Quinlan, Edward W.
Carson, James M.
Walker, F. N., Jr.
Bigelow, Arland E.
Turner, John G.
Freshwater, Harold L.
McLaughlin, H. H., Jr.
Myers, George E.
Tilson, George E.
Greene, Harold F.

FIRST LIEUTENANTS

Hudson, James A.
Rousseau, Thomas H., Jr.
Quist, Frederick F.
Ball, Raymond C.
Lonsinger, Roy W.
Pullen, Richard T., Jr.
Fox, Elmer W., Jr.
Watson, Ronald
Emmert, Harry D., Jr.
Osthues, Henry E.
Ghent, Daniel T.
Wagner, Oliver W.
Sisak, John G.
Tracy, Sheldon C.
Walker, Archie S.
Raffaeli, Raymond J.
Lynch, William J.
Ward, Linus P.
Felter, Joseph H.
Shaw, William G., 3rd
Bates, Frank A., Jr.
Meacham, Joseph R.
Smith, Bowen N.
Maldeis, Albert F., Jr.
Townsend, Lester B., Jr.
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HELL IS GREEN*

By Lieutenant William F. Diebold

The group of excited young pilots crowded around the desk. I tapped one of them on the arm and asked what all the excitement was about. He said, "Here!" and handed me a sheet of old, worn paper. Laboriously written were some scrawling words beginning, "Somewhere in Hell . . . I am the pilot who crashed . . . I need a pair of GI shoes, quinine, socks, sulfa. . . . I'd like to borrow a blanket if you could spare one. Cold. Cigarettes would be nice. Thanks for whatever you can do."

A lieutenant explained, "That note was brought in to an airstrip in Burma two days ago by a native who said the American was in a village called 'X.'"

It was the mission of this Search and Rescue Squadron of the Air Transport Command, to which I had been assigned, to find these airmen in the Hump and rescue them. I was just this day reporting for duty. The night before, I had arrived at this jumping-off place for China supplies. If I had known what was in the books for me there would have been one completely berserk lieutenant running around in the growing tea, trying to hide from the inevitable.

The inevitable arrived when I reported to Major Roland Hedrick, the head and brains of the Air Transport Command's Search and Rescue Squadron for India, Burma and China.

A pilot standing near the major made a mountain with one hand while with the other he imitated an airplane in flight around that mountain. He was trying to explain to the major how difficult it was to fly around that mountain with the object of coming low over a native village situated near the top. He had to come in low over that village, I gathered, to attract the attention of any white man who might be in it. Was the writer of the note in that particular village? That was the sixty-four-dollar question.

Finally I was able to catch the major's ear over the din. He seemed irritated at my presence, and who can blame him. He was confronted with a problem that might mean life or death to a pilot. The fact that he shook my hand instead of cutting it off showed patience.

"Lieutenant," he said, "on our maps the village of 'X' is shown to be here." He pointed to a spot on the top of a mountain in northern Burma. "The boys flew over that village yesterday with two doctors ready to bail out. There was a cloud sitting smack on top of that village almost all day," he continued, "and when the cloud finally did move away the boys found two peaks where there should have been only one, and damned if there wasn't a village on both peaks. The search plane buzzed both villages, and dropped notes requesting some sort of signal if the pilot was in that village. Neither village did a thing. I believe the kid is too sick to make the signal himself and he can't make the natives understand what he wants them to do."

Later, when the major and I were alone, my eyes drifted to his huge wall map. On it were myriads of different colored flags. Each flag symbolized a plane on the ground, a crashed plane. I heard myself speaking almost as if it were someone else.

"Major," I asked, "why couldn't you parachute a man into the village you think most likely to be 'X'? If the flier isn't there, he is bound to be in the other one. A process of elimination, as it were."

The major said, "Diebold, do you realize that the village of 'X' is hundreds of miles from any semblance of civilization, in the toughest kind of jungle? A white man goes in there once in twenty years. How would the parachutist get out?"

That stopped me until I happened to think that the downed flier had to be brought out and that the major planned to send in two doctors. He must have a plan to bring them out.

"Well," said the major finally, "if we're going to give that plan of yours a try, we must have someone who will volunteer to jump."

I think the major was trying to show me how impossible it would be. From somewhere inside me a voice said, "Hell, major, I'll jump!"

That statement surprised both of us. The skipper eyed me, for size, I guess, then said, "Okay, boy. Get dressed for a parachute jump and a long trek in the jungle. Be back in an hour."

I rose from the chair, my knees weak beyond all description, weaved out of the room into which I had so blissfully walked not more than an hour before, and headed for my *basha*.

"Well," I said to myself, "it might as well be me as anyone else. After all I'm not the first to try a parachute jump."

I filled my musette bag with the things I figured I would need and went down to the squadron operations, where Anderson, the pilot of the rescue ship, got me some new infantry combat boots. They are a little more than ankle high and offer support to that most vulnerable part of the body in a jump. They gave me some silver rupees with which to pay for anything I might want from the natives and we were off.

We flew in a C-47. This one had the rear door off and was filled with parapacks containing food, clothes and medicine. I sat on the floor by the open door. We flew for a few hours and I had a chance to see the country. The mountains seemed to go straight up and down. It was not often that I could see ground; the foliage was too thick for that. In my mind's eye I could almost see the snakes sticking their heads out of the trees, smacking their lips, if snakes have such things. I could hear the tigers telling their cubs to be quiet, that the Army Air Corps was providing them with their supper that night.

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*From *Cosmopolitan*.

Eventually Anderson called me forward and said, "Of course, Diebold, you've used a parachute before, haven't you?"

The only thing I had ever used a parachute for was a pillow to sit on in a glider. But I answered, "Not this paratrooper chute you've rigged up for me."

"Well," he said, "I've never used one either, but one thing I do know is that you had better be sure that your static line is attached to that long cable that runs the length of the top of the fuselage. I saw a movie once of some paratroopers jumping and that's the way they did it."

Simple, I thought. Now all I have to find out is what a static line is.

Eventually we came to the section of the country where our lost pilot was supposed to be. If a glacier made these mountains it must have been mad as hell at something. They were the biggest hunks of earth I had ever seen.

Anderson flew me from the two villages to the Ledo Road, showing me the way out. There could not have been over two mountain ranges, each towering some two miles up, nor more than two hundred miles of solid jungle. Nothing to it! We buzzed the village a couple of times, but only wildly waving natives appeared.

Eventually—as I knew it must—the time came for me to go. Anderson told me to stand at the rear door and when the bell rang, that would be my signal to jump. Sergeant Stanley Bloom from Boston helped me into my chute, and I took my stand at the door.

It seemed I stood there for an interminable period. My heart thudded against my chest. I was scared to death! I thought of my civilian insurance company and its directors. Wouldn't they be the happy lot if they could see me now? Suddenly the bell rang!

I had been unconsciously waiting for that sound with every fiber of my body. It took no planned action of my mind to get me out that door. I had conquered my mind when I went to the door; from then on motion was just reaction to a sound. I am sure of this for I cannot remember jumping. The bell rang and the next thing I knew was the roaring of the slipstream in my ears, the tumbling of the horizon, the tail of the ship passing overhead and then the almighty jerk.

I had learned to jump the hard way. Body position in the air was an unknown to me. My chute was too loose, the jerk was terrific. I blacked out for an instant, I guess, for the next thing I knew I was alone in the air and all was serene.

The feeling of elation and exhilaration that come over me when I looked up and saw that big white canopy over me is indescribable. The chute had opened. Oh, happy day! I kicked my legs and moved my arms and wiggled my body to make sure nothing had been broken. Nothing had. I was uncomfortable. I had been jerked down into the too loose harness of my chute and my entire weight was being carried in the crotch of my legs. It was then, for the first time, that I thought of the ground. Good Lord, how it seemed to be rushing up at me! Above the village was a clearing that looked about the size of a quarter. It was covered with jagged-edged stumps. A broken leg out here would really be something to worry about. Too, what good would I be to anybody if I could not walk?

Anderson had done a swell job. As he planned it, I was going to land in the clearing. The least I could do was to miss the stumps. I pulled a handful of shroud lines on my right to see which way it made me go. It did not seem to change a thing except to make the ground come up even faster. That was all the argument I needed. Let fate take its course.

Fate took its course, I landed bang on top of a stump. My knees collapsed and I bounced to the ground.

I just sat there saying over and over aloud, "Damn it, I made it!"

Anderson woke me up. He brought that ship right down into the clearing, rolling it over on its side so he could see me. I managed a feeble wave of the arm, and he went back upstairs and circled, waiting for me to get oriented.

I was busy gathering up my chute when I heard voices shouting, "Okay—okay." I turned in wonderment, "Well, I'll be—!" I said aloud. "These people must speak English."

Out of the brush they came. To me they looked pretty fierce; to them I must have looked about the same, for they stopped dead. With one hand on my .45 I looked them over. There were two men and a boy. Beautifully dressed in loincloths, each had a long knife in one hand and a shorter one in the other. They were brown and small and wiry.

Looking braver than I felt, I walked over to them. I said, "Well, how the hell are you?" Their answer was silence.

I tried again. "Like a cigarette?"

On that one I did better. They said, "Umm, umm." But when I held out the pack they took, not one cigarette, but the whole pack. I tried a little Hindustani. What I said must have meant something in their language, for they took my parachute and led me down the trail.

Anderson was getting impatient. He started to buzz the village when I arrived there. The village had two houses and everybody turned out to see me come in. I took out a white cloth and signaled to the plane that I was in the pink. I guess they misunderstood me, for on the next trip around they started dropping supplies. The natives and I ran for cover. The sky seemed to be filled with parachutes. Bloom up in that plane was pushing them out three at a time. Each pack weighed a hundred pounds and was not exactly the thing to be hit with.

On one pack was painted in large letters: RADIO. I opened it and took out the handie-talkie. I pulled out the aerial and immediately heard Anderson's voice in the midst of a conversation something like ". . . Diebold will probably be barbecued tonight." It made me feel swell. I knew these people had been head-hunters in the past, but this was now.

"Anderson," I said, "one more crack like that and I will name my next six Naga children after you." There was a squawk, then a clearer voice, saying, "Is he there, Bill?"

"How the hell should I know?" I retorted. "I just got here myself." I turned to one of the natives, pointed to myself and said, "American." Then I pointed to the two houses and said, "American?" He shook his head, then babbled excitedly to his kinsfolk standing around in a close circle. They babbled back at him and he turned to me, pointed to the opposite mountain and said something that resembled "Amoodicaun."

I got on the air, and gave Anderson the dope. "Right girl, wrong night, my boy. Come back tomorrow, and I'll be next door with the body."

Andy's voice came back. "You're in, sleep tight. Be back tomorrow." And that was it!

I watched the big plane disappear over the far mountains with misgivings. It made me lonely just to see it go. I stood in the middle of the group of staring natives and stared back at them.

The women wore clothes, damn it, and were definitely not good-looking. The men, in many cases, wore nothing but a loincloth. What surprised me most was their hair. Both men and women wore it piled on top of their heads.

There was one geezer whom the others seemed to treat with respect. I guessed he was the head man and I smiled at him.

He nodded and gave me what I took to be a smile. With that, I felt more on solid ground. Scattered all over the clearing were the parapacks. I pointed to them and then to one of the houses. He must have understood, for he barked out some orders and in a flash the packs were being gathered up by the natives. Then the chief led me over to one of the houses.

What places those houses are. They are built on stilts about ten feet off of the ground. They are long, bamboo-woven things with grass roofs. In the front, they actually have a porch.

The chief and I wallowed through the mud to his house. Surrounding the house were two or three water buffaloes and a dozen animals slightly resembling pigs. We entered via a very fancy stairway made from an old log with notches cut into it for steps.

The inside of the hut was really something! There were several rooms running to the rear of the shack. All were connected so that to go to the rearmost room, one must walk through the sleeping quarters of everyone in the house. The front room looked like the living room or parlor. A small fire was burning in the center of the floor on sand or something. But what really stopped me cold were the decorations on the walls. On every wall there hung a heterogeneous collection of dried heads, including monkey heads. That is, I've been told, since then, by men who should know, that they were monkey heads, but from where I was standing they looked like the largest monkey heads I'd ever seen.

The chief sat down cross-legged on the floor before the fire and motioned me to join him. Then he pulled out a two-foot-long, two-inch-in-diameter pole made of bamboo. He filled it with water, dropped in some brown stuff, put one end in the fire and propped the other end against a forked stick. Believe it or not, we were going to have tea, brewed in bamboo.

We had our tea from bamboo cups. The stuff tasted like tobacco well boiled. Nevertheless, I nodded, smiled and smacked my lips in evident enjoyment. This pleased the chief, I was happy to see, and he too, smiled, smacked his lips and said something like *"Kajaiee."* I treasured the word as my first. It must mean "good," although from the taste of the tea, I could hardly believe it.

By this time, the natives outside had piled up all the parapacks. I looked at them in dismay. How was I ever going to get them over to the far mountain? It was now too late in the afternoon to try to make the trek to the other village. I went down into the mud and lifted them all up to the porch, where I opened one of the packs and found a couple of cartons of cigarettes. I handed cigarettes to the boys, who seemed tickled.

I looked at the chief, pointed to one of the parapacks, then to the other mountain, made motions as if I were carrying one of the packs and walking. Then I pointed to the handful of men below us.

