COAST ARTILLERY JOURNAL

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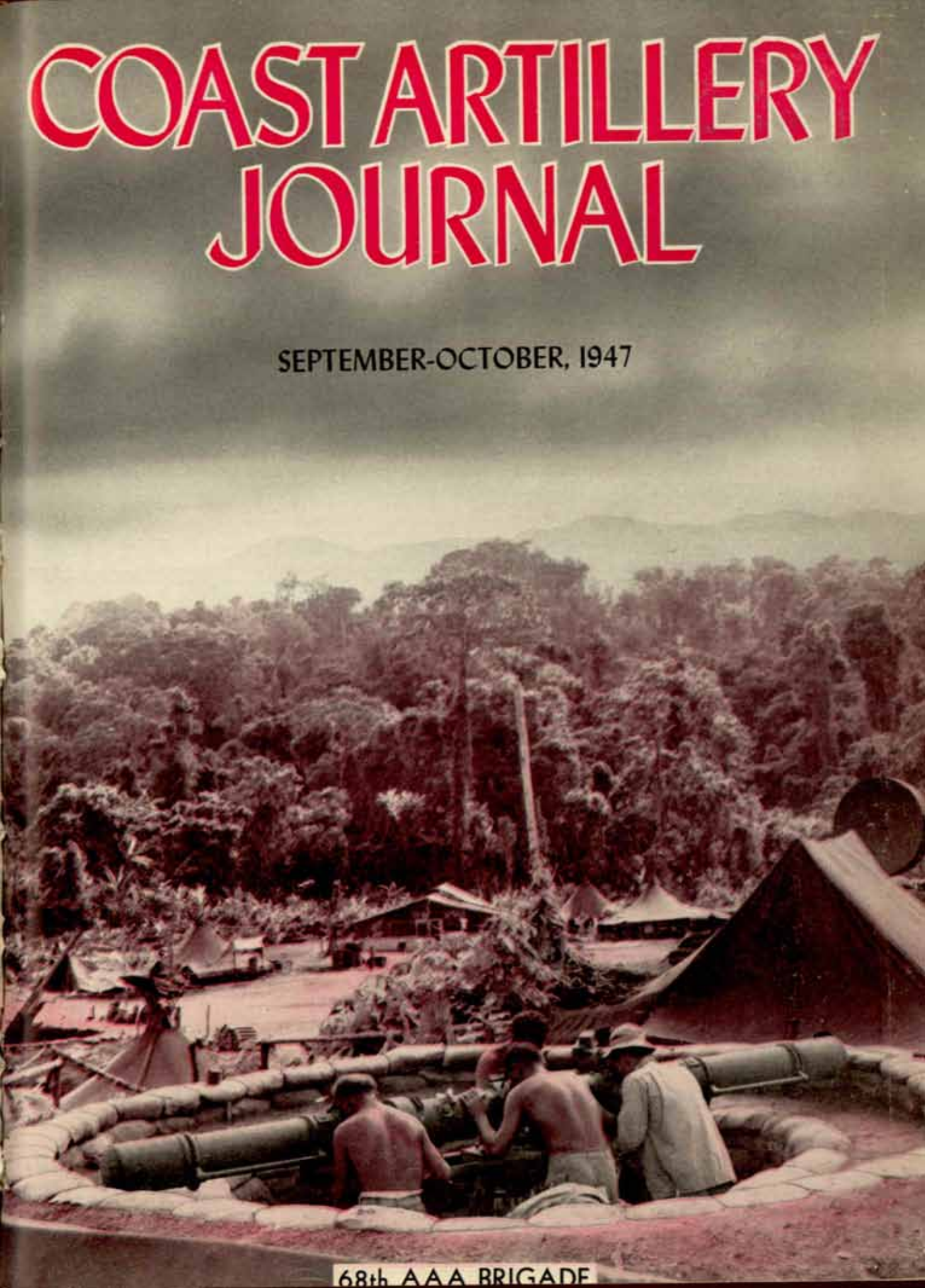

68th AAA BRIGADE

THE HARD WAY HOME

By Colonel William C. Braly, (CAC)

What happens when an officer of the United States Army, a man who has spent his life in the service and is known and respected from Corregidor to Fort Williams, Maine, is told he is lower than the lowest Japanese private? How can he keep his self-respect in a Jap prison camp? How can he keep his sense of humor when he is shivering in rags, underfed, overworked?

Colonel Braly answers these questions. Decorated for his service in the defense of Corregidor, he was one of the Americans taken prisoner by the Japs in the early days of the war. In THE HARD WAY HOME, he tells his own story and the story of his Allied and American fellows, as prisoners of war of the Japanese.

His book is an astounding record of humor, decency, courage among men who lived for years under a regime of brutality and open murder.

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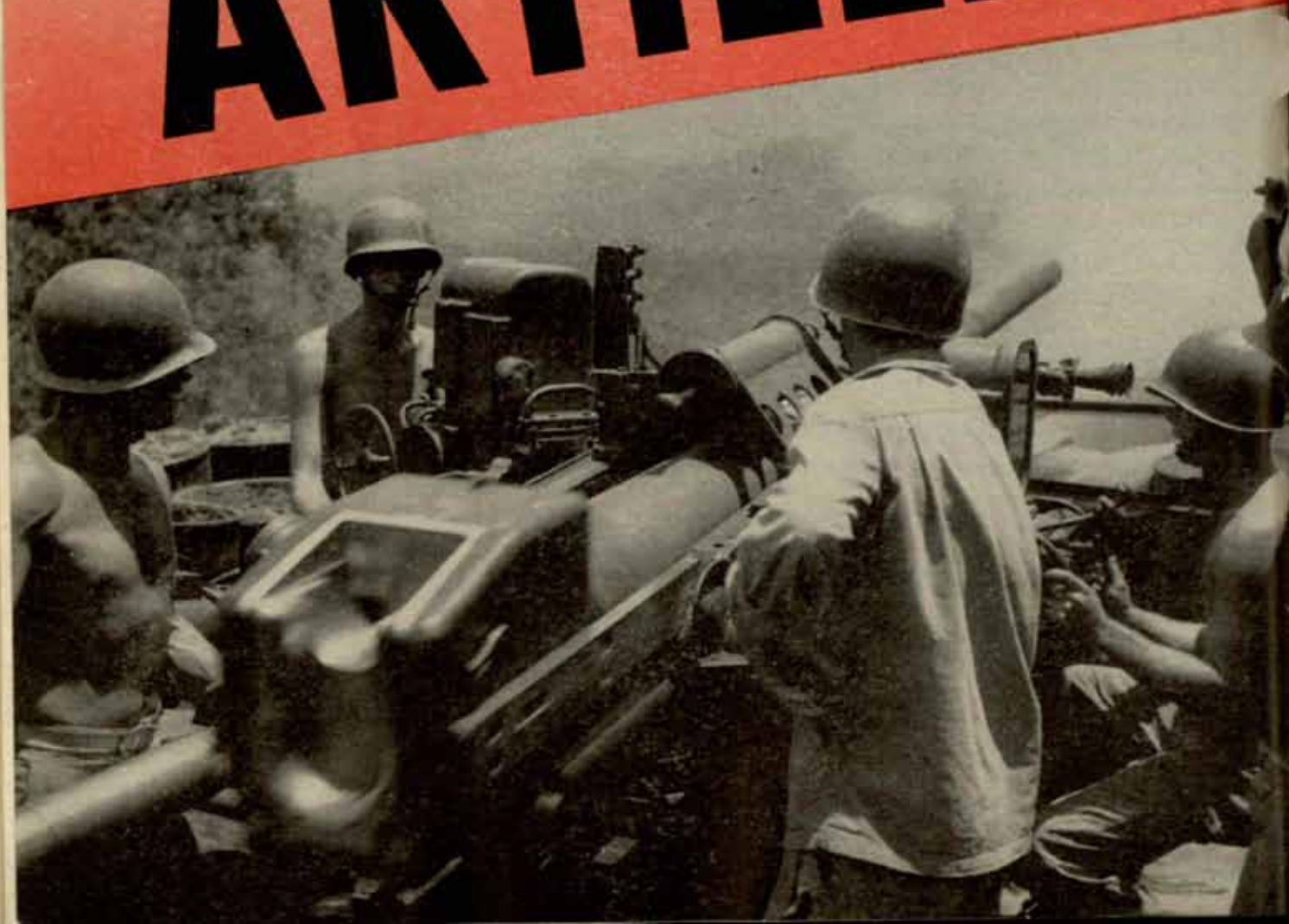
Activities of the

68th ANTI-AIRCRAFT ARTILLERY



AIRCRAFT BRIGADE

By Colonel Charles A. French

American forces landed on Guadalcanal and the nearby Florida Islands on 7 August 1942 and after some seven months of gruelling fighting, these islands and Savo Island were completely in our possession while the Russell Islands to the northwest had been invaded. However the Japanese air force, from bases in the central and northern Solomons and from Rabaul, continued to attack the shore and water installations of those islands until late in 1943.

Late in 1942, the 214th CA (AA) was moved to Guadalcanal from Hawaii relieving the 4th Marine Defense Battalion that had, until then, furnished the entire antiaircraft defense. In the Spring of 1943, the 70th CA (AA) regiment that left the States in January 1942, and had accompanied initial landing forces into Noumea, New Caledonia, was brought to Guadalcanal to reinforce the 214th. During the year, two regiments, four groups, five gun battalions, five AW battalions and three searchlight battalions were added.

With the invasion of the New Georgia Islands and Vella La Vella in the central Solomons, and the shifting and increasing requirements for antiaircraft defense, the need for further antiaircraft control and planning became evident.

A 90mm gun of the 746th AAA Gun Battalion fires on a Jap pillbox and gun installations located on ridge in the background. Cannon Hill, Bougainville.

The South Pacific Commander requested authority for the organization of an antiaircraft brigade and the 68th AAA Brigade was assigned (on paper) to his command.

Organization and Initial Assignment of Units

The 68th AAA Brigade was organized on 10 August 1943 at Noumea, New Caledonia, the headquarters of the South Pacific Area. At that time the South Pacific Area (SPA) was commanded by Admiral "Bull" Halsey. Lieutenant General Millard Harmon commanded U. S. Army forces in the area (USAFISPA).

The 68th was one of the few antiaircraft artillery brigades organized overseas, personnel being drawn entirely from units in the South Pacific Area.

After some six weeks devoted to organization, and command and staff training, brigade headquarters was moved by LST to Guadalcanal, arriving on 10 October 1943, where it received its baptism of fire in the form of a number of Japanese air raids. These were among the last of the many enemy air attacks on the island. During one of these final raids, three Jap planes were shot down by successful searchlight-fighter tactics. During another attack, a Jap plane came in close to water level, under cover of shipping in the harbor, and successfully bombed a ship at anchor causing heavy damage and loss of life. To prevent further attacks of this nature, pontoon rafts on which automatic weapons and quarters for gun crews were installed, were anchored well beyond the outer line of ships to cover all seaward ap-

proaches to the harbor. Living aboard these rafts was uncomfortable during rough weather but the floating defenses stopped further attacks.

On 2 October 1943 all Army antiaircraft and seacoast units in the forward area (which included all of the Solomon Islands and islands of the Bismarck Archipelago to the NW) were assigned to the 68th Brigade and later three Marine Defense Battalions, the 4th, 9th and 11th, were placed under its operational control. Some of the assigned and attached units were then completing campaigns in New Georgia and on Vella La Vella.

While brigade headquarters was at Guadalcanal, a number of changes took place. Colonel Holst was assigned as Commanding Officer of the 117th AAA Group at Guadalcanal and he was replaced as Brigade Executive by Colonel Donald B. Herron, former Antiaircraft Officer for the XIV Corps. Colonel Herron later was placed in command of the 198th AAA Group at Treasury Island and was replaced as Brigade Executive by Colonel Preston Steele, former Commanding Officer of the 497th AAA Gun Bn.

The 70th and 214th CA (AA) Regiments were reorganized to form the following units: 70th AAA Group, 70th AAA Gun Battalion, 967th AAA Gun Battalion, 925th AAA AW Battalion, 214th AAA Group, 528th AAA Gun Battalion, 950th AAA AW Battalion, 250th AAA Searchlight Battalion.

As of 31 December 1943 the 68th Brigade consisted of:

Unit	*Commander**	*Location*
Hq & Hq Btry 68th AAA Brigade	Brig. Gen. C. A. French	Guadalcanal
13th AAA Group	Col. Bird S. DuBois	Russell Ids.
14th AAA Group	Col. John H. Pitzer	Florida Ids.
70th AAA Group	Lt. Col. C. W. Hill	New Georgia
77th AAA Group	Col. Wm. A. Weddell	New Georgia
117th AAA Group	Col. John J. Holst	Guadalcanal
198th CA(AA) Regt.	Col. George J. Schulz	Treasury Id.
251st CA(AA) Regt.	Col. James B. Carroll	Bougainville
70th AAA Gun Bn.	Lt. Col. Futral	New Georgia Vella La Vella Bougainville
77th AAA Gun Bn.	Lt. Col. Welty	New Georgia
164th AAA Gun Bn.	Lt. Col. McCarthy	Russell Id.
199th AAA AW Bn.	Lt. Col. Paulis	Guadalcanal
268th CA Bn (HD)	Maj. Robert C. Guhl	Guadalcanal Florida Ids.
276th CA Bn (HD)	Lt. Col. McClean	Guadalcanal
356th AAA S/L Bn.	Lt. Col. G. H. Mundt	Guadalcanal
362d AAA S/L Bn.	Lt. Col. D. D. Dohn	Guadalcanal
374th AAA S/L Bn.	Lt. Col. Clark	New Georgia
471st AAA AW Bn.	Lt. Col. Barrett	Florida Ids.
475th AAA AW Bn.	Lt. Col. Toler	Guadalcanal
497th AAA Gun Bn.	Lt. Col. Preston Steele	Guadalcanal
737th AAA Gun Bn.	Lt. Col. Roy K. Kauffman	Florida Ids.
925th AAA AW Bn.	Lt. Col. Fergusson	New Georgia
933rd AAA AW Bn.	Lt. Col. Grow	Russell Ids.
938th AAA AW Bn.	Lt. Col. Stokes	New Georgia
967th AAA Gun Bn.	Lt. Col. Gere N. Moore	Guadalcanal
Btry A, 259th CA Bn (HD)	Capt.	Savo Id.
Btry C, 250th AAA S/L Bn.	Capt. Laird	New Georgia
725th AAA S/L Battery (Sep)	Capt. Schwenk	Russell Ids.
826th CA Btry (HD)	Capt. Cyr	Guadalcanal

*It is regrettable that due to lack of records, the name of one commanding officer and the first names of others must be omitted. My apologies to those fine officers so neglected—AUTHOR.