Evidently the chief got the idea, for he smiled, nodded, said *"Kajaiee,"* and called one of the men up on the porch. At the end of a lengthy conversation, the boy crawled off the porch and, with a companion, started down the trail.

We went back inside and I found myself some rations and started to cook a little dinner over the natives' fire. The dinner consisted mostly of cereal, which isn't what I would usually order, but compared with what the chief offered me, it looked delicious. His menu consisted of monkey meat which was cooked before my awe-stricken eyes. They tossed the monkey, whole and entire, into the fire. The odor of burning hair made my mouth water!

The chief, after he had eaten, took out a long bamboo pipe. About a third of the way up the pipe from the bottom, he had an inch piece of hard vine sticking out. He poured water into the mouth of the pipe, held it upright and then put it down on the floor. In one hand he had a copper dish with a long handle on it. In this he put a brown pasty substance. He held it over the fire until the brown stuff came to a sizzle. At the same time, with his knife, he had shredded a green, folded leaf. He browned the shreds, then mixed the sizzling stuff into it, put it into the vine sticking out of the bamboo.

I didn't really know that he was smoking opium, but I soon guessed when I saw the "out of this world" look in his eyes. He wasn't alone, for on all sides of me, the boys were reaching with bamboo tongs for embers to light their pipes.

This opium den held quite a bit of interest, so I thought I'd stay up and see how it all ended. One of our old drinking songs blossomed out of nowhere—"Old MacDonald Had a Farm." I sang a couple of verses, and it wasn't long before a couple of the natives chimed in with "E-I-E-I oooooo." After a couple of thousand, no less, Old MacDonalds we all got tired singing, and I decided to go to bed, slinging a jungle hammock between two of the uprights that supported the porch.

Throughout the night there was a continuous procession of incoming natives. The two men the chief had sent out earlier in the day had evidently been emissaries to other Naga villages.

Morning, no matter how one looks at it, is a hell of a time. Your bed is so warm and comfortable that it seems sacrilegious to leave it. The Nagas must have realized that and years ago solved the problem by never going to bed. At four-thirty in the morning, the women were up and pounding rice. Wearily I swung my feet out of the hammock and eased into my boots. As I climbed the notched ladder, my eyes met a sight I won't easily forget. The big front room of the chief's house was filled with brown-skinned Nagas all staring at me. The fire behind them framed their squatting bodies, their piled-up hair with a weird flickering background. On all sides they were framed by the leering, naked skulls on the walls. Standing at the entrance to that room, I tried to smile and said my one Naga word. *"Kajaiee."* It

worked, for they actually laughed. Then tension was broken. The chief led me over to the fire.

"My God," I thought, "not tea—not at this hour." But tea is what the good and venerable chief had in mind. I held up both hands in a negative gesture. I got up again and went over to the food sack for some good old American coffee. I didn't know how it would taste brewed in a bamboo tube, but it couldn't be worse than their tea. I took a bamboo tube from the rack behind the chief, poured in some coffee, stuck the end of it in the fire and propped the other end up with a forked stick. The chief looked slightly annoyed until I poured him a bamboo cupful and he tasted it. His face lighted up in evident enjoyment and he passed the cup around the circle of men for all to taste. In the next hour, I did nothing but make coffee for the Nagas. They would drink it as fast as I could make it.

Dawn was breaking like an egg over the mountains. Dull red beams poured down the mountainsides and probed into the dark interior of our opium den. Down in the valleys a few trees reached up from the mist. In the forest the animals began to stir. The strange early morning cries of birds mingled with the doglike sound of barking deer.

Eventually, the natives, too, began to stir a little. Each man had a basket which held about thirty pounds. The top of the basket had two shoulder straps of woven bamboo. Another loop from the top of the basket went through a wooden yoke. It looked a little puzzling until they put the baskets on their backs, then it became a very sensible arrangement. They would put their arms through the two loops attached to the basket and the yoke fitted on the backs of their necks against their shoulders. The end of that loop went up and onto their foreheads.

They formed a circle, baskets in hand, and the chief loaded them from the parapacks. Evidently they had union rules, too, for each man was loaded according to his size. When all the men had their baskets full, the old chief went out and recruited all the youngsters, male and female, plus a number of young ladies.

It was a colorful line of porters that started down the trail. Going downhill was fine, as far as I was concerned. The brush closed in on all sides and in many places overhead as well. We went through a field of grass that was the tallest piece of front lawn I have ever seen—at least ten feet high. The chief cut me a bamboo stick, and like a blind man I felt my way along through a solid mass of jungle.

Then there were the leeches. . . . As you walk down the jungle trail, you can see them sitting up, half their bodies waving around in the air, waiting for you to brush them with your foot. When you do they become attached with such tenacity that pulling them off is a terrific job. In the first place, their bodies are covered with a sort of slime solution; to get a grip on them is next to impossible. Those fool creatures can crawl through the eye of a shoe or between the belt of your trousers and your shirt. When they do hit flesh, they sink in their jaws, excrete a fluid that frees your blood of its usual coagulation. Then they lie there growing larger and larger as they drink your blood. If, after one has sunk in his jaws, you should try to pull him off, his jaws remain, poisoning the wound.

At the foot of the mountain we came to a river. It was a roaring torrent. The mountainsides swept straight down to the rushing, white water. But behind a huge boulder in the stream was a comparatively quiet pool. The Nagas all tossed off their loincloths and ran in, splashing each other. The women showed no hesitance as they joined in the swim. The bath had a twofold purpose: it was fun and it washed off the leeches. Slightly abashed, I stripped and joined them. Women or no, the leeches had to go.

The morning coolness was gone and the sun was hot. This time I started out in shorts and shoes. I was going to take a tip from the natives, for after all this was their country. The Nagas are hill people and hills are their business, but with me—well, hills are wonderful when you're flying over them or walking down them.

On and on we chugged up the mountain. Those hill people kept up a running conversation while they climbed. I was thankful that I was able to breathe. It seemed forever, but we finally did hit the top. Perched there was a village, if I may call one house a village. I eagerly looked around for the lost pilot, but, of course, this wasn't the right village; we still had another mountain to climb.

By now it was around eleven in the morning, and the sun was really pouring it on. The water in my canteen was about to boil—so was my blood, what blood the leeches had left me. All the Nagas jabbered to each other and I staggered into the shade of the house. When I finally got the sweat out of my eyes enough so I could see, I lighted a cigarette and looked around. As soon as I did that, I had to pass cigarettes out to all the party. There went another pack. Everyone quietly sat down for a smoke except one woman who stood in front of me holding a baby in her arms. The baby was a cute little thing, except that where there should have been hair, there was nothing but a mass of scabs and running sores. I felt that there must be something I could do to help it. The mother handed me the baby, and I asked the chief for the medical kit. He unpacked a couple of the baskets and finally found it. First I washed the child's head with warm water and then smoothed the whole thing with boric acid ointment. I gave the mother a can of salve and told her, by signs, to put some on twice a day.

All this treatment gave the Nagas the mistaken impression that I was a medicine man. Naga after Naga came forward with infected leech bites. I opened each hole with a sterilized knife, swabbed it, applied sulfa powder and a bandage.

Eventually we started out again. What goes up must go down, thank the Lord, because for us it was now down. It was quite a trail; so steep and muddy that I spent most of my time sliding down on what was left of my shorts. The stones didn't bother my posterior much, it was the sharp roots that really dug in. At the bottom we came to another river.

We shed our clothing like mad and in we all went. I looked down at my feet. Practically all I had left were bloody stumps, the blisters were so numerous. When I jumped into the pool, damned if I wasn't almost swept downstream with the current. I grabbed the nearest hand. When I finally got the water out of my lungs and was able to mumble a meek *"Kajaiee,"* I looked up at the person who was holding me up. My face turned crimson—the big strong hero had been saved by a gal and, to make matters worse, she wasn't hard on the eyes. She smiled at me; I

smiled back, and we began to pick leeches off each other.

From there on, it was up, up, forever up. I was so slow that even the women, burdened as they were with packs, pulled away from me. Two hours after we left that stream I was about finished.

I thought I was beginning to imagine things when I first heard the sound of airplane motors, but I wasn't. I grabbed the little radio and started calling.

Andy's cool, firm voice brought me around. "Where the hell are you, boy?"

"You've got me," I answered him. "I think it's hell, but I haven't been introduced to Satan yet."

"Well, get on the ball," he told me, "you haven't all day, you know."

"Give us four more hours and I should be with the body, I think."

"Four hours," he said. "Okay, we'll be back then, but hurry up."

Wearily we plowed upward. My throat was raw from the quick gasps of hot air.

Then suddenly, around the corner of some heavy brush there came into view the most beautiful sight I've ever seen —two Naga houses. Instead of being surrounded by mud and filth, to me these were made of ice-cream cones surrounded by peppermint candy. There is no describing the ultimate goal when all within you has been telling you that you'll never make it. I staggered to the nearest log and slumped down. I simply sat and stared at those two huts.

Ten minutes later, when I had regained my breath, I made my weary way up to the larger of the two huts. On the porch stood a wrinkled old man. My native friends were standing below the porch looking up at him, all talking at once.

As I approached, the jabbering ceased. I stood with the crowd and looked up at the old man too. He made a short talk to me, not a word of which I understood, then he motioned me up on the porch. I climbed the notched log and entered his house after him.

I peered into the gloom of the front room. Over by the fire I could vaguely see the outline of a form stretched out on the floor. I walked over, afraid of what I might find. The flier was lying beside the fire, the back of his head toward me, but he twisted around and tears ran down his cheeks. Neither of us said a word at first; we merely gripped hands as I knelt down beside him. It was impossible to say anything. I was too choked up with emotion. As the flier lay there sobbing softly he looked to me as if he were on the way out of this lovely world of ours. His beard was long and tangled. His hair spread out like a woman's over the log he was using as a pillow. The bones of his cheeks stood out in ugly relief below yellowing, bulging eyes. He spoke through cracked, fever-ridden lips.

"Thank the Almighty you've come!" I spoke with all the unfelt confidence I could muster. "Right you are, lad, and a couple of doctors will be here soon. We'll have you running as good as new in no time and out of this firetrap in a jiffy."

He closed his eyes and gave a long sigh. Then he opened them again and said, "Have you any food?"

"Coming right up," I answered. "Would some nice hot cereal fill the bill?"

Quietly he answered, "Of course," and once again closed his eyes. I have never fixed cereal faster, and I made tea, too. When the food was ready, I fed him. All he was able to take were a few spoonfuls and a couple of sips of tea. Then he was exhausted from the effort.

I lifted the dirty burlap the natives had covered him with, for an examination. My stomach turned inside out. He was all bones, and all over his legs and body were huge ulcerous sores. He was looking at me, so I had to say something. I smiled and said, "Prickly heat, eh?" It was a very poor attempt at humor, but he managed a feeble grin.

I replaced the sack and started to talk to him. Anything to make him feel better. As I talked I could see him improve. He told me in a weak voice that he was Greenlaw W. Collins from New Orleans.

It had been his first Hump trip. "I was flying a peashooter and had engine trouble, so I had to bail out. I landed in a tree and lost my jungle kit, so I had no food. I followed a river I found. How long I followed it, I don't know, but it was over three weeks. The natives found me going down the river and brought me up here on a litter.

"I thought sure I was a goner," he went on. "Didja see those sores on my legs? I kept 'em open with a native knife. That was right, wasn't it?"

"Perfect," I answered. "You'll be up running in a week."

The search plane buzzed the village. I went out on the porch and turned on the radio. Andy's voice came through: "Air Rescue calling gravel-shuffler."

I was in no mood for jokes. "Andy, this is the gravel-shuffler, and we need medical help as soon as you can get it."

"Stand by," he answered. "I've got the docs aboard and they'll be right down."

The big plane circled around. It shot up the side of our mountain and over the village. A parachute blossomed out from the rear. The wind caught the falling chute, and it disappeared over the far side of the mountain. I wished the boy luck and then turned to the chief and pointed in the direction the chute had gone. He immediately sent two of his men on the run in that direction.

Around came the plane again and the sprawling, tumbling figure of a man flew out the cargo door of the ship. The figure tumbled and fell straight down, but the chute still didn't open. I could see the doctor's arm flaying the air as his hand grasped for the ripcord and missed.

It seemed almost too late when he finally found the ripcord and the chute opened. The canopy snapped open above his head and a split second later he hit the ground. As the natives and I ran to where he hit, he slowly sat up.

"My God," he said to no one in particular, "I've really had it!"

He had landed in soft mud at least six inches deep. The chute had broken his fall, and the mud had cushioned his body. After I helped him to his feet, he stuck out his hand and we shook.

"My name's Spruell," he said, "although it was damn near mud." We both laughed in relief. "Bill to my friends," he added. I appreciated this, for I had spotted the major's leaf on his shirt.

Suddenly I remembered the radio. Andy's voice squawked out at me, "Get on the air, gravel-shuffler, before I have to bail out and find out what's goin' on."

"Everything is going to be all right, Andy," I answered. "Better stick around for a few minutes until the major takes a look at Collins. He may need more supplies than we have here."

Inside the hut, the major took a quick look at Collins while I laid out the medical supplies. "Okay," he said. "Tell them all I need is some glycerine."

I told Andy and he said, "Okay. I'll be back in the morning. Good luck."

Just about this time, up the notched log came the other parachutist, Captain "Sandy" Morrisey from Milwaukee.

The two doctors went to work on Collins immediately. I thought I had better be paying off the natives, so I went down the ladder and gave the chief a handful of silver rupees. He handed each native one apiece, then handed the remainder back to me, keeping one himself. "One rupee, about thirty cents American, for all that work," I thought, and motioned the chief to give an extra rupee all around. Everyone looked highly pleased. Sixty cents for all that mountain climbing and they considered it high wages. What a place to retire!

The natives decided to stay the night and all tried to move into the front room where the doctors were working on Collins. I started to shoo them out, but that lovely creature, my hand-holder-in-the-stream, seemed more reluctant to leave than the others. Since the doctors were busy with things in which I would be of little assistance, I decided I'd best walk her home. Home, of course, being the other hut fifty yards away.

As we sloshed through the mud hand in hand, we must have made quite a picture. Hands across the sea, as it were, or "make friends with the inhabitants of this strange country, soldier." And I believed in obeying orders. I know one word of her language, and she knew none of mine. We carried on an interesting conversation. I'd smile, then she would smile. Then I would say "*Kajaiee*" and she would say "*Mmmmum*" or something like that.

The party in the other hut had started when we got there and my date and I were invited. I had named her Butch and at every mention of it I received a smile. So I asked, "How about a drink, Butch?"

She loquaciously replied, "Ummmmmmmuum glug glug!"

Everyone around us was talking at once, it seemed. A white liquid was produced, as well as pipes which even the women smoked. The white liquid was rice wine. I took a drink and then reached for my head which was lying on the floor or the ceiling or somewhere.

In an hour or so the major came for me, having heard the noise. While I had been gone, the major and Captain Morrisey had given Collins blood plasma, lanced his ulcerated sores, shaved him, cut his hair, given him an alcohol rubdown. I gave him some more cereal and he fell asleep almost immediately.

After dinner, Major Spruell said, "Lieutenant Collins needs a few days' rest here so that we can bring his strength up before we attempt to move him."

"Good," I thought. "That'll give me time to get better acquainted with the villagers. 'Love thy neighbor' is my motto."

It was a pleasant evening. The firelight twinkled merrily and the chief and his friends had their pipes gurgling lustily. Opium smoke permeated the air. My little Naga friend was trying out one of our combs on her long, thick, black tresses as Sandy and Bill made cracks such as, "What does she see in him?"

To which I answered, "Love, my friends, is blind but she knows a man when she sees one."

The only thing that marred the evening was the thought of that long trek out. It really didn't seem possible that we could make it. Not in a couple of months would Collins be in shape to walk that tortuous trail. For him, it would be the litter or nothing.

I held a map of the area. I could see the mountain we were on and the big river where we had taken our first swim. The three of us sat there discussing the pros and cons of the situation, measuring the number of miles from where we were to the Ledo Road. As the crow flew it was roughly fifty miles, but we weren't crows, so we added another fifty miles—up and down hills. My eyes kept focusing on the river I'd swum in that morning. It ran a crooked, narrow path until it flowed into a larger river. The larger river's course led it straight down the Ledo Road. It was a way out without walking, but that current had been swift. Could a boat make it? I thought it could.

"I've got it," I yelped.

"Well, hang onto it," replied the major. "I'll examine it in the morning."

I ignored the remark. "If it were up to you two, we'd walk our feet off, or sit here and rot—that's not for this apple."

"Okay, genius. What's your plan?"

I pointed to the map. "See that river there. Today I took a bath in it, and that river is navigable if one doesn't mind shooting a few rapids."

"Where would we get the boat if we did want to try it?" Sandy asked.

"Maybe they could drop us one from the plane," I replied, "a rubber one."

After much discussion, we decided to ask the rescue ship the next morning to take a look at the river and if it looked all right, to drop up a boat, if they could. Finally we decided to hit the hay.

Dawn was a most welcome sight, for it meant I could get some sleep. Either the Nagas have a tougher hide than I, or generations of fleas and mosquitoes have made them insensitive to bites. Not a Naga squirmed throughout the night, but when I wasn't batting my face into a horrible mess, I was scratching my skin raw.

Later that morning, the search plane flew over us and dropped the glycerine. I told Andy of our plan for evacuating the patient. He flew over the river for a while and then returned, reporting "Those rivers are full of rapids and look mean. I don't think your plan is practical."

"Well," I explained, "it will be almost an impossibility to drag Lieutenant Collins out through all that jungle."

"You may have something there," he answered. "I'll drop the rubber boat if you want it, but it's your responsibility."

A week passed; the boat had been dropped and our supplies were in order. Collins had improved remarkably. We figured it to be about time to start.

A litter with very long end poles, so that it could be carried by no fewer than eight men, was made by the natives. We laid "Greenie" on this and strapped him down, and one of the medics doped him up. This was going to be a rough trip.

When we were ready to leave, I approached the chief in whose village we had stayed. He had been instrumental in the saving of Greenie's life, but I hadn't the least idea what was or was not of value to him. I gave him a hundred silver rupees, wondering what he would do with them. Then I gave him a couple of GI jungle knives and some junk jewelry for his wives. The knives seemed to please him most. He literally beamed approval. So, with smiles and much shouting and waving of hands, we were off down the trail. Naturally, Butch, my constant companion, came along.

The trip was not easy going. In the front, two men were constantly cutting trail, widening it for the litter to pass. The trail clung to the sheer mountain wall, but at four that afternoon we hit the river. Our total take on the trip was one snake, a pit viper and poisonous as hell, two barking deer and a monkey.

At the river, we made camp and proceeded to cook dinner. The monkey and one deer went to the natives. The other deer we cut into steaks which we roasted on a spit over the fire. It was a delicious dinner. The natives, naturally, cooked the monkey as well as their deer. Out of sheer curiosity, I had to have a taste of the monkey. For the record, may I say that the anatomical resemblance of a monkey to a human makes one feel a bit on the cannibalistic side; apart from that, he is good to eat.

Where we had camped, the water was an angry beast with froth on its mouth. It twisted down the narrow gorge, roaring as it hit the solid rock embankments. The river was deep, for it had been swollen by the monsoons. We knew that if the boat capsized, only a good swimmer could make it to shore alive. For Greenie, it would have been impossible. Directly below our position were two mean S curves. At the first curve, the water pounded against the rocks; then, changing its course ninety degrees to the next curve it churned its way around that one. It was a formidable sight. The major suggested we carry both patient and boat downstream below the danger point. This seemed a good idea, except that the mountain wall jutted up almost vertically from the water. The final decision was to tie some shroud lines together, doubling them, wrap one end around a boulder and tie the other to the boat. In this way we could ease the boat around the curves, or so we thought.

In the morning we all donned our life jackets, inflated the little rubber raft and put Greenie aboard. Major Spruell went down to the sharpest curve, the first one, to help ward off the boat. Sandy climbed into the boat with Greenie. I twisted the doubled line a couple of times around a boulder. We were all set to go!

I gave each of the natives that had helped us down a silver rupee apiece and all the extra equipment that we could not put in the boat. They were satisfied with that, but a little awed at what we were going to try to do. One of them kept holding me by the arm, trying to stop me. I looked around and it was Butch. She actually had tears in her eyes.

Turning away, I went over to my position at the rock and called back, "Okay, boy, let 'er rip!" Sandy shoved off into the current. Immediately the boat began to toss around on the surface of the boiling water. I began paying out the line slowly. Suddenly it snapped and the little raft shot along with the current. Sandy gave a yell and I held my breath as the boat shot into the first curve. Sandy was paddling frantically, but ineffectually; the bobbing mass of rubber swung around; they were going backwards into that pounding torrent of roaring water. The boat hit the rock wall with terrific force, rebounded like a rubber ball, hit the current again and whirled around to the next curve where the same thing happened.

Major Spruell, trying to ward off the boat, had fallen off the rock and disappeared into the current. I was left alone with the natives who were gaping, as was I at the place where the boat had disappeared around the curve. I tried to make a hasty march down the side of the stream, first taking the precaution to inflate my life vest. The rocks were too slippery for me and I, too, fell into the water and was swept away. I got one good gulp of air before I hit the icy water and that was the last gasp, it seemed, for ages. The water turned me head over heels, whirling me around; then my head hit the rock wall.

When I regained consciousness, I was bobbing along in a fast but straightaway current. The life vest had saved me. Downstream I saw the yellow life raft beached on a small sand bar. Sandy and Bill were busy bailing it out. I came bobbing over to the bar and climbed ashore. When they saw me, they let out a yell of welcome, for they had thought I was finished just as I had thought they were.

After a short rest, we pushed the boat into the swift water again. This time we all climbed aboard, Greenie Collins lying in the bottom and the three of us perched on the doughnut-like sides.

The boat, lacking any type of keel, would go forward, sideward, then backward. We would sail into a whirlpool and just sit there going around and around. The center of the pool would suck us down, but the buoyancy of the raft saved us. It was like riding a revolving turntable, for the pull of gravity had the three of us on the outside hanging on with all our strength. Then the whirlpool would release its hold and we would go sliding across the surface of the water at a terrific clip. Somebody would yell, "Look out!" and—*crash*—we would plow into a rock jutting up from the water.

Suddenly Sandy shouted, "Good Lord, look what's ahead of us now!"

We saw a small waterfall.

Our luck had been too damn good, I thought. This was the end of the line.

The water frothed and boiled over the line of rock and we plowed right into the center of it. The boat shot out and over the waterfall, which was about two feet high. For just a second we were suspended in the air like a ski jumper and then the boat fell to the water with a sickening thud, filled and began sinking.

Overhead, a tree limb branched over the water. Sandy screamed at me, "Grab that limb!" I made a grab and caught hold. I was all but yanked out of the boat, but somehow managed to hang on to both. The drag swung the boat

around to the bank just in time. We were all cold and wet through, but poor Greenie was frozen. The sun was out, but it was too early to give us much heat. Sandy and I gathered dried bamboo, built a roaring fire and made coffee. We all sat there, huddled around the fire, a miserable group, but happy to be alive.

"Well," Sandy said at last, "we only have a couple of hundred miles to go."

In the distance we heard the sound of a plane. As it flew into sight, I made a grab for the radio, but it was finished. Just a little too much water. The plane spotted our fire and circled us, evidently trying to make radio contact. After five minutes of circling, the pilot realized that our radio was out. We saw the rear door of the "Doug" come off and the figure of a man appear.

The figure started flashing out code. As the letters became words the uplift in our morale was something to write home about. The flashing light told us that not five miles ahead was the junction of our river and the larger one. There, Search and Rescue Squadron had motorboats waiting for us.

Immediately we started out again, our spirits a great deal lighter. The boat would whirl and we would laugh—help was near. Less than three-quarters of an hour later, we shot around a curve in our river and there was the junction, with three motor barges waiting.

Cameras flashed (Public Relations is always in there pitching); hot coffee was ready and good dry clothing. Our rescuers were Major M. K. O'Heeron of Houston, Texas, who acted as if he did this sort of thing every day, and Lieutenant Glenn J. Dateman from West Cleveland, Ohio. Those two men were certainly a sight for our sore eyes.

Major Spruell put new dressings on Greenie's ulcers. We put clean if outsized clothing on him, loaded the rubber raft into one of the barges and laid him on it. It made a perfect air mattress when turned upside down. We rode all day, and that night brought us to the comparative comfort of the Ledo Road.

Search and Rescue had an ambulance waiting and Greenie was whizzed off to a near-by hospital. When we loaded him into the ambulance, he stuck out his hand and said, "Thanks is a small word when you've saved my life, but . . . Aw, hell! Thanks a lot for everything." It wasn't much of a speech as speeches go, but it was all we wanted, for we knew it was sincere. That boy Collins was all right for our money, we agreed.

ABOUT OUR AUTHORS

Colonel Gerald G. Gibbs was Executive Officer of the 45th Brigade during the major portion of the period about which he writes. (Page 2.)

Dr. R. J. Havens is in charge of the Atmospheric Physics Sub-section of the Rocket-sonde Section of the Naval Research Laboratory. (Page 10.)

Harold S. Morton was retired as a Colonel in 1946. During the war he was intimately involved in the development of the VT fuze while Chief of Special Projects, Office of the Chief of Ordnance. Later he served on the five-man "Special VT Fuze Panel" appointed by the Joint Chiefs of Staff. He is now an engineer with the Applied Physics Laboratory of Johns Hopkins University. (Page 13.)

Colonel D. W. Hickey, Jr., is Director of Instruction, the Seacoast Branch, The Artillery School. During the war he commanded the 54th AAA Brigade. (Page 15.)

Major Franklyn J. Michaelson is in the Research and Analysis Department, Antiaircraft and Guided Missiles Branch, The Artillery School, Fort Bliss, Texas. (Page 17.)

Orville S. Splitt and Murray Green are civilian information specialists in the Directorate of Public Relations, Office of the Secretary of the Department of the Air Force. (Page 21.)

Major General John L. Homer is in command of The AA and Guided Missile Center and President of Army Ground Forces Board Number 4 at Fort Bliss. General Homer is also in charge of the AA and Guided Missile Branch of The Artillery School. (Page 24.)

Lieutenant Clarence F. Craw is a member of the Public Information Office Staff of the Philippines-Ryukyus Command in Manila. (Page 27.)