By 1 January 1944 the strength of the brigade, including attached Marine units was 22,736, officers and enlisted men.

NORSOLS CAMPAIGN

The battle for Guadalcanal and the nearby islands was fought on land and sea in the air against great odds and our losses were heavy. Espiritu Santo Island, the largest and most northerly of the New Hebrides group, was used as an air and naval base for the Solomon operations. In addition, damaged Navy vessels were returned to Santo where floating drydocks had been installed for their emergency repair. Japanese Air Forces from bases in the central and north Solomons and from Rabaul were heavily attacking our land and sea installations at Guadalcanal.

By late spring 1943, the way was clear for the invasion of the New Georgia Islands in the central Solomons. The SPA Commander planned initially, to capture the New Georgias and then attack Kolumbangara to the north. It was later decided to by-pass Kolumbangara leaving it to "ripen on the vine," capture Vella La Vella to the northwest and then invade Bougainville by way of the small islands off its south shore. Due to poor landing beaches and strong Jap defenses found there, this plan was again modified and the plan finally adopted was to follow the fall of Vella La Vella with the capture of Treasury and Sterling Islands some 50 miles to the north as a stepping stone for a landing on the northwest coast of Bougainville, north of Empress Augusta Bay.

NEW GEORGIA-VELLA LA VELLA PHASE—Late in June 1943 General Griswold's XIV Corps together with the 1st Marine Raider Regiment and the 9th Marine Defense Battalion invaded the New Georgia Islands. In August, elements of the 70th CA (AA) Regiment went ashore and established defenses at the Segi Airstrip and on Rendova while the 11th Marine Defense Battalion defended the air field at Ondonga. The 9th Marine Defense Battalion had already established antiaircraft defenses at the Munda Air Field, which our Engineers had greatly improved. By September, after more than two months of hard jungle fighting against a stubborn enemy, the islands were ours. This victory against a strongly fortified base and against superior numbers had been costly but it was a serious blow to the Japanese. The Munda field was the nearest air base to Guadalcanal and one of the best fields in the Solomons. It had been used extensively in air attacks against our forces at Guadalcanal and in air attacks against Espiritu Santo in late 1942 and early 1943, though it had been subjected to very destructive air attacks by our air forces prior to the invasion. Its loss pushed the available Japanese air bases back to southern Bougainville.

Btry B, 70th AAA Gun Battalion landed at Vella La Vella with the 4th Marine Defense Battalion and the 3d New Zealand Division in September where it took part in action against heavy Japanese Air attacks. Official figures of enemy losses are not available but Marine antiaircraft records show that more than 50 Japanese planes were destroyed in the first two weeks of fighting.

After Kolumbangara had been by-passed and Vella La Vella successfully invaded, the enemy started withdrawing from the former island. Some enemy vessels supplying

A view of Section 13, Battery C, 373d AAA Searchlight Battalion at Bougainville.

troops or engaged in their evacuation, were destroyed but unfortunately many Japanese soldiers escaped to Bougainville. A few weeks after the landing Vella La Vella was in our hands and a coral surfaced air strip was in operation on its southeast coast.

During the period December 1943 to March 1944, the 77th AAA Group, Colonel Wm. A. Weddell, Commanding, with Gun, AW and Searchlight units of the old 76th and 77th CA (AA) Regiments (that had defended Espiritu Santo and Efate Islands in the New Hebrides) and the 276th CA (HD) Battalion attached, relieved the 4th, 9th and 11th Marine Defense Battalions and assumed antiaircraft and seacoast defenses of the New Georgia and Vella La Vella Islands. Air action was light, the last enemy attack coming on 13 February when one enemy plane was destroyed.

TREASURY ISLANDS PHASE:—On 26 October 1943, the 198th CA(AA) Regiment, Colonel George J. Schulz, Commanding, landed on Treasury Islands with elements of the 3d New Zealand Division to provide the antiaircraft defense of an air strip to be constructed on Sterling Island. Sterling is a long narrow coral island near the south shore of Treasury Island. Between these two islands lies excellent anchorage for seaplanes and small naval vessels. Five antiaircraft enlisted men of the landing force were killed by enemy artillery fire from hostile guns emplaced high up on the hillside. During the period 31 December 1943 to 31 March 1944, enemy air attacks were frequent and fairly effective, the regiment being credited with 13 enemy aircraft destroyed and 5 probables. A coral surfaced air strip nearly 8000 feet long was constructed on Sterling Island by our Engineers. This played a very important part during the balance of the campaign, in support of the Bougainville and Green Island operations.

BOUGAINVILLE PHASE:—Battery D, 70th Antiaircraft Artillery Gun Battalion attached to the 3d Marine Defense Battalion went ashore on Bougainville with the First Marine Amphibious Corps about 1 November 1943. While troops and equipment were being landed and for a few days thereafter, the Japanese made many air attacks against shipping and supplies along the shore line, one gun position of the 3d Marine Defense Battalion suffering a direct hit during one of these attacks. A considerable number of enemy planes were shot down, many of which were credited to the Navy which did some excellent antiaircraft shooting. The 251st CA (AA) Regiment was moved from Fiji and landed on Bougainville on 4 and 5 December 1943 and on 16 January 1944, the 199th AAA AW Battalion came ashore from Guadalcanal. This Battalion shot down one Jap plane on 6 February. Although air activity had practically ceased, the enemy started heavy shelling of the air fields and increased infantry action in March. To reinforce our field artillery, the 1st (Gun) Battalion, 251st CA (AA) Regiment (later reorganized as the 746th AAA Gun Battalion) moved guns to high ground on the perimeter defense line where they were used effectively in direct fire against enemy gun positions, caves, pillboxes and other defensive installations. Elements of the 373rd AAA Search-

light Battalion provided battlefield illumination from regular tactical positions. This was the first use of searchlights in the South Pacific to furnish "Artificial Moonlight." It was highly successful, giving the effect of bright moonlight over the areas through which the enemy was likely to approach, while leaving our own troops in darkness. This method of battlefield illumination was frequently used in later operations in the Philippines. An antiaircraft provisional infantry battalion was formed by the 251st AAA Group (Reorganized from the 251st CA Regiment) which prepared and occupied positions on the regimental reserve line of the 129th Regimental Combat Team in anticipation of an attack by the enemy upon the perimeter defenses. The XIV Corps, which had replaced the 1st Marine Amphibious Corps in December 1943, was occupying a perimeter some 12 miles long, which enabled the enemy to muster sufficient strength at several points to break through the outer defenses. The perimeter defense line was a rough semicircle with the two ends resting on the shore line. The beach was well defended by antiaircraft and field artillery guns and a considerable number of 40mm antiaircraft guns with overhead protection had been emplaced for perimeter defense. The Japanese attack, although well planned was not well coordinated. Companies and smaller units would infiltrate through our outer defenses at night, in some cases capture pillboxes or other defensive works, and would launch individual attacks in the early morning hours. Many enemy soldiers walked through land mines and were killed. Fighting was for the most part at close quarters, many hand-to-hand fights being participated in by antiaircraft troops. Guns of the 70th and 746th AAA Gun Battalions and automatic weapons of the 199th and 951st AW Battalions played an important part in breaking up the attack and won high praise from General Griswold. Colonel Frederick, commanding the 129th Regimental Combat Team, told of being at an antiaircraft 40mm gun position one morning when it was attacked by about 40 Japanese soldiers at close range. He gave the single gun credit for stopping the attack and destroying most of the attackers. He stated that when the gun opened fire he could see nothing but Japanese soldiers and small trees flying through the air.

Very few Japanese prisoners were captured but often those captured, after learning that they would not be killed or tortured as they expected to be, were quite willing to give information concerning their own forces. In one case, a 90mm gun battery commander was having difficulty spotting a troublesome Japanese position on the opposite ridge some 2000 yards distant. He "borrowed" a Japanese prisoner, took him to his gun position on the perimeter and asked him through a Nisei interpreter, if he knew the

A 40mm gun of the 199th AAA AW Battalion used as an antipersonnel weapon at Bougainville.

Command Post and computer of Battery B, 70th AAA Gun Battalion on San Carlos, Luzon.

location of the enemy position. The prisoner, without hesitation, adjusted the height finder (with which he appeared perfectly familiar) to his eyes and turned it until it was on the Jap gun position. He then volunteered to stay and help locate other positions.

In the later phase of the operation, the 3d Marine Defense Battalion was relieved by the 2d Battalion, 54th CA (HD) Regiment (later reorganized as the 49th CA Battalion). This battalion carried on effective counterbattery and interdiction fire for the balance of the campaign, under the control of the Corps F.A.

GREEN ISLAND PHASE: The 967th Antiaircraft Artillery Gun Battalion landed on Green Island on 15 February 1944 with elements of the 3d New Zealand Division. This was a small atoll north of Bougainville with excellent anchorage and suitable for the construction of a bomber airfield, which was completed during the next few weeks. A small Japanese force offered resistance but was exterminated and the island was occupied by our troops. This island formed the stepping stone for the attack on Emirau Island and for action against Japanese-held bases to the north, especially the great naval base of Truk. On 25 May 1944, the 13th AAA Group with the 925th AAA AW Battalion arrived and assumed control of all antiaircraft and coast artillery (HD) units.

EMIRAU ISLAND PHASE: The 14th AAA Group with the 471st AAA AW Battalion, 737th AAA Gun Battalion and 725th AAA Searchlight Battery (Separate) landed on Emirau Island on 25 March 1944 and set up antiaircraft defenses of a coral surfaced air strip that was constructed by our Engineers across the center of that small island. Although this was the most advanced position in the South Pacific it was not attacked by the Japanese, further evidence of their diminishing air power.

Preparation For Philippine Operations

During the early spring of 1944, the brigade received SCR 584 radars and M-9 directors for all gun battalions and was charged with the organization of an Antiaircraft Artillery Combat Training Center at Guadalcanal. The first course commenced on 6 March. The 70th AAA Group Headquarters supplemented by personnel of other units formed the first training cadre and corps of instructors, Lieutenant Colonel Charles W. Hill, Group Commander, being the first commandant. After his departure for the States he was succeeded by Lieutenant Colonel (later Colonel) Robert M. Hardy, one of the five officers received from the U. S. as instructors for the Training Center. Antiaircraft equipment of all types was installed at the Training Center including two radio-controlled target plane detachments that were secured from the States. Training in new equipment and firing with all types of armament was conducted, students consisting of selected personnel from all units in the South Pacific. Colonel Harry S. Tubbs, antiaircraft officer for General Harmon, did an outstanding job in assisting with the organizing and equipping of the Training Center and in fact in the procurement of the latest matériel for all units in the area.

On 15 June 1944, the 159° East Longitude was made the boundary between USAFFE on the West and USAFISPA on the East. At this time, the 68th Brigade Head-

(Continued on page 45)

Electronics For Guided Missiles

By Dr. C. K. Stedman

Introduction

Guided missiles can be divided into four broad classes on the basis of the locations of their launching points and destinations. These are: air-to-ground missiles, ground-to-air missiles, air-to-air missiles and ground-to-ground missiles. The first class, those launched from aircraft against ground or ship targets, obviously represent an effort to improve the performance of bombs. The other three classes are to a large extent an elaboration of the science of gunnery resulting from the need for more accuracy and range than can be obtained with unaided shells and bullets. Thus air-to-air missiles will supplement, or possibly replace, guns on aircraft. Ground-to-air missiles will immensely increase the effective altitude and range of antiaircraft fire. Ground-to-ground missiles will extend the useful range of artillery to intercontinental distances and also increase the accuracy of fire against closer targets. In all cases, the line of development is the addition of self-propulsion for the purpose of increasing range without the use of excessive speeds, plus the addition of guidance to increase the accuracy at long range or permit corrections for motion of the target occurring during flight of the projectile.

Our purpose in thus dwelling upon the ancestry of guided missiles, is to demonstrate that they have evolved from gunfire because of the increased demands of modern warfare, and that they are not, as might be supposed, a result of the inroads of electronic techniques upon the ancient science of gunnery. Actually there are some types of guided missiles that make no use whatever of vacuum tubes. At the same time, many tubes are now used in connection with gunnery. Consequently the subject of electronics for guided missiles can best be seen in its proper perspective by considering at the same time the way in which vacuum tubes have been put to work in connection with conventional guns.