Willy Ley is one of the outstanding authorities on rockets. He came to this country from Germany in 1935 where he had been vice-president of the German Rocket Society before it was dissolved in 1934 as a result of Hitler's rise to power. For several years he was science editor of the New York daily, *PM*, but is now a research engineer with the Washington Institute of Technology. (Page 30.)

Lieutenant Colonel Peter S. Peca is in charge of the Guided Missiles Section of Army Ground Forces Board Number 4 at Fort Bliss, Texas. Colonel Peca has been in that position since the early inception of that section. (Page 34.)

Colonel J. P. Henderson is Director of the Marine Field Artillery School, Quantico, Virginia. (Page 37.)

Colonel E. A. Kastner, until most recently, was Director of the Department of Extension Courses at The Artillery School. (Page 39.)

Dr. Herbert S. Zim is an outstanding writer on scientific subjects. Among his other scientific books are: *Man in the Air, Air Navigation,* and *Parachutes.* (Page 42.)

Major John M. Wright became a Prisoner of War of the Japanese with the surrender of Corregidor on 6 May 1942. He was liberated in Korea on 8 September 1945. (Page 46).

Lieutenant William F. Diebold writes of his own experiences while a member of the Search and Rescue Unit at the Air Transport Command in India. Although not trained for the mission he performed, it is quite evident from the narrative that Lieutenant Diebold acquitted himself in a most exemplary manner. (Page 48.)

Coast Artillery Journal

Fifty-fifth Year of Publication

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

News and Comment

This Issue's Cover

The picture which adorns the cover of this issue was selected because it is symbolical of the Christmas season and certainly will remind many of our subscribers of the Christmas season of 1944 which is when this picture was taken near Krinkelt, Belgium.

Election of New Members to Executive Council

The ballot for the election of a new Vice President and three members of the Executive Council appears on the opposite page again this issue. It is reprinted to give association members who haven't voted, a chance to do. If you have already voted, please disregard this ballot.

The members whose terms of office expire 31 December 1947 are:

Brigadier General Aaron Bradshaw, Jr. (Vice President)
Colonel Hobart Hewett
Colonel Andrew P. Sullivan
Colonel W. I. Brady
Colonel E. Graham Martin.

All members of the Coast Artillery Association are urged to cooperate by forwarding their votes or proxies to the JOURNAL office. Complete instructions are contained in the ballot.

Orientation Courses for Reserve and Guard Officers

Two-week orientation courses for Organized Reserve and National Guard officers, to be conducted at all Army Ground Forces schools during the first six months of 1948, have been scheduled by Army Ground Forces Headquarters, General Jacob L. Devers, Commanding General of the Army Ground Forces, announced recently. To be attended by reserve officers of either company or field grade and National Guard officers of field grade, the courses will be similar to the series of two-week training sessions conducted during the past summer, which proved highly effective in orienting key civilian component officers in current Army policies and training doctrines and latest military developments.

The courses will be given at the following schools, with the first class scheduled to start at each school January 11, 1948, and subsequent classes starting on February 8, March 7, April 4, May 2, and June 6:

The Infantry School, Fort Benning, Georgia; The Artillery School, Fort Sill, Oklahoma; Seacoast Branch, The Artillery School, Fort Winfield Scott, California; AAA and Guided Missiles Branch, The Artillery School, Fort Bliss, Texas; The Ground General School, Fort Riley, Kansas; and The Armored School, Fort Knox, Kentucky.

In general, instruction during the 72-hour course will be branch immaterial in character. However, each school has

been allotted 31 hours in which subject material pertaining to the school's particular arm may be taught at the discretion of the school authorities if it is felt that inclusion of such material will best cover the needs of the group enrolled or make for more effective presentation.

Approximately 17 hours of the branch material subject matter to be covered in the courses will be devoted to research and development work of the armed forces. Other subjects will include structure and functioning of the new types of ground divisions, military policy of the United States, mobilization planning, the replacement training system, and organization and functioning of the division staff.

Reserve officers desiring to attend may apply either through their Organized Reserve headquarters or directly to the Army area commanders. Applications of National Guard officers should be submitted to the National Guard Bureau in Washington, D. C.

Nation-wide Ceremonies Mark Return of Organized Reserve Colors

Ceremonies marking the official return on Armistice Day of colors or standards and battle honors to ground and service units of the Organized Reserve Corps throughout the country were conducted on November 11.

Of the 6,000 Reserve combat and service type units activated to date, approximately 1,600 received their colors in the November 11 observances.

Providing a link with the history and traditions of many of the famed combat units of World War II and earlier conflicts, colors were presented to peacetime successors of these units which have been reactivated in the Organized Reserves.

Among the organizations to receive their colors were more than a score of the nation's Reserve "Minute Men" divisions which in the recent war supplemented the divisions of the Regular Army and National Guard to constitute the victorious ground fighting team of the Army of the United States.

In the northeastern states these included the 76th, 77th, 78th, 79th, 94th and 98th Infantry Divisions, and in the South Atlantic area, the 87th Infantry and 80th and 100th Airborne Divisions.

Divisions to which colors were returned in the midwestern states included the 83d, 85th, 102d and 103d Infantry Divisions, and the 84th Airborne Division. In the Southwest and Pacific Coast areas, the 90th, 91st, 95th, 96th and 104th Infantry and 13th Armored Divisions were so honored.

In addition to the above named, all of which served overseas in World War II, one new Organized Reserve division, and two others which did not see action as complete units, were presented with their national flags in lieu of the distinctive unit colors to be given them at a later date.

Additional ORC Units

The following ORC units have been activated since the last issue of the JOURNAL:

California:

810th CA Battery (90mm, AMTB), Los Angeles.
811th CA Battery (16" Gun, HD), Los Angeles.

BALLOT

UNITED STATES COAST ARTILLERY ASSOCIATION

INSTRUCTIONS AND INFORMATION

The Vice President and three members of the Executive Council are to be elected on this ballot, to replace officers whose terms of office expire December 31, 1947. 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. It is considered advisable to have at least five members of the Council residing in or near Washington in order to facilitate the transaction of business

Ballots received after December 31, 1947, 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,
Deputy Commandant, National War College, Washington, D. C.

☐ _____

FOR MEMBERS OF THE EXECUTIVE COUNCIL (Vote for Three)

☐ Colonel Paul H. French,
Chief of Organization Branch, Organization and Training Group, National Guard, Washington, D. C.

☐ Colonel Alexander H. Campbell,
Member of the Security Section, Joint Security Control, Office of the Joint Chiefs of Staff, Washington, D. C.

☐ Colonel Leonard L. Davis,
Assistant Chief, Service Group, Services, Supply and Procurement Division, WDGS, Washington, D. C.

☐ Colonel John H. Madison,
Director of Instruction, AA and Guided Missile Branch, Fort Bliss, Texas.

☐ Colonel Legare K. Tarrant,
Strategic Plans Branch, Plans and Policy Group, P&O, WDGS, Washington, D. C.

☐ Colonel Robert J. Wood,
Student, National War College, Washington, D. C.

☐ Lieutenant Colonel Sam C. Russell,
Development Group, Research and Development Div., WDGS, Washington, D. C.

☐ _____

_____
Signature

_____
Rank and Organization

_____
Address

Seacoast Artillery School Development Board

A Board of the following Officers to be known as the Seacoast Artillery School Development Board has been appointed at the Seacoast Branch of The Artillery School by Brigadier General William S. Lawton:

Colonel Daniel W. Hickey, Jr., President
Colonel Carl W. Holcomb
Lieutenant Colonel George F. Peirce
Lieutenant Colonel Alexander Grendon
Lieutenant Colonel Charles W. Hill
Lieutenant Colonel Hubert duB. Lewis
Commander Walter J. Stencil
Lieutenant Colonel Frank B. Moses, Recorder

The purpose of the Board is:

a. To explore existing tactical doctrines having reference to seacoast artillery and coast defense and to initiate recommendations to amend existing doctrines when such amendments are indicated.

b. To formulate new doctrines on coast defense and use of seacoast artillery based on explorations under Paragraph a., above.

c. To determine whether new weapons, such as guided missiles, rockets, underwater torpedoes and similar developments can and should be adapted to coast defense, and if so, whether the present directives from higher Headquarters for the development of such new weapons are sufficiently comprehensive to cover their uses in coast defense.

d. To invite the presentation of new ideas from all known sources in the adaptation of latest scientific research with respect to the modernization of coast defense weapons and doctrines.

e. To encourage throughout the seacoast artillery, individual research and forward thinking in connection with the latest scientific developments and their adaptation to coast defense and seacoast artillery.

f. To determine what steps should be taken to develop protective measures against the atomic bomb and the nuclear radiation effects within the seacoast artillery.

g. To determine what steps should be taken to develop protective measures with respect to biological and chemical warfare within the seacoast artillery.

h. To determine what steps should be taken in the seacoast artillery to develop protective measures against guided missiles and rockets launched from surface ships—weapons, doctrine, training.

i. To determine what steps should be taken in the seacoast artillery to develop protective measures against airborne operations.

j. To be a clearinghouse for all new ideas submitted to the SBAS concerning coast defense missions, equipment, armament and operations.

Meetings of the Board will be held at frequent intervals in order that all ideas and presentations to the Board may be acted upon within a minimum of time.

* * *

On Universal Military Training by General Eisenhower

The fundamental principle of democracy is equality—equality of burden as well as equality of opportunity. Where the defense of our country is concerned, this principle imposes on each American the duty of service in the manner most effective for the preservation of our way of life. Selective Service was its wartime application. Its logical peacetime application is Universal Military Training, an equitable method of preparing the citizen for his personal defense responsibility so that—should war come again—it shall not find us unready. So long as the use of force has not been forever and effectively barred from international relationships, this responsibility must be met soberly and seriously by the United States. Universal Military Training, as proposed by the President's Advisory Commission, is an important clause in American democracy's insurance policy against extinction by war.

* * *

To the Editor

Your letter of September 11th and the additional CA JOURNALS that were requested by the Senior State Instructor for Texas have been received.

We are working on two (2) Guided Missiles Battalions here in the office and have selected the Commanding Officers for both battalions at the present time. There are 67 additional officers that have indicated a very enthusiastic willingness to go into this new field and those men will form the initial two battalions.

Colonel Pindar, C.O., 1st Guided Missiles Battalion, has been instructed to build up the organization for our Reserve Battalion. I was informed by Colonel Crowell, Executive Officer to General Homer that he mailed you several copies of the "Organization and Training of Civilian Component Units in Guided Missiles" work. That is our beginning. Colonel Pindar will talk to the Reserves on 20th October 1947 on that chart and the proposed training program. There we will begin the assignment of the 67 officers and any others to the T/O positions and our large initial problem is over. Without the enthusiasm of the Commanding General this work could not be done.

The JOURNALS are one of the most important parts of the program that we have at the present time and will be depended upon to a very high degree in laying the foundation for future training.

It is planned that in the next nine to twelve months there will be three such battalions here with those battalions offering approximately 180 Reserve officers position assignments that we would not have under any other suitable organization. These battalions are necessarily within the Composite Groups now activated in the El Paso area.

Our work is necessary to keep the interest of the Reserves and is very slow at first to insure that progress made is something that will last and not become too involved and over the heads of the men.

A letter of inquiry from Philadelphia on the GM Bn was received as a solution in taking care of 4000 CAC officers there. I referred them to you, also, for assistance. I am thoroughly convinced that we can get it done here, especially with the assistance that we have from the School and you.

Sincerely,
WILTON L. SANDERS, Lt. Col., Cav.,
Unit Instructor, ORC, Texas

Additional National Guard Units

The following National Guard Coast Artillery Corps units have been Federally recognized since the last issue of the JOURNAL:

California:
- 186th AAA Operations Detachment, Long Beach.
- Headquarters & Headquarters Battery, 719th AAA Gun Battalion (SM), Richmond.

Connecticut:
- Headquarters & Headquarters Battery, 103d AAA Brigade, West Hartford.
- 172d AAA Operations Detachment, West Hartford.
- Headquarters & Headquarters Battery, 745th AAA Gun Battalion, Norwich.

Georgia:
- Battery "D," 101st AAA Gun Battalion (SM), Waynesboro.
- Battery "B," 250th AAA Searchlight Battalion, Augusta.
- Medical Detachment, 250th AAA Searchlight Battalion, Augusta.

Illinois:
- Medical Detachment, 693d AAA AW Battalion (SP), Chicago.

Maine:
- Battery "C," 314th AAA AW Battalion, Calais.
- Battery "D," 703d AAA Gun Battalion (SM), Rockland.

Minnesota:
- Medical Detachment, 256th AAA AW Battalion (SP), St. Paul.

New Hampshire:
- 954th Gun Battery (HD), Portsmouth.

New Mexico:
- Separate Detachment, 200th AAA Group, Las Cruces.
- Battery "A," 697th AAA AW Battalion, Boswell.
- Battery "A," 716th Gun Battalion, Las Cruces.
- Battery "B," 717th AAA Gun Battalion, Taos.
- Battery "A," 726th AAA Searchlight Battalion, Albuquerque.
- Battery "A," 804th AAA AW Battalion, Portales.
- Battery "C," 804th AAA AW Battalion, Clovis.