Electronics in Gunnery

The first application of electronics to gunnery was probably the use of radio communication during World War I to assist in directing artillery fire by reporting hits and misses. In World War II, radar was developed and was immediately applied to gunnery because of its ability to locate targets at times of low or zero visibility, and track them continuously with high accuracy. It also provided more accurate determination of range than was possible with optical range finders. Electrical gun directors were also developed, which made possible completely electronic fire control systems. Many such systems were built for naval guns, shore defense, antiaircraft artillery, and aerial guns. In the B-29, electronic gun directors were used with optical sighting. Up to this point, vacuum tube devices were used as accessories to the guns themselves. However, while these developments were going on, plans were being made to incorporate vacuum tubes even into the ammunition itself, and with the advent of the proximity fuze, electronic ammunition became a reality. Furthermore, these fuzes are probably subject to radio countermeasures which will explode the shells some distance in front of their target, so we are finally brought to what might be called electronic armorplate.

Electronics in Missiles

In general, the applications of electronics for missile guidance include the same functions for which electronics is used in connection with unguided projectiles. That is to say radio communication is extensively used for liaison and coordination of fire. Targets may be located and tracked by radar. Target position information may be utilized in electronic computers to determine the time and direction of launching, also electronic proximity fuzes may be used. In addition to these functions which are common to missiles and projectiles, missiles may use vacuum tube amplifiers in the servo mechanisms which operate the control surfaces. Radio communication is likely to be used for transmitting control signals to the missile, and may be required to transmit information from the missile back to the control point. If the missile is equipped to home on the target, electronic techniques are probably, though not necessarily involved.

It is interesting to survey the principal German guided missiles from the standpoint of their utilization of electronic techniques. V-1 did not depend fundamentally upon vacuum tubes. The control surfaces were pneumatically actuated and the gyro and compass pickoffs were pneumatic. However, in order to improve accuracy, some bombs were equipped with a radio transmitter which enabled them to be tracked by radio direction finders so that the course of successive bombs could be corrected. V-2, on the other hand, used a considerable number of vacuum tubes even though it flew on a preset course for most of its trajectory. Some tubes were used as amplifiers in the gyro stabilizing system, some in a radio command system for correcting the initial line of flight with respect to guide beams transmitted from the ground, and others in a radio receiver used to cut off the fuel in case the missile was obviously malfunctioning at the time of takeoff. X-4 was an air-launched missile for use against aerial targets, which was controlled by very fine wires drawn out from spools in the mother airplane and in the missile. It is believed that this was done principally to reduce the vulnerability of the missile to countermeasures; however it also had the effect of eliminating the need for vacuum tubes.

Capabilities of Vacuum Tubes

We have seen that vacuum tubes have invaded the do-

main of gunnery and are required for the operation of most types of guided missiles. And it is safe to say that this has not occurred merely because it has become fashionable to do things electronically. It is true that electronic engineers will sometimes use one or more vacuum tubes to do a job that can be done better by simple mechanical or optical means. However, in the majority of cases, tubes perform functions that cannot be performed in any other way. It may be of interest, therefore, to review these functions for the benefit of those not familiar with the details of electronic techniques. Actually there are only five principal types of operations that vacuum tubes perform. And electronic circuits for the most diverse purposes are composed of tubes which perform one of these five operations, just as innumerable different machines have been designed by various combinations of a few basic elements such as gears, pulleys, cranks and levers. These operations are: (1) amplification, which means the conversion of an electrical signal into one which is essentially of the same form but with higher voltage, current or power; (2) oscillation, which means the conversion of electrical energy from a direct current source, into alternating current. Depending upon the application, the alternating current generated may have a frequency anywhere from one or two cycles per second up to 10,000 megacycles per second or more; (3) trigger action, in which no response occurs until the applied signal exceeds a certain threshold value. When the threshold is exceeded an output current or voltage of a given value, usually considerably larger than the input signal, is initiated. The action of a tube used in this way resembles that of a relay. The effect can be accomplished either with gaseous tubes such as thyratrons, or with vacuum tubes arranged in a suitable circuit; (4) rectification, which means the conversion of alternating current into direct current; (5) mixing, which is the process used in superheterodyne receivers for converting high-frequency signals into low-frequency signals which can be amplified more readily.

In addition to vacuum tubes for these purposes, there are gas filled tubes such as thyratrons and voltage regulators, etc., a number of special purpose tubes such as photocells or iconoscopes for converting light into electrical signals, and cathode ray tubes for converting electrical signals into visible form.

Requirements for Tubes in Military Equipment

Even though vacuum tubes were so extensively used in World War II, complete reliance was not placed on them since, in most cases, soldiers could continue to fight if their electronic equipment failed. However if guided missiles ever become the principal weapons in a future war, the result will be almost complete dependence on vacuum tubes. If a radio receiver fails in an airplane, the ship may be crippled only to a very limited extent; repairs may be made in flight, or a stand-by receiver may be put into service. The same applies to the navigational and bombing radar, and other electronic equipment. A missile, however, is a total loss if it malfunctions after firing. Furthermore it may only require one bad electrical connection to turn a missile that would otherwise fly straight as an arrow to its target, into one that would perform the most remarkable maneuvers and end up by landing on the crew that launched it. Thus a high premium is placed upon reliability in missile equipment. Another feature of the requirements that has not existed before is the need for extremely long shelf life. This results from the fact that in a future war an enemy might bring to bear an extremely heavy concentration of air power with the least possible warning. There would be no time for the defenders to set up production lines and manufacture guided missiles with which to defend themselves. They would have to place their reliance instead upon missiles which had been stockpiled, probably for many years. The design must therefore be such that only relatively simple procedures are required to make them operable and above all the number of failures due to deterioration in storage must be made extremely small. For these reasons, it is important to consider what the prospects are for achieving sufficiently reliable performance of electronic equipment.

Consider first the vacuum tubes themselves. Failures in the course of normal operation will usually occur during the first few hours so that if the equipment survives a proof test of suitable duration the likelihood of failure during the next few hundred hours is extremely small. Most of us have had the experience of replacing one or two vacuum tubes in a new radio set shortly after it was purchased and then having the set operate without further failure for many years. This is a situation which lends itself very well to statistical quality control, so that on the basis of properly planned life tests on large number of units, operating conditions can be specified such that the probability of failure will be less than any stated limit during a given period of operation. It will be particularly easy to ensure a high probability of proper operation in missile equipment because good vacuum tubes do not deteriorate except when in use. And the total use, including periodic testing, will probably not exceed twenty-five hours. In addition to random failures due to uncontrolled defects in manufacture, a tube may fail if subjected to extreme conditions exceeding those for which it was designed. Of these, the one most likely to cause trouble is high temperature, since control equipment generates heat and is sure to be mounted in a confined space. However the provision of cooling means is a straightforward engineering problem, and at the most can only cost some added weight and complexity in the missile. Humidity causes no trouble since, by their nature, tubes are hermetically sealed (the external connections are considered part of the wiring). High acceleration or vibration may cause mechanical failure or short circuits between elements and it cannot be said that there is now available a complete assortment of tube types which are satisfactory in this respect. Tubes can be designed to withstand extremely high shock as witnessed by the proximity fuze tubes which were fired in high-velocity shells, but of these there is only a limited variety of types. Many of the common types of radio tubes will withstand 200g which is ample for most missile applications, but they are physically too large. Further development will therefore be required to produce a complete variety of miniature and subminiature tubes which will meet the shock and vibration requirement of missile applications. However, suitable substitutes are available for interim use in experimental missiles.

Reliability of Electronic Circuits

Vacuum tubes alone are of no value unless the electric wiring and the other components of the circuit perform as intended. A very large amount of experience was accumulated during the war on failures of electronic equipment and some of this is applicable to equipment for use in missiles. In particular, the importance of protection against moisture became very well recognized. In humid tropical climates, moisture destroys the insulating properties of many materials and permits electrical breakdown to occur. It also promotes corrosion at points where dissimilar metals are in contact and so causes open circuits. These effects can be retarded by spraying all wiring with moisture and fungus-resistant coatings, but the treatment must be renewed at approximately two-year intervals. Very satisfactory techniques have recently been developed for hermetically sealing components into airtight cans. This completely eliminates the possibility of failure due to moisture or fungus as long as the can lasts, although of course the inter unit wiring is still exposed. The amount of such wiring can be greatly reduced by hermetically sealing entire assemblies.

Thus the experience gained during World War II with the performance of large quantities of electronic equipment under combat conditions has at least drawn attention to the kind of problems that must be solved to achieve reliable performance. Some of the techniques are directly applicable to missiles, but because of the extremely long shelf life and short service life required, combined with the need for very high probability of proper functioning when fired, the techniques will have to be carried very much further and a great deal of experimentation and development will have to be done in order to meet the requirements. It will not be easy even to design equipment which can safely be stored for years under controlled conditions in specially designed warehouses. The difficulties will be even greater if it is judged necessary to have large numbers of missiles installed in a permanent state of readiness for an instant alert.

Conclusion

We have seen that guided missiles can be regarded as a product of the evolution of bombs and shells. In the case of antiaircraft missiles, the development is forced upon us by the fact that a high-altitude airplane has time to change course radically during the time of flight of an antiaircraft shell, so that means for guiding the missile become essential. The long-range ground-to-ground missiles, on the other hand, may or may not represent a case of military necessity depending on the effectiveness of the enemies' air defenses. However, the development of all types of guided missiles can be justified as an effort to exploit the military possibilities of new developments in jet propulsion and supersonic aerodynamics.

We have seen also that while certain types of missiles may be guided without recourse to electronic means, in the majority of cases very heavy reliance will be placed upon vacuum tubes and the associated circuit. The importance of electronics for missiles can be partly accounted for by the use of radar for tracking targets or for tracking the missiles themselves. However radio communication is also very important. The third major field of application of electronics in missiles is in amplifiers for the stabilization and control system.

The various possible electronic guidance systems for missiles have been surveyed quite thoroughly in recent years and an excellent summary of these was published recently in this Journal.* It is believed that they include suitable means for guiding missiles of all of the types contemplated, although a great deal of development work remains to be done before systems of each type will be fully perfected. Also it cannot be said with complete certainty at present that radically new inventions or scientific discoveries may not be required before certain types of missiles can be guided with sufficient accuracy to make them militarily effective.

In addition to the development program for perfecting the various guidance systems, it will be necessary to put a great deal of effort into improving the reliability of electronic equipment. Present design is inadequate in this respect, but there is no reason to suppose that techniques cannot be devised for building electronic equipment that will last almost indefinitely.

*"Guidance for Missiles," Gifford E. White, Coast Artillery Journal, November-December 1946, p. 18.

Radio Relay Communications Systems

By Lieutenant Colonel William S. Marks, Jr., Signal Corps, Res.

Introduction and History

Of the several thousand signal devices of the recent war —many of them radically new—Major General Rumbough singled out radio relay and labelled it "the communications sensation of World War II."

There were good tactical reasons for this choice, of course. But the technical advances and resultant performance of radio relay were of such importance that this revolutionary development in communications systems is now the cause of intensive development by commercial companies, who have ambitious plans for the installation of operating systems. Their experience to date appears to be fully on a par with the military success of radio relay. All this foreshadows a rapidly increasing supplement to the wire line facilities of telephone and telegraph companies, and in many instances virtual replacement by radio relay circuits.

Prior to the development of radio relay and its extensive wartime operational use, civilian and military radio communications maintained essentially the same status established by Marconi in 1901 when he successfully applied wireless to practical communications. True, more devices were added and the process expanded. But up to the evolution of a radio relay system, communication radio was used principally as a medium for sending telegraph messages from point to point by techniques which required highly skilled operators at both ends of the circuit. All in all, little real progress had been made toward the use of radio for the telephone service similar to that provided by wires and cables.

Radio relay has now cleared this long-standing hurdle, permitting radio to compete with wire for the same class of service and, equally important, bringing about a true integration of radio and wire facilities to such an extent that the telephone user is wholly unaware whether he is talking over a wire or radio circuit. And both telephone and teletype traffic can be routed indiscriminately either over wire, radio, or any combination of both.

Radio Relay in the North African and Mediterranean Theaters

The Army's first radio relay system was inaugurated in North Africa.

At first it was an improvised system, used principally for single channel simplex traffic between Allied Force Headquarters in Algiers and Second Corps Headquarters, thence to forward mobile units. Due to the rapid movement of Second Corps Headquarters and the great distances covered, it was impractical for wire construction to keep pace with the advance. The result was the increasing and vital performance of the radio relay circuit; it carried the bulk of operational and administrative traffic for the Second Corps, reaching upward to 16,000 word groups per day. The circuit spanned a maximum of 418 miles, stretching from Algiers to Hill 609, thence to Bizerte and Sidi-Bou-Said, near Tunis. Installed on accessible mountain peaks, four relay stations covered this distance. The longest span was 120 miles between Djbel Toukra, 4,900 feet high, and Djbel Ouasch with a 4,200-foot elevation.

From the outset, radio relay made an impressive showing, and as a direct result became an integral part of signal operations during the subsequent Sicilian and Italian Campaigns.