New York:
- Headquarters & Headquarters Battery, 209th AAA Group, Rochester.
- Headquarters & Headquarters Battery, 269th AAA Group, New York City.
- Battery "C," 212th AAA AW Battalion (SM), New York City.
- Medical Detachment, 212th AAA AW Battalion (SM), New York City.
- Headquarters & Headquarters Battery, 212th AAA AW Battalion, New York City.
- Headquarters & Headquarters Battery, 207th AAA Group, Albany.
- Battery "A," 212th AAA AW Battalion, New York City.
- Battery "B," 212th AAA AW Battalion, New York City.
- Battery "D," 212th AAA AW Battalion, New York City.
- Headquarters & Headquarters Battery, 773d AAA Gun Battalion, New York City.
- Battery "A," 773d AAA Gun Battalion, New York City.
- Battery "B," 773d AAA Gun Battalion, New York City.
- Battery "C," 773d AAA Gun Battalion, New York City.
- Battery "D," 773d AAA Gun Battalion, New York City.
- Medical Detachment, 773d AAA Gun Battalion, New York City.
- Headquarters & Headquarters Battery, 898th AAA AW Battalion, Rochester.
- Battery "A," 898th AAA AW Battalion, Rochester.
- Battery "B," 898th AAA AW Battalion, Rochester.
- Battery "C," 898th AAA AW Battalion, Rochester.
- Battery "D," 898th AAA AW Battalion, Rochester.
- Medical Detachment, 898th AAA AW Battalion, Rochester.

Ohio:
- Battery "A," 183d AAA AW Battalion, Fort Hayes.

Pennsylvania:
- Battery "A," 416th AAA AW Battalion (SM), Philadelphia.
- Medical Detachment, 689th AAA AW Battalion (SP), Pittsburgh.

Rhode Island:
- Battery "B," 705th AAA Gun Battalion (SM), E. Greenwich.

Virginia:
- Battery "D," 691st AAA AW Battalion, Onancock.

Washington:
- Headquarters & Headquarters Battery, 205th AAA Group, Seattle.
- Battery "A," 700th AAA AW Battalion, Aberdeen.

* * *

Simulated Bombing Attack on Capital Repelled By National Guard

The National Guard of the District of Columbia and four States cooperated in staging radar-directed interception of a simulated bombing attack on the nation's capital Sunday, November 2, 1947.

"Enemy" bombers come in over the Washington Monument and were intercepted over the Bureau of Engraving and Printing while a public address system on the Mall amplified radio directions from ground control to interceptors for the benefit of spectators. A large scale map pictured the entire demonstration as the radar operation of aerial defense, one of the most closely guarded wartime secrets, was opened to the public.

Brigadier General Albert L. Cox, Commanding General of the District National Guard, said the demonstration was the first of its type ever staged in this country, "and by far the most interesting air show Washington has ever seen."

The 260th Antiaircraft Artillery Group of the District National Guard, commanded by Colonel Leroy S. Mann, also participated in the demonstration on the Mall, displaying the equipment of its 260th Gun Battalion, 380th Automatic Weapons Battalion and 340th Searchlight Battalion.

15,200 National Guard Officers Federally Recognized In 16 Months

Federally recognized National Guard officers now substantially outnumber the highest officer strength of the National Guard in the period of expansion shortly before induction into Federal service in 1940.

Approximately 15,200 officers have received Federal recognition since June 1946, when active reorganization of the National Guard began, and an additional 1,300 officers have applied for Federal recognition. In June 1940, there were approximately 14,500 officers and 227,000 men in the National Guard.

Officers are chosen through a strict system of selection and must be prepared to assume the same responsibilities as those of the Regular Army. In addition to meeting the physical and mental standards required by the Army, they must have at least six months honorable active service in World War II. Second lieutenants may be commissioned from among qualified enlisted men of the first three grades whose war records prove their professional fitness.

Commissions can also be granted to enlisted men of the National Guard who graduate from officer candidate schools or aviation cadet courses, former officers and flight officers with honorable war service, and certain specialists without previous military training such as clergymen, doctors and dentists.

National Guard to Participate in Industrial College Program

Selected National Guard officers will be trained in the basic problems of economic mobilization by the Industrial College of the Armed Forces.

Under a special program set up by the service school, a series of six two-week courses, one each month, will be conducted for National Guard and Reserve officers, educators, and industrial executives during the period January through June, 1948.

The National Guard has been given a quota of one officer for each State, Territory and the District of Columbia. Officers selected, to be nominated by the various States, will, in general, be above the rank of major, with outstanding service records whose wartime assignments would be at the policy-making level.

The courses will be conducted by a specially trained group of Army and Navy officers from the ICAF faculty. They will be given in cities located in important industrial centers in the six Army areas.

Beginning January 12, 1948, the first six courses will be conducted in New Orleans, Birmingham, San Francisco, New York City, Pittsburgh and Chicago, respectively. The same cities may not be selected each year, according to the Industrial College announcement but it is expected that courses would be conducted "in the larger industrial areas each year, and in the smaller industrial areas every two or three years."

National Guard officers chosen for the courses from the States will attend at the scheduled cities in their respective Army areas. Candidates from Hawaii will attend at San Francisco, those from Puerto Rico at New Orleans or at Birmingham, and from the District of Columbia at New York City.

According to a statement by the Industrial College, the courses, modeled after the complete course now given at the College, are calculated to "Inculcate and foster interest on the part of National Guard, Reserve officers, educators and executives of industry in problems incident to economic mobilization . . . and to supply a group of National Guard and Reserve officers instructed in the fundamentals of industrial mobilization to augment the group of Regular officers trained in the complete course in Washington."

It was also pointed out that the proposed courses are "the best practicable means of reaching the type of National Guard and Reserve officer and industrialist who will be invaluable in accomplishing the prompt mobilization of industry in an emergency."

President Approves Seal For National Military Establishment and Flag For Secretary of Defense

President Truman has approved the designs submitted by the Secretary of Defense for the seal of office of the National Military Establishment and for the Secretary's flag.

The seal is of the following design: An American eagle is displayed facing to the right. Wings are horizontal. The eagle grasps three crossed arrows and bears on its breast a shield whose lower two-thirds carries alternating white and red stripes and whose upper third is blue. Above the eagle is an arc of thirteen stars with alternating rays. Below the eagle is a wreath of laurel extending to the eagle's right and a wreath of olive extending to the eagle's left. On an encircling band is the inscription "National Military Establishment" and "United States of America."

When the seal is displayed in color, the background is to be of medium blue with the eagle and wreath in natural colors and the arrows, stars, and rays of gold. The encircling band is to be dark blue with gold edges and letters in white.

The American bald eagle, long associated with symbolism representing the United States of America and its military establishment, has been selected as an emblem of strength. In facing to the right, the field of honor is indicated. The eagle is defending the United States, represented by the shield of thirteen pieces. The thirteen pieces are joined together by the blue chief, representing the Congress. The rays and stars above the eagle signify glory, while the three arrows are collectively symbolic of the three component parts of the National Military Establishment. The laurel stands for honors received in combat defending the peace represented by the olive branch.

The flag of the Secretary of Defense, of medium blue silk, bears embroidered in its center the eagle, shield and arrows found on the seal of office. In each of the four corners of the flag is a white five-pointed star with one point upward, of silk appliqued. The flag is trimmed on three edges with a knotted fringe of white silk and attached below the spearhead of the staff is a cord with a tassel at each end. Cord and tassel are of blue and white strands.

The preparation of the final designs was accomplished by the Heraldic Section of the Office of the Quartermaster General of the Army. Mr. Arthur E. DuBois, authority on Heraldry in that office, had supervision of this work.

Address Supplement Errata

Since distribution of the Address Supplement with the September-October issue of the JOURNAL, several discrepancies in rank and address and a few omissions have been discovered.

Below correctly listed are the individuals erroneously listed or omitted from the Supplement:

MAJOR GENERAL

Lemnitzer, Lyman L., Quarters No. 1, National War College, Washington 25, D. C.

COLONELS

Brandon, David R., 46 Webster Avenue, Port Washington, New York.

Carroll, J. B., Senior Instructor, ORC, East Pennsylvania, Pennsylvania Building, 15th & Chestnut Streets, Philadelphia 2, Pennsylvania.

Jackson, Harold R., 7 Stetson Street, Lexington, Massachusetts.

Huguley, Thos. C., P.O. Box 97, Station "A," Atlanta, Ga.

Mott, F. E., 211 Rockingstone Avenue, Larchmont, New York.

Sohn, Milton G., 1156 McClellan Drive, Los Angeles 24, Calif.

LIEUTENANT COLONELS

Barton, Chester T., 1019 Brown Street, El Paso, Texas.

Button, Ronald E., c/o Directorate of Staff Duties, General Staff Branch, Canadian Army Headquarters, Ottawa, Ontario, Canada.

Schouman, Hazen C., Unit Instructor, CAC, 1408 Federal Building, Los Angeles 12, California.

CAPTAIN

Butler, Robert H., 147 Milk Street, Boston, Mass.

* * *

To the Editor

The very fine tentative Guided Missiles Bn. T/O & E, along with the stack of literature, was eagerly received by ORC enthusiasts in Indianapolis. They now have formed their provisional unit and have issued a training schedule for the winter based upon your interesting JOURNAL articles. Thanks to you and your valuable publication, they are very happy.

* * * * *

Sincerely,

E. F. ADAMS
Colonel, CAC
Senior Instructor, ORC, Indiana

* * *

Honorary First Defenders Annual Ball

The Annual Military Ball of the Honorary First Defenders was held in Allentown, Pennsylvania, on Friday, October 24th in conjunction with the annual meeting of that unique organization.

The ball was the prelude to the annual enlisted men's dance for members of the 51st AAA Brigade headed by General Curtis who was honorary chairman of arrangements for the ball. The enlisted men's dance was held October 25th with a repeat performance of the entertainment held Friday.

Commands To Replace Departments Overseas

Four overseas Army departments will be abolished November 15 in accordance with the Unified Command Plan approved last year by President Truman, the Department of the Army announced today.

The move will result in creation of a consolidated Army command in the Caribbean area, replacing the old Panama Canal and Antilles Departments, and a reassignment of duties in Alaska. At the same time, the Hawaiian Department, labeled "obsolete" by the Army, will pass out of existence without establishment of a successor headquarters.

In addition to revision of overseas command structure, the Army said, the November 15 action will "standardize nomenclature" of ground elements overseas.

To replace the former Panama Canal and Antilles Departments, "U.S. Army, Caribbean," will be established with headquarters at Quarry Heights, Canal Zone. It will have Army jurisdiction in the Canal, Puerto Rico, Virgin Islands and leased Army bases in the West Indies and British Guiana.

"Headquarters, U.S. Army, Alaska," will succeed the Alaskan Department in charge of Army troops and installations in Alaska, including the Aleutian chain.

With the closeout of the Hawaiian Department headquarters, Army Ground Forces, Pacific, will be renamed "U.S. Army, Pacific." This headquarters will continue to supervise Army troops in the Central and South Pacific. The change of name was ordered in the interests of standardization, as was the redesignation, also effective November 15, of the Headquarters Ground and Service Forces, Europe, as "Headquarters, U.S. Army, Europe."

Parallel Navy and Air Forces headquarters, already in existence or to be established, will operate, as will the Army units, under the respective unified commanders.

* * *

Troops Train For Exercise "Yukon"

The first contingent of troops from the famed Second Infantry (Indianhead) Division scheduled to participate in Exercise "Yukon" this winter are now completing their final training in preparation for their departure to Alaska.

The first company has departed from its home station at Fort Lewis, Washington, for the advance training area at Ranger Creek Camp near the snowy slopes of Mount Rainier. There the troops will receive instruction in the use and care of clothing and equipment necessary for their stay in the far north.

The exercise which is being pioneered by the first contingent will be followed in successive stages by other units from the division until four augmented rifle companies have participated in exercise "Yukon." The project will continue until the first of March of next year, and each company will remain in Alaska for a period of approximately three weeks.

The initial phase of the training program, which got under way early in August, included familiarization with C-82 Cargo planes. This training was conducted by members of the 82d Airborne Division from Fort Bragg, North Carolina. Hours were spent in loading and lashing drills in order to familiarize all personnel with methods used.

Coast Artillery Newsletters

65TH ANTIAIRCRAFT ARTILLERY GROUP

FORT AMADOR, CANAL ZONE

COLONEL PAUL B. NELSON, *Commanding*

The 65th AAA Group is approaching the final stages of advanced training for the calendar year 1947. The major training topics recently have been target practices, field exercises, security, mobility, and airborne techniques.

Units of the 65th AAA Group are spread over the entire Canal Zone; one battalion, the 903d AAA AW, has its headquarters at Fort Clayton; the other battalion, the 764th AAA Gun, has its at Fort Gulick. Attached to each battalion are Batteries "C" and "D" of the other battalion, thus making each battalion a "composite" unit in nature. The gun battalion is composed of Insular troops and the automatic weapons battalion of Continentals.

Colonel Harold A. Brusher, former commanding officer of the 65th Group, was transferred to Headquarters Atlantic Sector on 11 August 1947 and was assigned as Deputy Commander.

Colonel Paul B. Nelson, newly arrived from a War Department General Staff assignment in Washington, assumed command of the 65th on 11 August 1947. Colonel Nelson was a combat battalion commander during the Tunisian campaign, North African and Sicilian campaigns, and in the Corsican operations. Colonel and Mrs. Nelson reside at Quarters No. 21, Fort Amador.

Through frequent tracking missions and target practices, a high standard of proficiency has been obtained by gun crews and the operators of fire control equipment. Almost constantly at least one battery within the group is at one of the firing points conducting a familiarization or service practice. Tracking missions also are held almost every day for one or more batteries. The recent arrival of a number of P-80 jet planes in the Canal Zone will provide a more realistic tracking target for antiaircraft.

A majority of the 65th's units have completed a week's airborne training. This is in line with the current AGF policy that all units will in the future be air-transportable. This training is climaxed by an actual air movement. The troops are very interested in airborne instruction and requests have been received for more of it.

The first classes of the 65th AAA Group's Radio Operator's course and Radio Repair course recently graduated. At the graduation of the radio operators, Colonel Nelson's address was radioed to the students in code from a remote location.

The 65th Group has been sending a number of students to each new class of the Panama Canal Department's NCO Leadership School. In the latest graduating class, a member of the 65th finished second in the class standings. In the latest graduating class at PCD's Food Service School, a member of the 65th was first in his class.

The 65th AAA Group has launched an integrated recreation, education, and athletic program. Units on the Pacific side run a weekly tour that includes the historically famous Church of the Golden Altar and the ruins of Old Panama. Atlantic side units run a tour that includes old Fort San Lorenzo.

All units of the group send personnel on weekly trips to Barro Colorado Island in Gatun Lake. Persons making the trip go by the only method of transportation—train to Frijoles, a little town near the center of the Isthmus, and then by launch to the island. The men are taken on a conducted tour of the island, which is a wildlife reserve under administration of the Smithsonian Institution.

The Food Conservation Program has been vigorously imposed in the 65th AAA Group. Off-duty fishing trips and oyster hunts have resulted in supplying many battery messes with enough seafood to feed the entire batteries concerned. Units are also gathering and using as much native fruit as possible.

CHANGES IN OFFICER PERSONNEL

Recent arrivals, with assignments:

Col. Paul B. Nelson	Commanding Officer, 65th AAA Group
Capt. Lucius G. Hill, Jr.	TI&E Officer, WA&R Officer, PIO, 65th Group
Capt. John L. David	Asst. S-3, 65th Group
1st Lt. Duane E. Radford	Btry Officer, 903d AAA AW Battalion
1st Lt. Lincoln E. Ost	Btry Officer, 903d AAA AW Battalion
1st Lt. Gerald F. Weatherford	MTO, 903d AAA AW Bn
1st Lt. Walter F. Pont	Btry Officer, 764th AAA Gun Battalion
Lt. Col. Theodore W. Lowrie	Commanding Officer, 903d AA AW Battalion
Maj. Adrian A. Bourdon	S-3, 764th AAA Gun Battalion
Lt. Col. Henry P. Van Ormer	Executive, 65th AAA Group

Recent departures, with destinations:

Col. Harold A. Brusher	Headquarters Atlantic Sector
1st Lt. L. Sobke	Headquarters, CDC
Capt. John C. Fralish	U. S. Ground Mission, Guatemala
Capt. Anthony R. Hober	Completed tour—returned to U. S.

138TH ANTIAIRCRAFT ARTILLERY GROUP

YOKOHAMA, JAPAN, APO 503

LIEUTENANT COLONEL ARTHUR L. FULLER,
Commanding

Summers in Japan are said to be extremely hot and in this we concur for the "dog days" are upon us. In seeking respite from the heat, the Group working day was changed to begin at 0730 and end at 1530. Swiming, golf, and cool refreshment enthusiasts were pleased by this arrangement.

The personnel shortage mentioned in the last newsletter remains static. Replacements arrive but trained personnel continue to depart. Continuation of training will depend on the constantly changing security guard requirements and the availability of personnel.

On 1 August 1947 the Radio Controlled Airplane Target Detachment sailed for Inchon, Korea, on the USAT *Gen. Aultman*. Lieutenants J. G. Harkins and G. S. Smith accompanied the detachment which spent six weeks providing OQ flying missions for the 865th AAA AW Battalion (SP) at Kimpo Army Air Base. The firing range is adjacent to a rest hotel and the personnel quartered there were provided with an "added attraction" since many planes were shot down in flames. The detachment returned 16 September 1947 and after a brief rest prepared to furnish missions for the 11th Airborne Division

The Nagahama Repatriation Center, the "Ellis Island" of Japan, operated under the direct supervision of the 753d AAA Gun Battalion (SM), was the scene of much ado during the week end 16-17 August 1947 when 806 Austrian and German Nationals were processed for repatriation to their homelands. The repatriation group was made up of 133 diplomats and 673 others, ranging in age from one month to 74 years.

The 76th AAA AW Battalion (SP) has resumed full-time training in both Headquarters Battery and Battery "B." Field problems and artillery tactics are being stressed. A very successful First Three Graders party was held at the Enlisted Men's Club in September. The party served to bring the senior NCO's together and aided materially in creating a greater *esprit de corps* and sense of cooperation.

Three War Department Technical Instruction Teams have arrived in Japan. Schools for officers and enlisted personnel were started and the results of these endeavors are already apparent in many phases of the training. The AW Team is composed of Captain W. L. Hays, Lieutenants K. L. Peterson, J. J. Corr, Jr., W. J. Johnston, and R. P. Warrington. The gun team comprises the following members: Lieutenant Colonel F. L. Beaver, and Captains F. J. McCabe, R. W. McCartney and L. R. Burton. Major K. F. Davis and First Lieutenant T. T. Rutter compose the AAAIS Team.

Troop Information and Education continues to hold its rightful place in the occupation soldiers' training. In addition to the weekly briefings conducted by battalion TI&E Officers for battery personnel, the Group TI&E Officer briefs the battalion TI&E Officers and their assistants weekly and attends a bimonthly briefing conducted by the Eighth Army TI&E Officer. In this way the program is enlivened, kept up to date, and much guidance is offered to all concerned.

A combined Field Artillery-Coast Artillery party was held at the New Grand Hotel during August, with the overflow attending at the Hodagoya Country Club. Group parties will continue during the fall and winter season. On Saturday afternoon, 27 September 1947, the Nagahama Repatriation Center area was the scene of a group picnic. Softball and horseshoe pitching contests preceded an elaborate buffet supper and later in the evening a Japanese orchestra furnished music for dancing under colorful Japanese lanterns.

Lieutenant Colonel Hiram N. Smith, Commanding Officer, 753d AAA Gun Battalion (SM) was placed on DS with the War Crimes Commission in July and Major Antonino H. Manguso, Executive Officer, assumed command of the battalion.

On 4 September 1947, Lieutenant Colonel Richard L. Morgan was transferred to Headquarters Eighth Army and appointed Supervisor of Dependent Schools. Major Victor E. Matteson, former Executive Officer, 753d AAA Gun Battalion (SM), replaced Colonel Morgan as Commanding Officer of the 933d AAA AW Battalion (SM) and Major Harold L. Freshwater was appointed Executive Officer.

The following arrivals and assignments of officers have occurred:

76th AAA AW Battalion (SP): Second Lieutenants James S. Elliott and Daniel R. Moriarty.

933d AAA AW Battalion (SM): Major Harold L. Freshwater and Second Lieutenants John S. Wieringa, Jr. and John C. Geary.

753d AAA Gun Battalion (SM): Second Lieutenants Daniel W. Hickey, III and William R. Parker.

538th AAA Searchlight Battery: Second Lieutenants Blucher S. Tharp, Jr. and Raymond E. Thayer.

The following officers have left the group: Lieutenant Colonel Richard L. Morgan; Captains William M. Beveridge, Primus Bennett, Arthur A. Grefe, Glen Beecher, William J. Smith; First Lieutenants Rayner Field, Robert H. Johnstone, Carl B. Geissinger, Theodore H. Batsford, William C. Ellett; Second Lieutenant Marion P. Chaplesky; Captains William Z. Finley, M. T. Oakley; Major Charles C. Ringwalt; First Lieutenants Ten Broeck W. Baldwin, Donald B. Smith.

South Sector Command

FORT RUGER, HAWAII, APO 956

BRIGADIER GENERAL JAMES E. MOORE, *Commanding*

During the months of August and September, activities of the command remained unchanged, resting mainly with the housekeeping of the posts on the southern portion of the island of Oahu and the maintenance of harbor defense installations.

In August Fort Ruger played host to the local National Guard units who took their annual field training at that post during the last two weeks of the month.

Several officers of the reserve components have taken active duty training with staff sections of this headquarters in periods of from 15 to 90 days. During the months of August and September the following officers reported for duty: Lieutenant Colonel Campbell W. Stevenson, Major Andrew S. In, Major Frank N. Thomas, to G-2 section; Major Wallace D. Berry and Captain Ronald Greig to G-3 section; Major Clinton E. Lunt, QM; Captain John M. Tanimura and First Lieutenant Francis W. C. Hu to the Engineer section.

During this period, the command lost several officers through normal turnover of personnel. Late in August, Colonel Hollis LeRoy Muller, Deputy Commander, started his terminal leave prior to retirement after 40 years service. Captain Winston S. Brooks, Headquarters Commandant, was transferred to Headquarters AGFPAC while Lieutenant Colonel Frank A. Stacy, Major Charles Earnest, Major Harry Hartley, Major Edwar W. McLain, Major Waldemar A. Wittmus and Captain Chester M. McKeen were transferred to new assignments on the mainland.

Newly assigned officers included Lieutenant Colonel Septimus B. Sightler, assistant Chief of Staff, G-1; Lieutenant Colonel Everett D. Light, assistant Chief of Staff, G-3, formerly Commanding Officer of the 867th AAA Bn at Fort Ruger; Lieutenant Colonel Roy A. Strickland, Adjutant General, from Headquarters Third Army at Atlanta, Ga.; Major Harold L. Jones, Headquarters Commandant, from Fort DeRussy; Captain Charles Garrett, Ordnance Officer; First Lieutenant Alexander E. Berger, Food Service Supervisor from the 867th AAA Bn.

35TH COAST ARTILLERY MAINTENANCE DETACHMENT

FORT RUGER, HAWAII, APO 956

LIEUTENANT COLONEL FRANK D. GREBE, *Commanding*

Replacements have brought the command up to strength and have greatly lightened the work load for everyone.

The mission of this organization continues to be the maintenance of the numerous seacoast installations scattered throughout the island of Oahu.

Postwar planning has resulted in numerous studies of the seacoast of Oahu with the resultant decision to eliminate many obsolete batteries and the addition of several newer, larger caliber.

It is expected that Colonel Donald C. Hawley, Commanding Officer, 35th Coast Artillery Maintenance Detachment, absent since early July, will be able to return to duty in the near future.

98TH ANTIAIRCRAFT ARTILLERY GROUP

FORT KAMEHAMEHA, HAWAII, APO 956

COLONEL JOHN HARRY, *Commanding*

Officers and men of the 97th AAA Gun Battalion celebrated the sixth anniversary of the battalion's activation with a special Organization Day program at Ft. Kamehameha on the 14th of October. Anniversary activities included presentation of the Unit Participation streamer for the 97th's part in the blitz of December 7. Brigadier General James E. Moore, Commanding General, South Sector Command, made the presentation.

Other activities included an aloha assembly with a brief message by Lieutenant Colonel Raymond C. Cheal, Battalion Commander; a gala birthday party in the "A" Battery dining hall, and special athletic events including an Officer-EM baseball game.

The Organization Day baseball trophy—a handsomely inscribed pot d'chambre—went this year to the Officer team, which managed to eke out a 4-3 victory over the Enlisted Men.

A brief recap of the 97th's history shows that the 97th was activated as the first battalion of the 97th CA (AA) Regiment at Schofield Barracks in 1941. On the morning of 7 December 1941, all batteries of the battalion fired on the invader, and Battery "D," which was positioned at Fort Weaver, disrupted two flights of enemy bombers and prevented bombing of the Fort Weaver ammunition magazine.

The 97th is now stationed at historic Fort Kamehameha, and is commanded by Lieutenant Colonel Raymond C. Cheal, formerly Executive Officer of the 98th AAA Group. Other 97th Staff Officers are: Major Frank L. Coleman, Executive Officer; Major Woodrow Steichen, Operations Officer; Captain Benson Grant, Supply Officer; Captain James F. Beers, Intelligence Officer; Captain Frank R. Griepp, Chaplain; WOJG Bernard E. Vincent, Motor Officer and WOJG Orville M. Harvey, Personnel Officer.

Line officers include: Captain Karl W. Lehmann and First Lieutenant Archie D. Brown of Headquarters Battery; Captain George S. Pappas and First Lieutenant Harry J. Kammel of "A" Battery; Captain Norman E. Fine and

First Lieutenant Raymond P. Ruppel of "B" Battery and Captain Delbert O. Carpenter and First Lieutenant William M. Dicke, Jr. of "C" Battery.

New arrivals include six officers and two enlisted specialists of the WD Technical AAA Instruction team, which arrived from Fort Bliss late in September. The team is composed of Captains Ray E. Ecker, Luverne, Minn.; Elmer R. Wegner, Chicago, Ill.; Henry A. Lowe, Chester, Va.; Edward C. Grant, Detroit, Mich.; Edgar C. Cox, Baltimore, Md.; First Lieutenant Creade E. Miller, Norfolk, Va.; Sergeant Charles E. McNeil and Private Charles E. Haga.