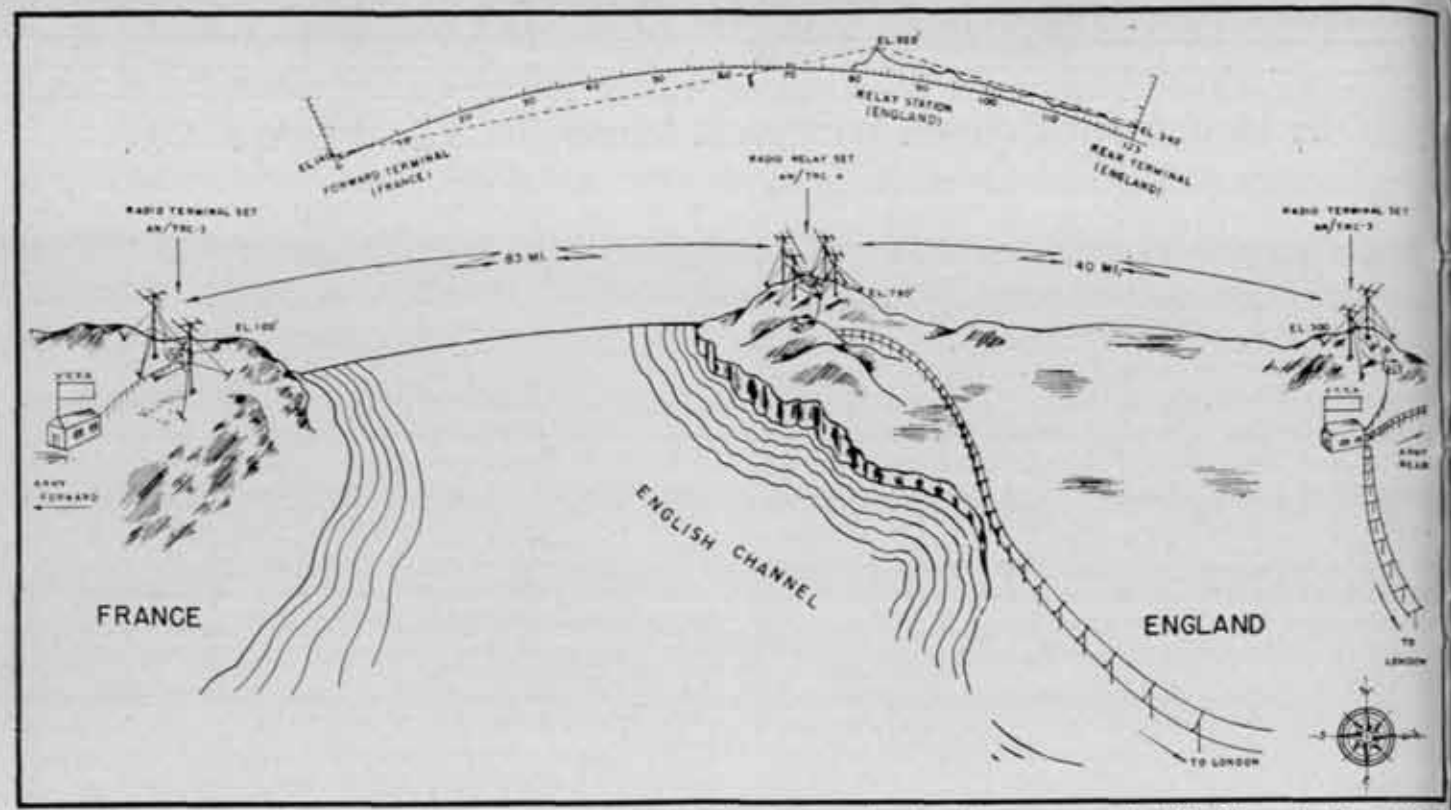
In Italy, personnel and equipment were greatly augmented, and completed a variety of key missions. It provided important links between Allied headquarters in Caserta and the U.S. Fifth Army and the British Eighth Army Headquarters. Radio Relay was also the main reliance between Anzio beachhead and Headquarters Fifth Army. This circuit was one of the best illustrations of the importance of radio relay to military communications and the extreme flexibility possible in routing this type of circuit. The enemy held all intervening ground between the Fifth Army and Anzio, including a high range of mountains in the direct route, making them unavailable to radio relay sites. As a consequence, the radio relay station was placed on a mountain 35 miles to the rear, near Naples, thence beamed along the coast line to Anzio 92 miles away. The circuit handled a peak traffic load of some 20,000 word groups per day for Sixth Corps.

Operations in the ETO

Concurrently with the early use of improvised equipment in North Africa, the Signal Corps was hard at work developing several types of radio relay equipments tailored to fit the needs of the Army at all echelons. The specific target was highly flexible and fast-operating systems for the impending operations in France and the Pacific.

The first of the resulting sets to be standardized, Radio Set AN/TRC-1 using frequency modulation, was rushed through development and placed in large scale production. The initial circuit using this equipment in ETO went into operation on D + 2 to establish cross-channel communications between First Army units on Omaha Beach and the Ninth Tactical Air Force at Middle Wallop, with connections into the wire circuits to 21st Army Group and London. From the very first, operational use of the equipment was beyond expectations and brought about sharply increasing demands from the Theaters for its use. In fact, Tables of Allowances never did catch up with requirements, and issue of the equipment remained under control of the Theater Signal Officer to the end of hostilities.

From the initial use of this new radio relay equipment by the First Army and Ninth Tactical Air Force in establishing cross-channel communication in the early stages of the Normandy invasion, it was issued as rapidly as possi-



Perspective view of First Army multi-channel V.H.F. Radio Relay Communications System across English Channel—June 1944.

ble to other units as they became operational. General Patton found it most valuable in all of his campaigns and particularly in his first, the rapid advance across France. In writing of this operation, General Patton said its success many times hung on a shoestring and the shoestring was radio relay. Radio relay equipment installed in a truck was the last vehicle to enter the town of Bastogne before the Germans completed their encirclement. It furnished telephone and teletype communication between Corps and General McAuliffe throughout the entire siege until relieved. As the war progressed in the ETO a very extensive network of radio relay systems was built up, and maintained in the rear of the Armies who were now using it in a manner similar to wire networks. There were circuits from Paris to Cherbourg, to Deauville, to London, to Namur, to Vittel and later to Frankfurt. The Paris terminal was early placed atop of Eiffel Tower and as more circuits were required from and through Paris, additional equipments were installed on the topmost landing of this famous structure. Visitors to Paris fortunate enough to get to the top of the tower received their passes from the Theater Signal Officer who had requisitioned it.

The Air Forces also had a very extensive radio relay network from their Headquarters at Chantilly, near Paris to their advanced headquarters, to their Tactical Headquarters, to Bombardment and to Fighter Wing. They had perhaps the longest radio relay circuit in the ETO extending from Chantilly to Bad Kissingen, Germany, 410 miles. Eight relay stations or nine "hops" were used on this circuit.

Operations in the Pacific

Radio relay proved to be most vital to the later Pacific operations. Here the value of radio relay to military operations was much more readily apparent and its possibilities were more fully exploited.

In the combat areas of the Pacific, there was very little commercial wire and cable circuits to be rehabilitated and the terrain and weather conditions made wire line construction most difficult if not impossible. Also amphibious landing and island hopping were commonplace; so as soon as the possibilities of radio relay became known, more and more reliance was placed on it in all signal plans from Hollandia to Okinawa.

The TRC-1 radio relay equipments and teams were sent to the Pacific sometime prior to its inaugural use in the ETO at Normandy in June 1944.

The first relay circuits were tried out in static installations. However, during the Hollandia Campaign beginning in April 1944, the full tactical possibilities of this equipment were foreseen as a means of establishing and maintaining communication with constantly moving tactical units.

In this particular operation, a radio relay team moved into the Humboldt Bay Area at D + 5 and established a VHF system between corps and division CPs. Available wire communications were being constantly interrupted because of the rugged terrain and enemy infiltration. As a result of this, the advantages of radio relay soon became apparent. Based on this experience, use of radio relay circuits was greatly augmented all over the South Pacific Area. It was reported that in the Hollandia Area alone, of some 30 square miles, 14 terminals were in use supplying 60 teletype and 26 voice trunk circuits for both Army and Navy.

Revised signal plans for the invasion of Leyte assigned important missions to VHF (very high frequency) radio

relay equipment. The most important was the new mission of providing the vital ship-to-shore communication link. Earlier experimentation had shown the VHF radio relay particularly effective in providing this type of service as large numbers of circuits could be provided with a minimum of equipment. More reliably to effect this communication a non-directional antenna was used for the ship-board terminal in place of the directional antenna normally provided. Thus movements of the ships as they swung at anchor did not affect directivity of the ship-to-shore circuits.

The Signal Communications plan called for the installation aboard ships of sufficient high powered radio equipment to establish and maintain communication with all important bases and tactical units, with various elements of the Navy, the press, and Army administrative circuits to the U. S. plus equipment to handle all intercept and intelligence work. Four ships, known as the General Headquarters Command Post Boat Echelon, arrived at Hollandia on 2 October 1944 completely equipped to handle all the communication problems normally required in any established base, and were additionally equipped with VHF Radio Relay prior to departing for the invasion of Leyte.

At H plus 5 hours, General MacArthur came ashore on Red Beach, Leyte and made his famous "I have returned" broadcast. This broadcast was sent from shore over the VHF radio relay to the Cruiser *Nashville* and rebroadcast to the people of the Philippines. It was also picked up by the Signal Corps ship *Apache* and rebroadcast to the U. S. By A + 2, all circuits were installed and in operation and it was possible to communicate by teletype and voice from the beachhead to virtually any base required.

The VHF Radio Relay through the CP Boat Echelon provided within a few hours, communications which normally required 10 days or more after establishing a beachhead. In addition, it had proven its value as a trunk line facility from GHQ to the major combat headquarters.

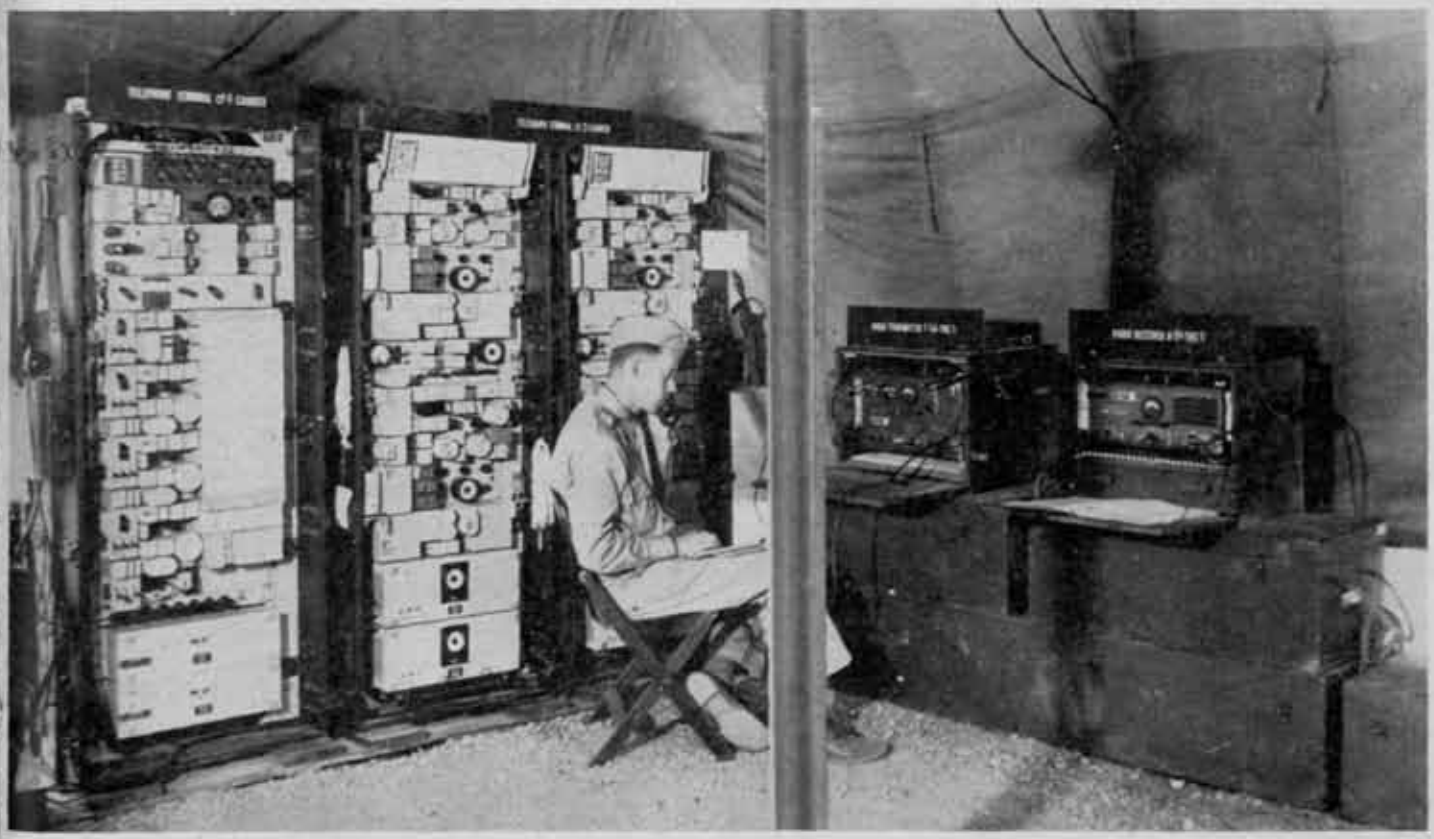
The Leyte operation set the pattern for Signal Communications for the Luzon operation. Additional ships were added to the CP Boat Echelon and the VHF Radio Relay Equipment now was to form a vital system of communication from the CP Boat Echelon to the forward-most combat areas as the infantry units moved down the Luzon Plain. As advances were made from Lingayen Gulf to Manila each advance mobile terminal became in turn a relay station. Shortly after the 1st Cavalry Division entered the city of Manila, a VHF radio relay truck was operating a circuit back to Lingayen Gulf, 130 miles away. These circuits were also used to handle the very large volume of Broadcast and press messages sent to the press ship *Apache*.