A six months' course of instruction for officers and enlisted personnel of the 97th and the 98th Group has been set up and is now operating at Fort Kamehameha. This course will also be attended by selected officers and enlisted personnel of the 1st AA Battalion of the Fleet Marine Forces, Pacific.

160TH OR COAST ARTILLERY GROUP

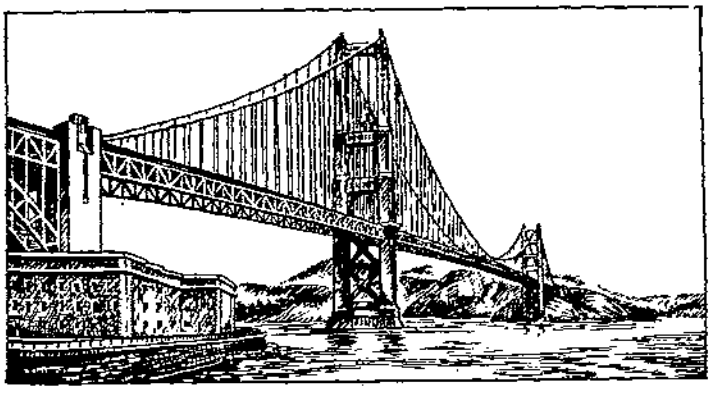
67 Broad Street, New York, N. Y.

Colonel Vincent A. Lane, *Commanding*

The 160th OR Coast Artillery Group, recently organized under authority of Headquarters, First Army, conducted its first field exercise and reconnaissance at Fort Tilden, New York, on 18 October 1947. Through the cooperation of Lieutenant Colonel vanNostrand, Commanding Officer of Fort Tilden, many of the Post installations were opened for inspection. Refresher lectures were given at each of the installations visited. This visit to Fort Tilden was designed to keep each reserve officer familiar with defense problems in the New York Harbor Defense area and to review those installations which had been on an inactive status since V-J Day.

The 160th Group has arranged a training program for the 1947-48 training period, which includes lectures and discussions on the organization of the Army and Air Force, psychology of leadership, air portability, combat teamwork, Air-Ground operations, universal military training, antiaircraft guns and their fire control, adjustment of fire by FO methods, antiaircraft operations room set-up, combined and joint operation, antiaircraft-automatic weapons and their fire control, self-propelled antiaircraft artillery mounts and armored vehicles. Each of these lectures and discussions will be accompanied by motion pictures, where possible. A second terrain exercise is planned for the Spring of 1948 at Fort Tilden, New York, involving the employment of antiaircraft in a Harbor Defense.

The training program of the 160th Group has been developed by the Commanding Officer together with Colonel David W. Hopper, Executive Officer, Colonel James Nesmith II, S3, Lieutenant Colonel Julius F. Walla, Assistant S3, and the responsibility for carrying it out has been rotated among the three Battalion Commanders, namely, Lieutenant Colonel James F. Carroll, CO, 1st Battalion, Lieutenant Colonel Donald A. Weadon, CO, 2d Battalion, and Lieutenant Colonel Richard E. Nodell, CO, 3d Battalion. All of the officers of the 160th Group feel that those benefits which are derived from reserve training are directly commensurate with the efforts which one puts into it, hence feel that training responsibilities should be rotated and delegated to the lowest echelon so that all can take part.



The Seacoast Branch, The Artillery School

Brigadier General William S. Lawton,

Officer in Charge

The following changes occurred during the month of September 1947:

Arrivals

Lt. Col. Hubert duB. Lewis	Intelligence Officer, Hq & Hq Detachment
Maj. Robert E. Butts	Secretary, Hq & Hq Detachment
Capt. George G. Tillery	Air Observation Pilot, Hq & Hq Detachment

Departures

None

The following changes occurred during the month of October 1947:

Arrivals

None

Departures

Maj. Charles T. Wetheral	Trfd to Far East Comd, Japan

COAST ARTILLERY ORDERS

Department of the Army and AGF Special Orders covering the period 23 August 1947 through 12 November 1947. Promotions and Demotions are not included.

Colonels

Aldrich, Harry S., to Staff & Faculty Army Language Sch. Presidio of Monterey, Calif.
Armstrong, Marvil G., to GSC WDGS Washington, D. C.
Azoy, Anastasio C. M., to RAD East Orange, N. J.
Blackwell, Herbert H., to Retmt.
Boyd, Harry R., to AGO Casual Det. Washington, D. C.
Case, Homer, to AGO Casual Det. Washington, D. C.
Davis, Henry C., to AGO Casual Det. Washington, D. C.
Detwiler, Harold P., to Far East Comd. Tokyo, Japan.
Dubois, Bird S., to Retmt.
Ellerthorpe, Dean S., to Retmt.
Forman, Ovid T., to AGF Bd No. 4, Ft. Bliss, Tex.
Folk, Frank T., to UnderSW Washington, D. C.
Foltz, Christian G., to Retmt.
Gallagher, Ferdinand F., to AG Casual Det. Washington, D. C.
Gibson, Richmond T., to Retmt.
Goeppert, Lloyd W., to AA & Guided Missile Br. The Arty Sch. Ft. Bliss, Tex.
Jones, Clifford R., to AGO Casual Det. Washington, D. C.
Jordan, William H., to Retmt.
Kahle, John F., to AGO Casual Det. Washington, D. C.
King, Edgar W., to AGF Pacific, Ft. Shafter, T.H.
McCormick, Walter L., to Retmt.
McGarraugh, Riley E., to Far East Comd. Tokyo, Japan.
McMorrow, Hubert A., to Retmt.
McNamee, William L., to OC of S Washington, D. C.
McPherson, William L., to Retmt.
Mabbott, Harold C., to Retmt.
Melberg, Reinold, to AGO Casual Det. Washington, D. C.
Merkle, Ernest A., to Far East Comd. Yokohama, Japan.
Newman, Glenn, to Retmt.
Ostenberg, Frank T., to AGO Casual Det. Washington, D. C.
Owens, George R., to 4th Inf. Div. Ft. Ord, Calif.
Pendleton, Harry E., to Retmt.
Smith, Perry McC., to Hq AGF Ft. Monroe, Va.
Spalding, Alba C., to European Comd. Frankfurt, Germany. Detailed in Sp. S.
Steward, Wilfred H., to Retmt.
Supple, Edward L., to AGO Casual Det. Washington, D. C.
Sweet, William H., to Retmt.
Thompson, Merle R., to OC of S Washington, D. C.
Wolfe, Shuey E., to Philippine-Ryukyus Comd. Manila, P. I.
Wolfe, Walter J., to AGO Casual Det. Washington, D. C.

Lieutenant Colonels

Abbey, Walter W., to Far East Comd. Tokyo, Japan.
Barros, Russell D., to Hq Army Security Agency Washington, D. C.
Bellonby, Emery E., to OMA Tehran, Iran.
Blumenfeld, Charles H., to OC of S Washington, D. C.
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A

BOOK REVIEWS

By Monty's Chief of Staff

OPERATION VICTORY. By Major General Francis de Guingand. New York: Charles Scribner's Sons, 1947. 474 Pages; Appendices; Maps; $3.75.

This is an honest and balanced account of the war written by one of Britain's most competent staff officers. From a relatively minor post in the Joint Planning Section of British GHQ at Cairo in 1941, Francis de Guingand rose to be Chief of Staff to the Eighth Army and Chief of Staff of the 21st Army Group. Few men had greater or more continuous personal knowledge of the main operations by which the tide of war in North Africa and Western Europe was turned against the Axis. In this book General de Guingand has tried to "blend history and personal reminiscence." He has reported on only those phases of the war about which he had firsthand knowledge. In notable contrast to other writers, he has refrained from sensational disclosures of what various Allied leaders said or did under the strain of war. He realizes that "merry-go-round" reporting of this kind has a "certain commercial value" but feels that it is "grossly unfair" to the Allied command team which hammered out the European victory in spite of occasional understandable conflicts of view.

The first campaign that General de Guingand discusses in detail is the ill-fated British effort to support Greece in 1941. Though you can search his book in vain for criticism leveled at another soldier, General de Guingand has a few harsh words to say about Anthony Eden, who, he feels, led the Greeks to expect greater military aid than Britain could supply. Many of his co-workers on the British staff at Cairo regarded the Greek operations as a hopeless mission. By contrast General Wavell appears to have gone into it with considerable optimism. As if difficulties in the field could be removed by pat literary references, he wrote across the top of a paper prepared by the Director of Military Intelligence on the dangers and difficulties of a campaign in Greece against a German antagonist a quotation from General James Wolfe: "War is an option of difficulties."

Since staff planning is the field in which General de Guingand achieved spectacular success, his views on British planning or lack of it in the Crete campaign deserve attention. He feels that the British by no means exhausted the defense possibilities of Crete, but contends that the German conquest of Crete without a follow-up of some kind in the Eastern Mediterranean was a strange—if impressive—business. What relation did it bear to the far greater impending operations against Russia? Why was it the first and last great German airborne operation?

Wavell's twopenny offensive against Rommel June 15-17, 1941 (Operation Battle Axe), was, he believes, launched without the slightest prospect of success. It was a mark of Wavell's greatness as a man that he immediately stopped the operation when he saw the situation firsthand. General de Guingand believes that Wavell's successors in the Western Desert, Cunningham and Ritchie, were never able to follow up their initial victories in Cyrenaica because they failed to evaluate the opportunities which the "Benghazi Bulge" offered for a successful enemy counterattack. No British leader solved that problem until Montgomery appeared on the scene with sufficient resources to hold Benghazi and press into Tripolitania without delay.

Although the author had great admiration for the character and organizing ability of General Auchinleck, he could not conceal his satisfaction on learning that Bernard L. Montgomery had been chosen to command the Eighth Army in the late summer of 1942. He describes in some detail the tremendous improvements that Montgomery made in the command situation and in the morale of the army. The division was restored to its basic position as chief combat unit. All special columns were abolished. An armored corps was formed to counter Axis armor, and air-ground cooperation was made absolute—not provisional as before. As for the troops, they were given special hardening and told that there were far too many unwounded prisoners being taken!

We are given a fairly complete account of Montgomery's neat defensive battle at Alam Halfa, August 31-September 7, 1942. It is a tribute to Montgomery's strategic intuition that he saw the importance of Alam Halfa, an undefended ridge of high ground in the rear of the El Alamein position, on his first visit to the front. He also saw that Rommel's next attack would be directed at that ridge. He planned accordingly and won. General de Guingand reveals one hitherto unknown feature of the battle. By means of "planted" false-going maps, which showed firm terrain in a sandy approach area, the Germans were led to waste precious gas trying to push their tanks forward to Alam Halfa.

General de Guingand adds little that is new about the El Alamein battle except to show that its success was not always anticipated in political circles. Apparently the bigwigs in Cairo were a bit nervous about the slowness of the "crumbling" phase of the battle. On a visit to the front on 29 October one minister of state went to "prepare" Churchill for the possibility of a reverse. De Guingand, who rarely took issue with soldiers, told the minister that if he sent such a message he would see that the minister "was hounded out of political life." Montgomery, it seems, inspired intense loyalties as well as controversy!

The failure of the Eighth Army to trap remnants of the Afrika Korps after the victory of El Alamein was due, in de Guingand's opinion, to two unseasonable rains which bogged down British tanks and gas trucks. The parallel failure of the R.A.F to stop Rommel's long chain of vehicles on the retreat is attributed to their lack of appreciation of the effectiveness of low-level attacks. Had the R.A.F been trained and equipped for low-level attacks, as they were after the passage of the Mareth Line, Rommel's troubles on the great retreat would have been multiplied. General de Guingand thinks that Rommel made a big mistake in trying to defend Buerat on his

retreat and in passing up the strong defensive position between Homs and Tarhuna.

On disputed points connected with operations in Sicily and Italy, General de Guingand makes a number of interesting remarks. He feels that had the positions of the U.S. Seventh and the British Eighth Army been reversed in Sicily, there would have been little difference in the rate of their advance. He discredits all claims that Montgomery's Eighth Army relieved Clark's Fifth Army at Salerno. "General Clark," he writes, "had everything under control before the Eighth Army appeared on the scene."

When he gets to the Battle of Normandy, General de Guingand feels impelled to answer various charges which Ralph Ingersoll (*Top Secret*) leveled at Montgomery's leadership. He thinks Ingersoll's assertion that Montgomery's staff did not appreciate the effect which the bocage country would have on the employment of armor is absurd. He discussed these matters with both Colonel Bonesteel and Montgomery on "many occasions." The British were committed to this sector. What did Ingersoll expect them to do? Sit back and say that the country was too difficult to fight in? He contradicts Ingersoll's assertion that the German use of the 88s in antitank roles was a surprise to the British command. They had been up against that thing before Ingersoll was in uniform. As for the latter's charge that the desert training and experience of British divisions unfitted them for fighting in the bocage country, de Guingand simply lists the divisions employed on the Caen front which were never near the desert.