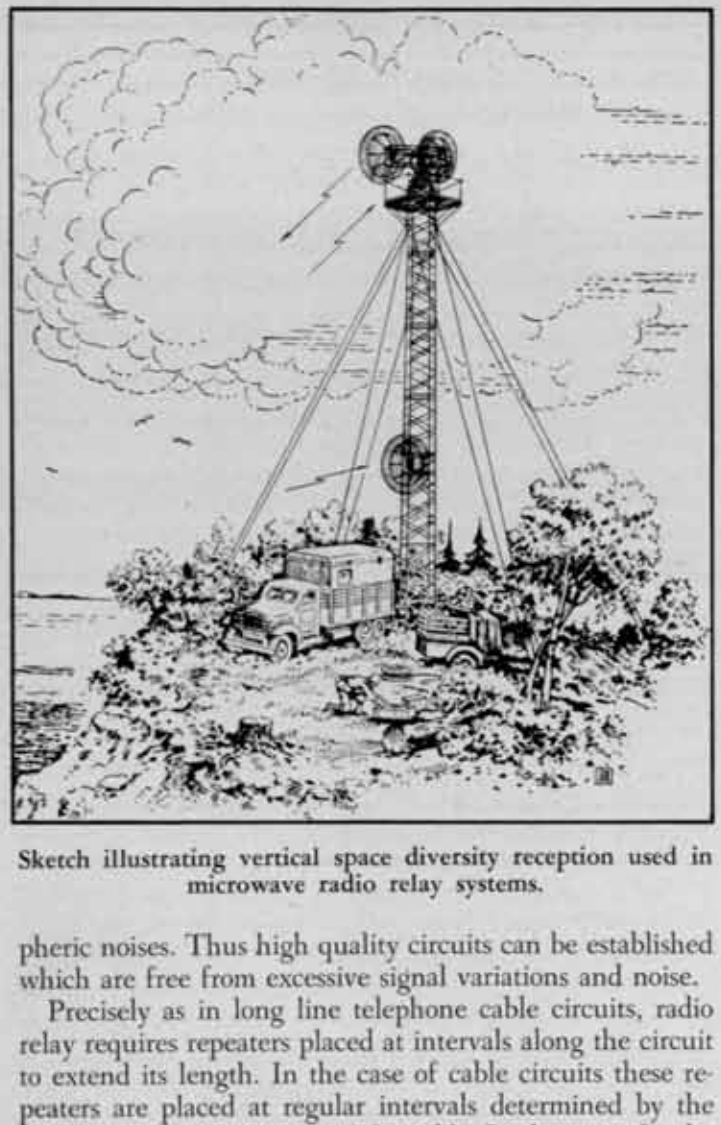
General Characteristics of Radio Relay

Radio relay provides a (multiple) number of communication channels over one radio channel. Thus it is not the old single channel push-to-talk radio. All the voice channels provide duplex telephone operation just the same as the telephone service over wire lines. Interconnection with switchboards is possible so that complete integration with the wire network is possible.

Radio relay circuits operate in the very high frequency or microwave part of the radio frequency spectrum. These frequencies are propagated essentially over "line-of-sight" paths and are relatively free from static and other atmos-

Radio relay terminal station showing telephone and telegraph carrier equipment at left and radio transmitter and receiver at right.





Sketch illustrating vertical space diversity reception used in microwave radio relay systems.

pheric noises. Thus high quality circuits can be established which are free from excessive signal variations and noise.

Precisely as in long line telephone cable circuits, radio relay requires repeaters placed at intervals along the circuit to extend its length. In the case of cable circuits these repeaters are placed at regular intervals determined by the attenuation characteristics of the cable. In the case of radio relay these repeaters, or relays, are located at varying distances determined principally by the relative elevation of the stations. These distances usually vary from 25 miles in flat or gently rolling country to 100 miles when mountain peaks are available for sites.

Tactical and Logistic Characteristics

It is certain that radio relay will find increased use and importance in the Army of the future because of its singular tactical and logistical advantages in providing necessary communication channels. The five characteristic high points which make radio relay stand out above other communication methods are speed of installation, flexibility, high traffic-handling capacity, and great economy in personnel and transportation. The importance of these characteristics to present-day Military Communications Systems was at once evident during the operations of World War II previously described, but the advantage of radio relay over equivalent wire circuits is perhaps best shown by figures:

Material for a 100-mile wire line using four-wire, Spiral-4, cable weighs 94 ship-tons. Radio Relay equipment for the same distance weighs only 25 ship-tons, allowing for a relay point every 25 miles. The construction of the wire would take four battalions 18,200 man-days; the equivalent radio relay installations, set up and placed in operation, require but 88 man-days. Breaking these figures down, wire requires 1,820 men 10 days; radio relay 44 men 2 days or less. Radio relay thus saves the using force some 18,112 man-days for each 100 miles of circuit. This is great economy in personnel and transportation.

There are also other advantages. In the case of wire line every foot is vulnerable to bombing, sabotage demolition, accidents from vehicles and other causes. This requires constant patrolling and hours of service outages while locating and repairing faults, whereas radio relay is subject to trouble only at the terminals and the intermediate relay stations. Alert attendants are stationed at these central points to prevent or correct any faults either by repairs or by fast substitution of a spare unit. Thus interruptions to service are kept at a minimum.

Both in the ETO and in the Pacific it was common practice, particularly forward of Army, to install a complete terminal set in a 2½-ton 6x6 truck and trailer, and a relay set in a 1½-ton 6x6 truck for quick moves and fast installations. These units were ready to go anywhere at a moment's notice.

Technical Characteristics

The Signal Corps, in conjunction with the electrical industry during the war, developed radio relay sets which employ the fundamental principles and techniques which are now the foundation of postwar developments in this field. These sets operated in the very high frequency and microwave parts of the frequency spectrum. The principal virtues of these frequencies which make them particularly suitable for radio relay use are: They are relatively free from static and other types of noise interference, they are free from distant station interference, and their short wave length makes beam transmission readily possible with practicable antenna structures. The radio waves do not follow the curvature of the earth but are transmitted in a straight line.

Because of this last mentioned characteristic radio relay stations are located on the highest ground available. A map reconnaissance is usually sufficient in planning a circuit using these sets, although an actual visit to the proposed sites and a test is best to insure a good circuit.

The outstanding characteristic of radio relay is its ability to provide a multiple number of telephone and teletype circuits over a single radio frequency. This is usually called multi-channel operation and the technique is referred to as multiplexing. Two principal techniques of multiplexing are presently being used. These are by what is known as frequency division and time division.

In the first named system the individual telephone channels modulate frequencies which are then combined into the transmitted frequency. At the receiving end a reverse process is utilized to regain the transmitted intelligence. In the time division system, each telephone channel is placed "on the air" in succession for only a small fraction of a second at a time, but so many times a second that the ear does not detect the hoax. Consequently each message goes through as though constantly being transmitted although actually sharing time with other messages. The general method used for time division systems is referred to as pulse modulation. Three common methods of pulse modulation

utilize variation of the pulse amplitude, position, or width.

By using this equipment the radio becomes truly integrated with the wire system and can be used to replace the cable and repeaters between two terminals in whole or in part, without the subscriber knowing the difference.

Propagation Experiences

The Signal Corps early realized that before a microwave radio relay system could be put to extensive tactical use, experience was necessary in order to be able to predict with any degree of assurance the reliability of these signals over various paths. Information on the subject was very meager. Radar reports had been received from the Pacific Areas about frequent radar detections at ranges far in excess of usual distances. This phenomenon was termed anomalous propagation and was due to temperature inversions in the atmosphere. The result was that the microwaves reached far beyond the optical horizon. To determine some of these effects under actual operating conditions extensive tests were carried out in California between June 1945 and February 1946. Radio relay circuits were established between the Presidio, San Francisco and Catalina Island, a distance of 439 miles, with 4 relay sites.

At first during these tests it looked as if microwaves for radio relay service were not feasible because the circuits were disrupted by frequent deep fades, with the higher frequencies giving the most trouble.

Over-water paths and partial-water-and-land paths were particularly troublesome. Over some paths the fades were frequent, short and deep, others occurred at intervals and were so deep as to leave no trace of a signal, over still other paths steady signals were maintained for several hours. Investigation indicated that these fades were due principally to the interference between those waves which travelled directly to the receiving antenna and those which reached it by another path in which the waves were reflected from the surface of the ground or water. The best solution was found to be the use of two receiving antennas separated vertically. It was observed that signal strength variation requiring the use of such "diversity reception" was always associated with the presence of temperature inversion. This temperature inversion was generally characterized by a visible, flat top separation between the lower smoke haze layer and the clear upper air and occurred between 500 feet and 2000 feet or higher.

Subsequent tests by commercial companies have given similar experiences. It may be expected that "diversity reception" of the type referred to or other yet to be developed means will be standard practice on microwave radio relay circuits of the future in order to overcome signal variations which are a direct result of this fading phenomena.

Future Trends

With increasing emphasis on national economy in the future, the military development agencies will call to a considerable extent on the commercial operating companies to assist in advancing the art of radio relay communications to insure this country's leadership in this field just as it has been maintained in the field of wire communications. The future seems secure in this respect, for a number of the major companies have announced extensive programs and have already made substantial progress in placing in operation part of their projected plans. The Western Union Telegraph Company is now operating multi-channel telegraph (teletype) circuits over radio relay between New York and Philadelphia. They have announced plans to cover all the major cities in the U. S. by this means.

The Bell Telpehone System have announced plans for a radio system between New York and Boston and New York and Chicago. The system will be on a broad band basis capable of relaying television programs or transmitting the multi-channel voice circuits which now are transmitted over coaxial cable circuits. Here again the multiplexing is done in a manner to permit integration with the wire equipment.

It appears that future developments of microwave radio relay will emphasize the use of broad band methods to effect complete integration with wire line facilities.

Much progress needs to be made in providing unattended relay stations in much the same manner as present repeater stations in long line cable circuits. This will result in great economy in personnel, always of major importance in military applications.

Although the major peacetime effort in development and operation of radio relay may be carried on by commercial organizations, military agencies will remain active in this field through training in schools and maneuvers in the use of present standard equipment. The Army Communication Service has operated an experimental radio relay circuit between the Pentagon Building, Washington and Headquarters, Army Ground Forces at Fort Monroe, Virginia to assist in determining future requirement of the military services.

The Alaskan Communication Service which is a responsibility of the Chief Signal Officer also plans to improve communications in Alaska by the installation of multi-channel radio relay circuits. In addition the military development laboratories all have developments of new and improved multi-channel radio relay sets on their programs to meet future tactical requirements.

The National Security Act's Effect On AAA

With the swearing in of James Forrestal as the Nation's first Secretary of Defense, the Armed Forces of the United States were formally unified with the Army, Navy, and Air Force as co-equal members of the National Military Establishment.

As a result, provisions of the National Security Act of 1947 became effective at midnight on 17 September, at which time the National Military Establishment came into being with three Departments and five separate agencies, all under coordinated and unified direction.

The following provisions of the National Security Act of 1947 pertaining to the CAC became effective immediately:

* * *

6. Responsibility for Antiaircraft Artillery; No Change in Present Agreements Which Are:—a. The U. S. Army is responsible for the activation, training and control of all antiaircraft artillery units and individuals assigned thereto, except as provided in paragraphs b and c below.

b. The U. S. Air Force will train and control all antiaircraft artillery units and individuals assigned or attached for air defense purposes.

c. The U. S. Army will provide sufficient antiaircraft artillery units and personnel to accomplish the antiaircraft artillery requirements of air defense to the U. S. Air Force; and further, provide sufficient antiaircraft units and personnel for integrated air defense training.

7. Employment of Antiaircraft Artillery in the Zone of Interior—It is agreed that this joint agreement signed by General Spaatz and General Devers should continue for the present.

An explanation of that agreement and its text follows:

The joint agreement was drawn up to provide a clear definition of authority and to eliminate indecision in the utilization of antiaircraft. Certain antiaircraft units are assigned to the AAF for aerial defense, while others are assigned to the AGF for field use. The agreement will prevent any confusion between AAF and AGF commanders on the use of antiaircraft units in an emergency, and provide a standard basis for their use throughout the country's six defense areas.

The new agreement provides for the use of antiaircraft units where they are most needed. Should an AAF commander decide that his AAF-assigned antiaircraft units are insufficient to ward off an air attack on his sector, he would call upon the AGF commander in that sector to "lend" enough units to carry out the air defense mission. These borrowed units, though AGF units, would then be under direct control of the AAF commander. The fire of the units would be directed from an AAF control center, in coordination with fighter plane control, although the actual directing officer would be a Ground Force officer familiar with the operation of an antiaircraft unit. It would be the responsibility of the AAF to establish communications with its borrowed units.

Should the trend of battle change, however, and the AGF commander feel that his need for the loaned units is greater than that of the AAF, he can recall his units by giving the AAF commander appropriate notice.

The agreement is so drawn that it permits decisions as to the utilization of the antiaircraft units to be determined by the local AAF and AGF commanders, since the utilization would not be the same throughout the country.

Both the AAF and AGF have divided the country into six corresponding defense sectors. Each of the six areas is defended by a numbered air force and a numbered Army; the New York, New Jersey, New England Area, covered by the First Air Force and the First Army; the Middle Eastern Area by the Eleventh Air Force and the Second Army; the Southeastern Area by the Fourteenth Air Force and the Third Army; the Southwestern Area, consisting of Texas and its bordering states, by the Tenth Air Force and the Fourth Army; the Midwestern Area, by the Second Air Force and the Fifth Army; and the Far Western Area by the Fourth Air Force and the Sixth Army. The air forces are under the AAF's Air Defense Command.

The joint AAF-AGF agreement will be in effect until the Secretary of Defense appoints an over-all defense commander for the continental United States.

Text of the joint agreement follows:

1. This agreement pertains to the employment of Army Ground Forces and antiaircraft units in the defense of the Zone of the Interior, prior to the designation of an over-all defense commander for the continental United States.

2. The following will govern when antiaircraft artillery units assigned to elements of the Army Ground Forces are utilized in the air defense of the Zone of the Interior.

a. The Air Defense Command will normally establish communications to Army Ground Forces AAOR's (antiaircraft operations rooms).

b. Army Ground Forces units participating in the air defense of the Zone of the Interior will be subject to standing operating instructions prescribed by the Air Defense Command for assignment of targets, opening and ceasing fire, conditions of alert and minimum manning requirement.

c. Army commanders will be responsible for Army Ground Forces antiaircraft units under their command being familiar with standing operating instructions of the Air Defense Command to the extent that such units will be prepared to participate at any time in the air defense of the Zone of the Interior.

d. The extent of participation and the areas to be defended by Army Ground Forces antiaircraft units will normally be determined by joint agreement between Army commanders and corresponding Air Defense commanders.

e. Army Ground Forces antiaircraft units participating in the air defense of the Zone of the Interior will remain under the command of appropriate Army Ground Force commanders except as specified under b above.

THE RADAR STORY

By Norman A. Abbott

Everyone is generally familiar with one or more of those constantly recurring stories which pop up from time to time in a continually changing guise and which purport to be fact but which upon further investigation are usually an odd mixture of fact and fancy. One such canard is that of the girl whose husband having just passed away arranges for his cremation by a funeral director. After the ceremony she receives an urn purporting to contain the ashes of the dear departed. Walking along a street a few days later she observes a suit in a secondhand clothing store window which appears to be very similar to the one worn by her husband upon his death. Feminine curiosity being what it is, she enters the store, inspects the suit and finds a stain of the same type and in exactly the same spot as her husband's suit had. Further inspection convinces her it is the same suit that was supposedly burned at the time of cremation. Being very disturbed, naturally, she reports the matter to the police who investigate and learn that the funeral director has been conducting a side line business of supplying cadavers to a nearby institution for use by medical students. And here the story usually ends. Sometimes the young wife is a daughter or mother, the country may change to France or Hungary, the medical institution to a quack doctor or skeleton merchant, but basically the story remains the same.

Radar is now old enough so that it too has its tale; one which recurs with new equipment in the hero's role, in a new location, and with a new set of circumstances, but when the stories are inspected they bear a peculiar resemblance to each other. It is not the writer's intention to claim that these stories are anything but "gospel truth," and they undoubtedly do contain much of the truth. However, they are presented here for such educational benefits as they may be worth.

The Originator of the Story—The SCR-268

The service test model of the Radar Set SCR-268-T1, the Army's first trial of the miracle of radar, was operating at the Coast Artillery Board. Some promising results were being obtained with the newest product of scientific ingenuity, and in the spirit of friendly esprit de corps which pervades such agencies, the Army Air Corps group at nearby Langley Field has been invited to witness the new device in operation. But in 1938 it is well known that such equipment is not practicable for military purposes. For the laboratory or a school, maybe yes, but for the requirements of the field, of course not. However, sometimes movies get dull and a "night out" won't do any harm, so the invitation is accepted.

Now darkness has fallen on a somewhat cloudy winter day in 1938 and the operation has begun. The hushed group is gathered about the mysterious collection of apparatus in the foreground. Nothing can be heard but the hum of the generators and an occasional brief order from the crew chief. The silence is broken by the hoarse bellowing from a loudspeaker. Then a rising murmur—Failure. The spectators include representatives of the Coast Artillery Board, the Signal Corps, and a special group of about 15 Army Air Forces officers. The loudspeaker has just announced that the pilot of the aircraft which was to have been detected announces that he is directly over the radar position. The nightmare of every equipment demonstrator has come true—what a time for failure!

The invited guests begin to show some signs of impatience. After all hadn't they known all along that such things weren't practicable? But where is the sound of the airplane's engines? Just then one of the operators steps up to the officer-in-charge and reports "Sir, our indicators have picked up an airplane, but he's 20 miles out to sea." A few hurried radio calls are put in, and a red faced pilot confirms that he has been misled by clouds and mist and a strong seaward wind and now finds himself actually over the ocean—and will someone please tell him which way to go to get home! With instructions received from the operators of the radar set, the pilot is brought back to his course—and the day is saved.

Not only has radar been proved practicable, but certain officers with somewhat more vision than others initiate action, and another set of military characteristics for a long range radar for use by the Army Air Corps is processed through the Signal Corps Technical Committee.

The Tale is Confirmed by the SCR-271

Our next encounter with the Radar Story takes place in Panama, where both the weather and the tale get hotter. This time the hero of our story is the Radar Set SCR-271. The first installation of this long range early warning radar set, a Signal Corps laboratories built job, has been completed and is intended to provide protective cover for the approaches to the Panama Canal. But of course it's only a newfangled gadget; just one of those things the long haired boys think up to put more wrinkles and gray hairs on commanding officers. The opinion of the local bigwigs on this toy isn't much higher than can be expected under the circumstances. After all, even the name radar has not yet been adopted—and, besides, what's in a name?

So just to prove the thing isn't worth the money and personnel being expended to keep this boondoggle in operation, the C. O. decides to pull a surprise raid, in his own private airplane, following his own personally selected route. And to be sure that no one has an opportunity to "squeal" he takes no one into his confidence, and even the pilot doesn't know where they are going until they've left the field, and he is then given directions piecemeal.

However, even though the United States is not at war,

the Panama Canal Zone is such a vital area that instructions covering protection against unknown or suspicious targets have been issued. The radar men are operating their equipment in a manner that has now become almost routine, checking off all targets against advance information supplied through channels. But suddenly a pip appears on the scope where no target is supposed to be. What is this, has something gone wrong with the apparatus? But, no, a few hurried checks and the radar is determined to be in good operating condition. The course of the unknown target is plotted and is seen to be approaching the canal area in a suspicious manner. The control center is advised and given full data on the mysterious approaching aircraft.

In the Commanding Officer's plane all is quiet. The Commanding Officer is snickering to himself, thinking up the scorching phrases with which he'll comment on the futility of this new foolishness with which the big brass has directed him to work. But suddenly the pilot calls out—"Sir, unless you know where we are we're lost. This fog has got me baffled." The Commanding Officer awakens from his reverie and looks out the window to see nothing but fog. There's only one thing left to do and the Commanding Officer does it. A radio request for aid is sent to the base. This call is associated with the unknown target reported by the SCR-271 and directions are issued to the pilot to change course in a prescribed manner. This change is checked with the radar set and the plane identified. Then instructions enabling the plane's return to base are issued.

A less skeptical officer returns to his office with a new appreciation of the "newfangled gadget." From then on, life for the radar men is more pleasant and their task considerably simplified.

The Story grows with the MEW

The scene shifts to Florida where the new Radiation Laboratories built MEW (microwave early warning) radar set has been installed for initial tests by the Army Ground Forces Board. Again we have a new equipment, this time it is the first 10 cm. radar set intended for long range search and early warning against aircraft and has been prepared as a replacement for the SCR-270/271 series. A previous 10 cm. set sent to this area for tests has performed unsatisfactorily. The longer wave SCR-270/271 and SCR-588 have been performing satisfactorily—so why does Headquarters insist on wasting time with stuff we know won't do the job? Look at that antenna—why at 10 cm. the beam will only be about 1° wide and how can you possibly detect an airplane at any decent range with only a 1° beam? And besides, everyone knows that such short wave lengths are reflected by clouds and rain and nothing will be detected in this Florida summer weather. But orders is orders, so the set is installed and testing begins. Surprisingly enough, not only does the set detect aircraft, but it even detects them when fog and rain are present.

Then comes the test that finally convinces the "Oh yeah" boys. One day a call is received at the MEW station from the airport. An expected plane has radioed in that it has been caught in one of the sudden storms that take place along the Florida coast in the summer and is now lost above the ocean, and urgently requesting help. The "standard" equipments have been trying to locate the plane but without success. Will the MEW please try and see if they have any luck? The crew sets to work with a will, for not only are they anxious to help find a lost plane, but this may even be the golden opportunity to prove the worth of the new gear. The suspected areas are swept, but no target appears. Then, the chief directs a full search and almost instantly, from a region far beyond where the plane should logically be, an echo appears. Data on this plot is immediately conveyed to the control central and airdrome. A check shows that this target can only be the lost plane! Instructions are radioed to the pilot who takes the action directed. A check on the indicators confirms the fact that this is indeed the lost plane.

The rest is, of course, well known. The pilot reaches the airport safely and the reputation of the MEW is assured. It is cut into the regular information center where it outplots the older sets by a wide margin, and then goes on to fight in both the European and Pacific theaters under the name AN/CPS-1.

The Tale is Fully Established by the AN/CPS-1

Our by now slightly familiar pattern this time changes its locale, although the equipment is familiar. The MEW, now renamed Radar Set AN/CPS-1, has been shipped to England in anticipation of use in connection with the forthcoming invasion of the Continent. The time is the spring of 1944. The location is the Coast of England.

The AN/CPS-1 has been given authorization to go on the air but it has not yet been tied in to the information centers. After all it's just some more of that silly stuff the Americans are always trying to grandstand with. And haven't the British sets been doing good enough for the past 5 years—who won the Battle of Britain anyhow?

However, there came the fateful day—as it must to all the sets cited in these stories—and Radar Set AN/CPS-1, the newcomer on the English landscape, is performing under its routine of operation. A target is picked up near Angers, France, and a track is made. There seems to be a number of planes in this group. It heads into the Bay of Biscay. Hmm—must be an enemy raid planning on a wide end run up from the South.

About this time the air-sea rescue channel becomes active. A distress call is being received. Some planes returning from a raid and bearing battle damage are in trouble. Direction finder bearings are passed to the AN/CPS-1 with a request for assistance. The crew chief, only too happy to find his set being put to operational use at last, confirms the flight, checks, and identifies it as friendly. This information from the AN/CPS-1 is passed on to the Sector Controller who sends two aircraft out to meet the squadron of B-17's and guide them safely to airdromes in England.

And of course we are now familiar with the superb performance of the AN/CPS-1 in combat thereafter.

Characteristically, the Radar Story does not appear to be limited to land based radar sets. For example there was the time that a group of aircraft with the new centimeter airborne radar surface search sets were being flown to England. The previous type equipments used for this purpose had been the more cumbersome, less accurate long-wave radar. On this flight, certainly of a routine nature since its purpose was simply to deliver equipment, the events trans-

pired again. A downed airplane was spotted by the radar operator, and after a confirmatory check a friendly destroyer was guided to the spot—and another rescue chalked up to a new radar.

As stated earlier in this article, the writer does not vouch for the amount of fact or fancy involved in the cited versions of the Radar Story. It is known that some parts are true, and others are, let us say, not verified. Undoubtedly some of the events have become slightly distorted in the telling. The moral of the story seems to be that new radar sets operating under conditions of "trial and tribulation" have an uncanny knack of causing aircraft to get lost, or perhaps it should be said of finding strayed aircraft which normally don't do such things—or perhaps it's just the Gremlins at work again.

If any readers of this tale have run across some other versions of The Radar Story, the writer would appreciate receiving a note of their experience, through the editor of this Journal. If practicable, it is requested that an estimate of the percentages of truth and "assumption" be furnished with the story.

A Simplified System For Field Artillery Employment Of A 90mm AAA Gun Battalion

By Lieutenant Colonel J. M. Culverwell, CA-Reserve

In the employment of 90mm AA gun batteries as field artillery, the first determinations required by necessity and standard practice are orientation and position. Field artillery units to which the 90mm guns are generally attached for field artillery firing require, as with their own units, that this be done by standard survey. However, a method whereby this survey may be accomplished in a shorter time and with the same degree of accuracy obtained by the survey party, using the radar, is outlined herein.

It is presumed first that maps are available, and that each unit position may be estimated to within a 1,000 meter square, although with good maps, this initial estimate may in fact be much closer than this. Each battery is also oriented as soon as possible after setting-down, in the usual manner, either by celestial observation if possible, or by map, or by compass, or in whatever manner is standard in substitute for a celestial observation. Each battery now has a reference zero azimuth, and it should not be changed again except to bring it to correct grid azimuth by the various methods possible.

During this period of initial set-up, the survey party will start to run in the battery nearest to a field artillery reference point in the manner of a standard survey in order to determine the coordinates of, and a grid azimuth for the radar of this reference battery. The latter meanwhile will have oriented itself as accurately as possible under the circumstances, just as the other batteries, and will, as soon as this is done, and the other batteries are similarly oriented, and in radio contact, make a meteorological balloon ascension. When the balloon is at a reasonable height, it will assist the other batteries to get their radars on the balloon by using the standard grid target location system, and when all are on, the reference battery will then announce numbered times at which all batteries will make simultaneous recordings of its azimuth from them, its angular height, and its altitude.