There was only one program of Montgomery on which his chief of staff did not see eye-to-eye with him. That was Montgomery's plan for a single advance into northern Germany immediately after the Battle of France. General de Guingand never approved this suggestion and still feels that Eisenhower was right and Montgomery wrong on this matter. If the Germans were able to defeat the British airborne landing at Arnhem in September 1944, they would also have been able to forestall a single thrust into Westphalia. The author adds little that is new to the story of the Ardennes battle and nothing to the crisis in relations between Eisenhower, Bradley and Montgomery which accompanied and followed it. He does admit, however, that at his famous press conference on the Ardennes fighting, Montgomery was "rather naughty!"

Some of the lessons which de Guingand drew from his own staff experience in World War II are as follows: (1) Flexibility is necessary in all spheres of war direction; (2) Prewar training of staff officers must be realistic; (3) Commanders and staffs for forthcoming operations should be appointed as early as possible; (4) Efficient staff and command teams should not be broken up.

Though this book will probably not be listed as a "best seller" it deserves a place in the library of every thoughtful student of the war.—H. A. DeWeerd.

Excellent Summary

THE ART OF WAR ON LAND. By Lt. Col. Alfred H. Burne. The Military Service Publishing Company. 205 Pages; Illustrated; $2.50.

In October, 1945, The Infantry Journal published my review of the British edition of this analytical study of warfare. My initial enthusiasm for this lucid introduction to strategy was not diminished. It is gratifying to find this book now in the excellent series of basic works on military science and theory published in handy volumes in this country. The publishers have been well advised to include Colonel Burne's book in this collection since it fills a longfelt want in the military library.

Colonel Burne is editor of the English artillery journal, *The Gunner*. Major General J. N. Kennedy, Assistant Chief of the Imperial General Staff (Operations) writes in the Foreword:

"Colonel Burne has not only studied military history for many years, but also has to his credit a gallant and distinguished record of active service. He is therefore exceptionally qualified to interpret both the theory and the practice of the art of warfare."

In the first part of the book the author develops a theory. Are there any broad general principles that can be derived from the study of military history to explain the secret of success in war? Of course, there are the traditional axioms such as security, economy of force, offensive action and the others. These are succinctly explained, together with the other terminology employed in writings on strategy. But military history proves that adherence to these principles of strategy only partially explains victories in battle. Terrain and climate vary. Social and technological conditions constantly alter not only weapons but also means of transport and logistics in general. The human element, the most stable through the centuries, is a consideration of the utmost importance.

Accordingly Colonel Burne establishes four "strands" that added together develop the "total strength of the cord." These are:

(1) The quality and capacity of the commander
(2) The quality and capacity of the troops
(3) Morale
(4) Resources

To these must be added the factors of terrain, weather and luck.

By far the greater portion of the book comprises the analysis with maps of thirteen campaigns from the Battle of Kadesh in 1288 B.C. to the Tunisian campaign in 1943. From our own Civil War, Colonel Burne takes Atlanta to illustrate the points he makes in his theory of war. In spite of the brevity and extreme simplification of

the historical evidence, this book is to be commended as an excellent summary of the basic doctrine of war that is still fundamentally valid in the atomic age. The book is also an excellent introduction to the study of military history.—BRIGADIER GENERAL DONALD ARMSTRONG.

Europe Today

THE EUROPEAN COCKPIT. By William Henry Chamberlin. The Macmillan Company. 330 Pages; Index; $4.00.

William Henry Chamberlin went to Russia not long after the end of World War I as a correspondent for the *Christian Science Monitor*. He left Europe when the Germans overran France in 1940. In the interim he had gained recognition as an outstanding interpreter of world affairs. Many officers of the American Army who were trained for military occupation duties will recall the penetrating insight with which Mr. Chamberlin lectured on Europe at the Yale Civil Affairs Training School and the Harvard School of Overseas Administration.

The European Cockpit is an analysis of the results of World War II, written after a four months' tour of Great Britain and the Continent. Those who participated in the Allied invasion of Europe, will find most interesting Mr. Chamberlin's book on contemporary European history.

Wars have traditionally been fought for the purpose of gaining territories and war indemnities from defeated nations. Russia has annexed, says Mr. Chamberlin, territories equal in area and population to the New England and Middle Atlantic States, with Virginia and North Carolina added. Also Russia has established protectorates over countries with another hundred million people, "which have been transformed into a closed Soviet political and economic preserve." Even Italy, as yet outside the Russian orbit, is forced to pay war indemnities along with Finland and other defeated nations. There can be no question that World War II was, from the Russian viewpoint, a successful war.

World War II was also accompanied by and followed by, Mr. Chamberlin believes, more brutality, cruelty, and disregard for human rights, than the world has seen since the time of the Thirty Years War in Europe, or perhaps, since the time of the Roman conquests. Beyond the Iron Curtain there is the "stark, terrible, but unmistakable fact of reversion to human slavery" for millions of victims of the secret police, for German prisoners of war, and for the men of the occupied areas who have been drafted for forced labor. For the people under Communist rule who have not been physically enslaved, there is the ever-present fear of arrest and torture by the NKVD. And there is imminent danger, Mr. Chamberlin says, of the spread of Communism over the rest of Europe.

Western Europe does not want Communism, he believes. There are a few small countries whose liberal democracy is an indication that all Western Europe may, with American assistance, escape the fate of nations which have come under the sway of Russia. Sweden and Switzerland, Mr. Chamberlin found, have stable governments, sound currency, and hard-working, well-to-do people. Belgium has recovered, for the most part, from the effects of the war, while conditions are steadily improving in Denmark, Norway and The Netherlands.

Great Britain, impoverished and battered by the war, he found doggedly fighting her way back to normal living. In Italy and France, however, spiraling inflation is wiping out the middle class. An ever-widening chasm of hatred between extreme right and left political parties is paralyzing recovery and threatening the two Latin countries with economic chaos.

In Germany Mr. Chamberlin found only "bleak, hopeless, unmitigated misery." The Allies have inflicted on Germany and other defeated nations, he says, almost all the crimes of which they found the Nazis guilty. "Forcible seizure of alien territory, mass uprooting and deporting of peoples, impressment of slave labor, rape, looting, and deliberate undernourishment of occupied countries," followed the winning of the war by the Allies. The conversion of Germany into an economic slums, he believes, has been the principal factor responsible for retarding the recovery of Europe from the aftermath of war.

Mr. Chamberlin has arrived at the "regretful conclusion that the world's worst war has been followed by the world's worst peace." For the conditions existing in Europe, he believes, the United States is not without responsibility, and he suggests that "a broad examination of the political conduct of the war by the Roosevelt administration is badly needed and long overdue." Why, asks Mr. Chamberlin, did American leaders believe the United States could "completely destroy the balance of power in Europe without facing, as a result, a disagreeable alternative" of throwing "its own weight into the scales to help create a new balance of power?" Why was the United States so shortsighted as to permit demobilization of American military forces on the American side of the world-wide frontier with Russia? The United States possessed at the end of the war a powerful military machine and "it was our own fault if we failed to use this power for constructive purposes." It would seem that American diplomats were unacquainted with de Toqueville's theory of eventual conflict between Russia and the United States.

Among the American statesmen whom Mr. Chamberlin holds responsible for the debacle in Europe is Henry Morganthau, Jr., former Secretary of the Treasury, whose blind vindictiveness he says resulted in a fantastic plan for the destruction of German industry, a policy which has exerted a "most disastrous influence on the course of European economic recovery." Harry Hopkins he labels an "amateur dilet-

tante special adviser" whose policy of appeasing Stalin at all costs brought about "grave injury to American moral integrity and national interests."

The Stuttgart speech by Secretary of State Byrnes, he believes, marked a realistic change for the better in American foreign policy. The refusal to accept as final the Russian annexation of eastern Poland and the Polish annexation of eastern Germany, the all-out effort to revive the shattered economy of Germany and other nations of Western Europe, the end of Russian appeasement,—all have brought hope and encouragement for Germany and the democratic nations of Europe.

To make American aid effective, however, Mr. Chamberlin insists that the nations of Europe must forget their internecine strife and hatred. They must unite, politically and economically, for their mutual welfare and to resist the encroachment of Soviet Russia. Free federation, he says, while difficult to achieve, "represents Europe's only chance to escape absorption by the Eurasian mass of the Soviet Union, to play again an independent role in world affairs. And perhaps a federated Europe represents America's last chance to live in a world of freedom, order and security."
—COLONEL PRESLEY W. MELTON, ORC.

Navies of Today—and Tomorrow

JANE'S FIGHTING SHIPS. 1944-45 (Corrected to April 1946). Edited by Francis E. McMurtrie. The Macmillan Co. 637 pages; Illustrated; $19.00.

The publishers of *Jane's* have brought out a new printing, somewhat revised, of the 1944-45 issue of their annual, in a somewhat unusual way: they have, apparently, printed by photo-offset process from a set of proofs of the English edition. This has its disadvantages.

For one thing, photo-offset is not a very effective way of reproducing half-tone illustrations, since every little dot in the original half-tone, when photographed, becomes slightly blurred. Moreover, passage of time has contributed to obsolescence of information.

Poor *Jane's* has experienced plenty of the well known slings and arrows during the past decade. Besides troubles, common to all publishers, with shortages of paper, personnel, and printers' time, and censorship, *Jane's* suffered the additional misfortune of having many of its plates blown up by a German bomb during the blitz. It has done well to keep appearing at all.

But shortcomings must be noted. There are errors, such as a drawing showing the *Sakawa* class with nine 6-inch guns (the data table correctly states that they carried six). There are errors due to obsolescence of information; the editor surmises that the carrier *Taiho* was the third *Yamato*, converted; she is now known to have been the *Shinonu*. The *Yamatos* were much bigger and had 18.1-inch main batteries.

The most serious shortcoming, because remediable, is that *Jane's* continues to print many ship-plans after they are obsolete or

inaccurate, and simply prints others badly. Examples are those of the *Richelieu*, *Gloire*, and *Pensacola* classes. The plans given in Kafka's and Pepperberg's *Warships of the World* are more detailed and more accurate, but the model-maker will still need *Jane's*, because it gives plan drawings as well as profiles. I should advise the model-maker, however, to get a copy of the original English edition if he can, because of its clearer half-tones.

These shortcomings are relative and moderate, and I hope to be remedied in the future. They must be weighed against its virtues, which are still immense.

The impressions that *Jane's* gives of the general state of naval affairs are as follows. In design, ships have been getting bigger and bigger for a given main armament, as a result of the ever-increasing load of anti-aircraft guns and electronic equipment. Or to put it another way, navies have been reducing the main armament of big guns and torpedoes on ships of a given size to make room for the new equipment. In an extreme case—that of American heavy cruisers carrying a main armament of nine 8-inch guns—tonnage has increased in the last decade and a half roughly from nine thousand to seventeen thousand tons, almost double. You might expect that engineering advances would enable a ship of a given size to carry more armament; but the trend has been in the opposite direction.

The other strong impression left by the book is of the immense preponderance of U.S. naval strength over all competitors at present. Whether you count by numbers of ships in various classes, or by tonnage, the effective naval strength of this country works out to a little less than twice that of Great Britain, and fifteen to twenty times those of the next strongest naval powers: France, Italy, and Russia. And of these, Russia is weaker at sea than appears on paper because of the extreme age of many of her ships, and Italy is to be deprived of much of her remaining fleet by the recently ratified treaty. In fact, the U.S. Navy is now, at least in equipment, clearly stronger than all the rest of the world's navies combined.

Such preponderance of strength, however, is at best a deteriorating asset. There is little likelihood of much naval construction anywhere in the world during the next decade or two, simply because the U.S. so clearly outclasses everybody in this respect. Even if we went to war in the near future, we might not use all the warships we have, for what would there be for them to do? But obsolescence is more rapid than ever nowadays; our vast fleet is inevitably doomed quietly to lose most of its value during the next decade or two, during which world naval construction will be confined to small experimental projects, and during which *Jane's* will change but little from year to year. When and if a construction race starts again, it will, probably, be with machines vastly different from anything we now know.—Lieutenant Commander L. Sprague de Camp.

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COMPANY COMMANDER

By Charles B. MacDonald

Charles B. MacDonald came to the 2d Infantry Division as a replacement company commander in September, 1944—and stayed with an infantry company (with time out for a wound and evacuation) for the rest of the war. COMPANY COMMANDER is his story—and by the time you've finished it, the men of Company I and Company G will be your friends, and winter warfare an old experience of your own. But MacDonald can tell about his own story. In his preface, he says . . .

"The characters in this story are not pretty characters. They are not even heroic, if lack of fear is a requisite for heroism. They are cold, dirty, rough, frightened, miserable characters; GIs, Johnny Doughboys, dogfaces, footsloggers, poor bloody infantry, or as they like to call themselves, combat infantrymen. But they win wars.

"They are men from Companies I and G, 23d Infantry, but they might be men from Companies A and K, 16th Infantry, or they might be men from Companies C and E, 254th Infantry. For their stories are relatively the same. Some may have fought the Germans longer than others, or some may have fought the Germans less. For all it was an eternity.

"The characters in my story are not fictional, and any similarity between them and persons living or dead is intentional, and some of them are dead.

". . . I am not the hero of my story.

"The heroes are the men from Companies I and G—the lead scouts, the riflemen, the machine gunners, the messengers, the mortarmen. Companies I and G are called rifle companies . . and when you call a company a rifle company, you are speaking of the men who actually *fight* wars."

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