The survey party will by this time have run in the reference battery, and will furnish it the coordinates of its radar, and if it has not been able to determine its exact grid azimuth, then furnish that also. If necessary, the reference azimuth will then be altered, and the battery then reoriented upon this, and the change noted. The reference battery will then compute the correct balloon coordinates at the various times when simultaneous readings were taken. It is now ready to: 1) orient the other batteries by simultaneous observations of a heavenly body, and 2) furnish them the balloon coordinates at the various numbered times. All this can be done by radio, even in the clear if necessary, as no position data is being disclosed. The other batteries, after correcting their azimuths if necessary, will then correct their azimuth readings on the balloon, and calculate their position from it; then combine this distance with the balloon coordinates as furnished, and have their own coordinates. As all computations should agree, three or four should suffice to give a check on the calculations.

This system has several advantages: 1) The survey party need run-in only one battery; 2) The time saved in this shorter survey; 3) All batteries are quickly oriented upon a common, correct azimuth; 4) Positions are quickly and accurately determined a few hours after occupation of positions, and 5) All this can be accomplished simultaneously with the first met message determination.

THE G. I. LETTER

By Lieutenant Lawrence Sanders

There is a mail call, the last one, just before the final briefing. Hanscom receives three letters: two from his mother, one from Veda.

He sits down on deck in the shadow of a hatch cover. He takes off his sun glasses, lights a cigarette, opens Veda's letter.

"Dear Bob,

"This is the hardest letter I've ever had to write, but I do want to be honest with you. I've met. . . ."

That's all he reads. He refolds the letter carefully, puts it inside his shirt. He stares out at the Pacific sunset.

The purple sun is dipping into the sea. It inks the sea in glowing colors. The sea shines, sparkles, in the glow of the setting sun.

"Hey, Bob."

He looks up. Everett is smiling down at him.

"Let's go," Everett says. "We're late now. Hear from home?"

"Yes," Hanscom nods. "I got three letters."

"I got five," Everett says. "All from the wife. Look here." He shows Hanscom a snapshot as they go below.

"The girl's three, and the boy's one," Everett says. "I haven't seen the boy yet. Big, isn't he? Don't you think he's big for his age?"

"Sure is."

"How are things with you?"

"Fine," Hanscom says. "Everything's fine."

"How's the gal? What's her name—Veda? Still love you?"

"Guess so."

"Waiting for those wedding bells, huh? Well, there's nothing like it. I really go for married life. I'd like to go for some right now. Bob, you marry that girl as soon as you can. You write—"

"Will you shut up?" Hanscom cries. "Please. Shut up, will you?"

Everett blushes. "I'm sorry, Bob. Did I say something wrong?"

"Oh hell, Eddie, it's not your fault. I got one of those G.I. letters. You know—'This is the hardest letter I've ever had to write.' "

"Oh my God. Bob, I'm sorry."

"What the hell. It's not important. I got other things to worry about."

But all through the briefing he thinks about the letter; he thinks about Veda.

Dimly he hears the Colonel talk of the latest aerial recon. Vaguely he hears the Navy man explain about underwater demolitions. Hazily he sees the Intelligence man point out features on a scale model of the island.

But his mind is 6,000 miles away, just floating. His mind is on Veda, his love of Veda, his dreams of Veda. Then his dreams, his hopes, his love; all are gone. There is nothing left. There is a blank.

"Any questions, gentlemen?"

Captain Harvey asks about Nip boat guns again. The Colonel explains. Lieutenant Everett asks about water again. The men sitting around the wardroom laugh, but again the Colonel explains about water, food, and cigarettes.

"That all?" the Colonel asks. "Well then, good luck to all of you. See you on the beach."

Hanscom moves without thought, without motive. Hanscom is a wooden man, a mechanical man. Someone has wound him up, set him going. He moves through his duties, not thinking, not feeling.

He inspects his platoon again. He oils his carbine again. He leaves a letter to his mother with the transport chaplain.

He can't think of the island, the boats, the waiting beach. There is this misery, this blank, this nothingness.

Until finally, awake and sweating in his bunk, waiting for the long night hours to melt away, waiting for the black night hours to fade away, all he thinks is this: might as well die. Sure. Why not? Might as well. Sure. What the hell.

The first two waves get off on time. Hanscom stands at his station, checks off the personnel in his boat. He doesn't feel the blast of Navy guns. He doesn't hear the planes nor see the hurtling bombs.

Now his world is his boat, his little map, his section of sand and coral.

Captain Harvey comes down the boat deck, pulls him aside.

"Bob, something's gone wrong," Captain Harvey says. "The boats can't get all the way in. We'll have to wade in from the reef."

"What? What?"

"Yes, from the reef. The boats can't get over. They'll dump us on the reef. We must wade in. We think it's not over five feet deep."

"All right."

"Sorry, Bob."

"Wade in from the reef." Now Hanscom is frightened. The words strike into his heart like a twisted knife. "Wade in from the reef." The double-e sound of "reef" pierces his heart, a dagger of fear.

"Reef" sounds like grief, beach, steel, meat, heat: all

agly words to him, frightening words. They race through his mind, jumbled, echoing.

"All right," he says to his men. "We must wade in from the reef."

They look at him.

"Snookered," DuBois says.

"Veda, Veda, Veda," the big shells murmur, whirring overhead. "Veda, Veda, Veda," the whirring boat engine murmurs. "Veda, Veda, Veda," the Nip slugs murmur, whirring across the waves.

Hanscom's boat circles, jockeys into the wave, gets the flag from the Control Boat, heads for the reef. Hanscom waits for someone to say, "This is it."

"This is it," Ryan says. "This sure is it."

"Drake, you lead off," Hanscom shouts.

Drake looks back at him, nods.

"Say one for me," Petersen yells at Vanelli. Vanelli is fingering his St. Christopher Medal. The Lester boys shake hands.

The morning sky is blooming with white shell bursts. The blue morning sky is torn with steel. The clear morning sky is shredded by the singing steel.

"Get set," Hanscom screams.

The boat grounds on the reef.

"This is as far as we can go," the apple-cheeked coxswain shouts. "I'm sorry."

He's sorry, Hanscom thinks. He's sorry, the Captain's sorry, everyone's so damned nice and sorry about it.

Holding his M1 over his head, Drake wades toward the beach. The other men follow him out quickly.

Hanscom takes one last look around. He sees the Captain's boat receive a direct hit. The limp bodies go pinwheeling up, black against the sky.

Then Hanscom is in the water, wading toward the smoky beach. He holds his carbine over his head with one hand. He reaches for Hamilton, floating face down. He tries to tug Hamilton along, drops him when he sees Hamilton has no face.

He looks down at the reddened sea. The surface is puckered with the singing steel. Might as well, he thinks. Sure. Why not. Might as well die.

Equipment floats by: an empty ammo case, a bundle of rations, a demo kit, a few soaked letters.

He wonders if the letters begin, "This is the hardest letter I've ever . . ."

Suddenly this thought: hundreds of letters, big, little, pink, blue, typed, scented, all the letters in the Pacific starting the same way: this thought makes him howl with laughter. He roars with laughter, chokes, gurgles, as the sea slaps up into his face.

Ryan looks back, puzzled. "You all right?"

Hanscom nods, plunges ahead.

Drake hits the beach. He darts up behind a wrecked Nip landing barge. He crouches, waves the others in. The Lester boys make it. Vanelli makes it. Cheever is down, his agonized hands clutching the wet sand.

Kelley makes it. Armstrong is down, legless. Ryan makes it. Petersen makes it. Shirmer is down, bobbing on the gentle swell. Brown makes it. DuBois makes it. Finally, Hanscom makes it, huddles next to Drake, sobs for breath.

Hanscom looks to his left. He sees Eddie Everett come in with his demolition team. They set up their pennants. Hanscom catches his breath, turns to his own men.

"Anyone see Bartolo?" he shouts above the firing.

"Dead."

"DeVrees?"

"Drowned."

"McSwaley?"

"Out on the reef. His eyes. I think the coxswain took him back."

"All right. Okay." Hanscom takes another look around the crowded beach. An outfit on his right has a radio set up and working. Hanscom peeks cautiously around the wrecked barge.

He looks over at Everett again. Eddie is lying on the sand, his arms crossed over his helmet. Hanscom grips his carbine.

"Fifty yards to the sea wall," he shouts. "One at a time."

Hanscom darts out, hearing the whir of bullets, "Veda, Veda, Veda." He runs, trips over a body, falls, rolls, regains his feet, zigzags. He hurls himself behind the sea wall, a mound of sand between palm log barricades.

He lies on his side, signals back toward his men.

A corporal lies fifty feet away, wrapping a shirt around a mangled arm. "Tell them to walk their barrage in," he screams at Hanscom. "They're killing us."

I could send a telegram, Hanscom thinks wildly. I could write a letter. "This is the hardest . . ."

Drake comes darting up. One by one, the men dash up to the sea wall. Hanscom checks them off as they come. He holds his breath. Make it, he wills. All of you, make it.

Petersen, the last man, starts his run. Hanscom relaxes. They're safe; they all made it. Then Petersen slumps to his knees in a splatter of red.

"I'm dead," he cries out to them. And he falls forward. And he is.

Beyond the sea wall is a stretch of open sand raked by pillboxes to the left and right. The first two waves, a few of them, have crossed this open ground and lived. They are up to the antitank ditch at the edge of the airfield.

Everett's demo team engages the left pillbox. Far down on the right, at a break in the reef, a tank waddles off an alligator, comes clanking down toward the right pillbox, its siren screaming.

Hanscom waits till both pillboxes are engaged. He sees one of Everett's flamethrowers get the range. Burning Nips spill out a back entrance, cartridges popping in their belts.

"Up and over," someone screams down to their left. The cry repeats on down the sea wall in wild echos. "Up and over. Up and over."

"All right," Hanscom yells. "A hundred yards to the airfield."

He staggers over the sea wall, the sun blinding in his face. Something plucks at his shoulder. Something twangs off his helmet. He drives on, crouching. His men follow him up and over.

He crawls, creeps, dashes, flops on his face. He fires two shots, his first, at figures scrambling from the right pillbox.

Then he's up, running, ducking. He throws himself into the antitank ditch at the airfield's edge. His men pile

in after him. He spreads them out; they bunch up again. They stick together.

A man is lying near the top of the bank, a rifle poked over the crest. Drake and Hanscom crawl up alongside of him.

"Is this the perimeter?" Hanscom shouts. "What outfit are you? Who's ahead? Is this the perimeter?" He reaches out to grasp the man's leg, pulls back when he sees the neat holes drilled through the helmet.

There are letters scattered about. More letters.

"This is as far as we go," Hanscom says to Drake. "We'll hold it here till more tanks get in. Spread them out. Send someone back. Someone's got to make the beach and find the Captain. No, the Captain's dead. Find the CP. Find Everett. Find someone and tell them where we are. We're up to the airfield. Tell them, for God's sake, walk their barrage up; their shorts are killing us. Someone's got to go back."

"I'll go back," Drake says.

Hanscom touches his shoulder. "Drake," he says. "Listen. . . ."

Drake smiles at him, crawls away.

They stay in their ditch for the rest of the afternoon. It is bad, as bad as it can be. They hurl back three Banzai charges. Brown is killed. Kelley is killed. Both Lester boys are wounded, but not seriously.

The Navy shells whir over them, "Veda, Veda, Veda," hammering at the hangars on the other side of the field.

Planes snap at each other overhead. A Hellcat smacks into the field directly in front of them, spraying their ditch with burning gasoline. The pilot sways downward slowly, strapped dead in his parachute.

At 1300 Sergeant Nuska brings up the rest of the platoon. Sergeant Nuska, holding his broken right arm in his left hand, brings up the rest of the men, sets them along the ditch.

All afternoon, Nuska and Hanscom play their men like chesspieces, shifting them along the trench, bunching them up, spreading them out, putting them back, bringing them forward.

When the black tropical night comes down, sudden as a curtain, they still hold the littered ditch. Stephans is dead. Cucco is dead. Albans is dead. Five wounded have straggled back to the beach.

Hanscom sends Nuska back. He sends back two men to bring up grenades. Then Hanscom takes off his helmet, wipes his face, eats a sweat-soaked liverwurst sandwich and a chocolate bar melted to the wrapper.

A corporal finds him in the darkness, reports with two light Brownings. Moving between flares, Hanscom sets them out on his flanks.

Just before midnight, the Major slides down into the ditch, muttering the countersign over and over. An unlit cigar is clenched between his teeth. He huddles close to Hanscom.

Hanscom points out his positions in the darkness. He whispers his strength, his plans. The Major grunts agreement.

"The Colonel wants you to take over Able Company," the Major says.

"Able Company? What about Everett? What about Andrews?"

"Andrews is dead. Everett is--well, the Colonel wants you to take it."

"Listen, Major," Hanscom says. "You know I don't figure to last out the night. And if I get through tonight, I sure won't last tomorrow."

"You take it anyway. There's no one else."

"Are they all up?" Hanscom asks him.

The Major waves vaguely toward the right and left. "They're all on line," he says. "What's left. You'll get more Brownings by dawn."

"All right," Hanscom says. "How we doing on the beach?"

"We're doing okay," the Major says. "We've committed our reserves. I think we'll stick. When you get those Brownings, put one back on the sea wall in that mess of palm logs."

"Don't tell me where to place my guns," Hanscom says. "I know what to do with them."

The Major is silent a moment. They both duck when a flare splits the night with a blue-white glare. Then the Major reaches out, grips Hanscom's arm.

"All right," he says gently. "They're your guns. This is your company. Do what you think best."

The Major spits out his cigar, crawls away into the darkness. Hanscom goes down the ditch to his left flank. He finds Everett's sergeant. The sergeant doesn't know where Everett is. The sergeant doesn't care.

Hanscom crawls back to the sea wall, flopping when flares crack the night with light.

He finds Everett. Everett is crouching in a crater, his teeth chattering. Everett is fixing short bits of fuse to TNT blocks.

"Listen, Bob, this is bad," Everett chatters. "Oh, God, this is bad. I'm not going to make this one, Bob."

"You'll make it," Hanscom says. "You're all right. Eddie, where are your boys?"

"My number's up," Everett says. "I won't leave this island alive. I know it. I'm finished."

"Eddie, shouldn't you be up with your boys?"

"I want to live," Everett says. He starts weeping, the tears sliding off his dirty face, plopping onto the blocks of TNT. "I really do want to live. I don't want to die."

"I've got all 'A' Company now," Hanscom tells him.

But Everett doesn't hear him. He is wrapped in his own grief. All he hears is the wind of fear rushing in from the black sea. All he sees is the glare of fear when flares shatter the black night.

Hanscom crawls back to his men. He really does want to live, Hanscom thinks, waiting for dawn. Him and his five letters. He wants to live.

The sky lightens. The ships take up their fire again. The first dawn patrols wing over. The first Zero crashes into the lagoon in crimson flames. The day is born. The new day starts.

Two flamethrowing tanks come up shortly before noon. They clank cautiously in and out of the ditch. They clank slowly across the airfield toward the crumbled hangars.

Hanscom's men follow them out, hiding in their shadows. A Nip pops up, pulls back his arm to throw, goes

down before the hail of lead from a dozen weapons.

At the hangars, at the long connecting pillbox, the tanks poke their snouts through casements, pour flame and steel inside.

Hanscom pulls a pin, holds the grenade longer than he should, throws, goes in fast on top of the blast. He stands braced, firing at dusty figures stumbling about in the wreckage.

Then Ryan is at his elbow, sweeping his Thompson back and forth. The ejected shells twang off Hanscom's helmet.

"On the right," he shrieks at Ryan, but one of the wounded Lester boys comes hurtling through a breach in the wall, clubs down a saber-swinging Jap officer with a pistol butt.

Hanscom's men pour in through windows, shattered doorways. There are moments of pure chaos, noise, blasting, flame, whining of bullets pinging off wreckage.

Tank gunners stand up in their turrets, firing hand weapons. A machine-gun crew comes up at a run, goes into action, the gun firing before it's fixed on the tripod.

"A field day," Ryan shouts exultantly, reloading his weapon, moving after the scurrying enemy.

The Nips scatter toward the jungle. Hanscom's men clear the hangars, shooting, blasting, clubbing, making sure of the dead, making certain of their victory.

Everett's platoon sets up to cover the paths leading to the jungle. Men die badly. Men die well. Men die screaming, praying, weeping, coughing their lives up.

It's a red haze for Hanscom. The haze chokes the air. It's a bloody misery. The blood soaks the dust.

The hangars are taken, a life for each worthless room. The shattered rooms are taken. The bodies fall, freeze into the shocking, awkward postures of the violently dead.

They set out their defense. They put out their automatic weapons. They reload. They search their dead for water, for ammunition, for food.

They look at each other with bleak and frightened eyes.

"Still alive?" Venelli speaks for all of them. "We're still alive?"

Hanscom kneels a moment, rests his weight on his carbine. He coughs, coughs, coughs, in the grating dust. He swallows the last warm, bitter mouthful of water in his canteen. Beneath the heel of his boot is a Japanese letter. He unfolds it curiously, looks at the strange characters. "This is the hardest letter . . ." Is that what Japanese women write?

Within fifteen minutes a Navy Corsair lands warily on the pocked field. A bearded pilot steps out, grins at them as they come running up. He shakes hands all around, passes down a bottle of rum, a box of cigars.

"Some clam bake," he grins. "Got any message for the folks back home?"

Hanscom gives the pilot a report of his situation, his need for water, ammunition, food, plasma. The pilot tells him flights will start in an hour to take off the seriously wounded.

The plane guns off the field. Hanscom goes back to the hangars, sets up his CP in a ruined corner of the connecting tunnel.

A man comes up with a walkie-talkie, gets through to the beach. Hanscom talks to the Major. The Major tells him to stay where he is; Dog Company of the 2d Battalion is moving up through him.

Everett pokes a face twisted in despair around the corner of the tunnel, calls, "Hanscom, Hanscom. Please."

Everett is leaning against a wall, holding a big chunk of concrete in his arms. It has bent steel reinforcing rods sticking out of it. Everett can hardly hold it.

Everett's eyes are blank. Saliva dribbles down his dirty chin. He has lost his helmet. His hair is bloody and matted.

"Listen, Bob," he says hoarsely. "Smash this on my foot. They're flying the wounded out of here this afternoon. Do this for me. I'm serious about this. I really mean this."

Hanscom takes him by the shoulders, shakes him back and forth.

"Eddie, Eddie," he says. "Are you crazy? Think a minute. Think what you're doing."

"Drop it on my foot," Everett mutters. "They'll fly me off. Bob, please, I haven't seen my boy. I haven't seen him yet. Please, Bob. I've got to get off this island. My number's up. Bob, please. I've got to get off."

Everett starts crying again. Hanscom stands watching him helplessly. Then he is angered. He looks down at the bodies of Stough, of Shirek, of Betuel, of one of the tank men, blood bubbling from his leather helmet. Then he is angered.

"Do it yourself," Hanscom cries. "I don't care what you do. I'm not going to do it for you. Get someone else to do it. I won't do it for you. I don't care how much you want to live. Get out of here. I don't care. Get back to the beach. I don't care."

Hanscom goes back to his CP. He starts writing a report, drawing a crude little map of his position. Drake comes in with some K ration. Hanscom eats a bar of something, a bar of some fudgy, dry, tasteless stuff.

After a while Ryan comes in, slumps wearily against a pile of masonry, lights his first cigarette in 48 hours. He sucks the smoke into his lungs.

"Mr. Everett is hurt," Ryan says to Hanscom.

"What's wrong with him?"

"Smashed foot."

"How did it happen?"

"I don't know," Ryan says, looking at him. "I don't know anything about it."

"All right," Hanscom says. "Get him on the first plane."

"I took his pistol," Ryan says. "That all right?"

"Yes," Hanscom nods. "You take his pistol."

The plane comes in at 1600. Hanscom watches them carry four wounded out across the field on pieces of planking. Hanscom walks out to the plane. He looks down at Everett. Everett looks at him. Everett turns his head away.

He watches Everett lifted into the plane. He watches the plane taxi slowly down the field, avoiding the craters. He watches the plane turn, come rushing down the field, lift into the air, climb, soar.

He looks up, sees the plane still climbing. He sees the plane heading out over the lagoon.

He sees the Zeros come down out of the sun. Black as

coffins, fast as death, the Zeros swoop down upon the plane.

He sees the far-off puffs of smoke. He hears the far-off chatter of the Zeros' guns.

The plane of wounded hesitates, falters, dives downward. Fast it plunges, faster, into the churning sea. It sinks immediately into the churning sea.

Hanscom stands watching, his mouth opened a little, a hand half-raised in protest.

At 1700 Dog Company of the 2d Battalion begins moving up through them into the bush. Lt. Steiner pauses a momen: to give Hanscom a swallow of fresh water from his canteen.

"How is it ahead?" he nods toward the jungle.

"A picnic," Hanscom says. "It's all done up in a ribbon for you. You'll have a field day."

"I know about what you mean," Steiner laughs. "Listen, Bob, I've been hearing stories about you. Everyone is talking about you. Nice going."

"Sure."

"The Colonel is tickled pink, I know," Steiner nods. "The whole beach is ringing with your exploits, as the papers say."

"No doubt about it," Hanscom says. "I'm a hero all right."

"Well, you'll get a medal out of it," Steiner tells him. "I heard the Major. You'll get one of the big medals. See what you get for staying alive? You try your damnest to keep alive, and that's what you get. They give you a medal for wanting to live so much."

"That's right," Hanscom says.

Officers Pose Questions On The Future Of The CAC

We are publishing here, our answers to a variety of questions asked by Coast Artillerymen. We feel that the questions are representative and hope that our answers may help to allay the apprehension felt by so many of our officers regarding their future in the Corps.

1. Am I likely to be assigned to the Seacoast Artillery for my entire career?

No. Upon the merger of the two artilleries all artillery officers will be subject to assignment with any type of artillery matériel. Newly commissioned officers will be required to serve with different types of artillery. Many present company grade officers will receive this diversified training and some officers of field grade.

2. Will the employment of the guided missile be definitely assigned as a mission of the AAA?

The term "Artillery" should have been used in lieu of "AAA." The responsibility for the operation of guided missiles has not been delegated to any particular service. The Ground Forces will undoubtedly employ surface to air and surface to surface guided missiles. The Navy, in all probability, will operate air to air and air to ground guided missiles in addition to the two types employed by the Ground Forces. Likewise, the Air Forces will operate various types of missiles not uncommon to those employed by the Navy and the Ground Forces. If the term "Artillery" had been used in the question, the answer probably is "yes."

3. Will the Automatic Weapons Battalion be organically a part of the division?

Yes. It is now provided for in the Infantry, Airborne and Armored Divisions.

4. What will be the effect in the future of the merger of the CAC and FA? Will an officer in the CAC have the same opportunity for advancement and command as the FA officer?

Opportunities for advancement will be equal for all members of the Artillery.

5. Will the future AAA be purely a defensive arm? Or will it be equipped with dual purpose weapons so that they can be used offensively when we have gained air superiority?

The future of the AAA will be both defensive and offensive. AAA units were extensively used on ground missions during this war and undoubtedly will be utilized more so in the future since they are now an organic part of all types of divisions. Artillery officers assigned to AAA duties in the Zone of Interior may be shifted to ground support artillery duties at any time.

6. What is the future of the AAA in reference to rockets, guided missiles and radar?

Here again, the term "Artillery" should have been used in lieu of "AAA". The primary weapons in the Artillery will include guided missiles, which will embrace long range and AA rockets, operated in conjunction with radar. As in the past, all officers will be required to be familiar with all primary weapons.

THE EDITOR.

Navigation By Electronics — Loran

By Lieutenant Colonel Leonard M. Orman, CAC

LORAN, short for Long Range Navigation, is a wartime electronic development which promises to be one of the most useful in peacetime. The system has marked advantages over both radio direction finding equipment and celestial navigation.

Shore-based stations send out pulses which when intercepted by Loran receivers enable an operator to determine within two minutes his craft's geographical position on Loran charts. Unlike celestial navigation, no calculations are necessary. Fog and weather do not hamper Loran.

Extracts from actual operational reports testify in its behalf:

"Loran positions obtained by airships were very accurate."

"During voyage Dutch Harbor to Attu, unit became separated from convoy. No sights possible. Loran used and later found correct."

"Loran is considered by this unit to be the outstanding single piece of equipment yet installed."

"In attempting to hit small islands in the Pacific Loran proved invaluable."

History

Loran was developed by the Radiation Laboratory at Massachusetts Institute of Technology. The first tests were so promising that the Navy Department immediately made arrangements to introduce the system into war service, and to install the first stations as quickly as possible on the northwest Atlantic coast. A similar system was independently developed for shorter range work in England and called "Gee."

It was needed most in 1942 to get convoys from the U. S. to Russia and Britain. The route was beset by two evils—bad weather and subs. Loran helped defeat both.

Civilian engineers from Radiation Laboratory made the first installations with the assistance of the U. S. Coast Guard and the Canadian Navy, in Greenland, Labrador and Newfoundland. Coverage over the North Atlantic was completed by the British Admiralty with a chain from the Faroes to Iceland and the Hebrides.

Just as fast as the chains became operative, they were used by Naval vessels taking convoys of freighters across the Atlantic. Working in the most adverse weather, the system brought through more than one big convoy that might have run into difficulty without it.

Loran went airborne in 1943 with the installation of sets in coastal patrol planes assigned to search North Atlantic sea lanes for U-boats. After the liberation of France, German Naval activity shifted to Norwegian waters and it became necessary to extend Loran coverage by installing a transmitter on the Shetland Islands.

Earliest Loran installations in the Pacific were made to give navigation aid through the bad weather areas surrounding the Aleutians. As the war pushed farther into the Pacific, and the need for greater coverage increased, chains were installed in Hawaii, the Phoenix, Caroline, Marshall and Admiralty Islands and Australia. A chain was installed by the Air Forces for the over-the-Hump route. The Bay of Bengal was later covered. By the end of the war approximately one-quarter of the earth's surface had been included in the coverage.

Principle of Operation

The figure on this page illustrates electronic navigation of the Loran type. A receiver on the aircraft intercepts signals transmitted at precise intervals from a pair of fixed ground stations and accurately measures the difference in the time of arrival of their signals. This measurement, in whole numbers, is referred to a Loran chart showing numbered lines of position. The numbered line corresponding to the measurement is the line of position the aircraft is on at the instant the measurement was taken. By obtaining time measurements from more than one pair of ground stations two or more lines of position can be obtained. Their point of intersection determines the position of the aircraft.

Let's analyze the simplest possible case. Suppose we have two land based transmitting stations, A and B, located several hundred miles apart and suppose these stations send out pulses simultaneously. If a ship or plane receives these two pulses simultaneously, it would be somewhere on the perpendicular bisector of the line joining these two stations. Now suppose that the craft receives the pulses at different instants but can measure the time difference. This time difference can be translated into distance difference since the speed of propagation of radio waves is known. By geometrical definition, the locus of points whose difference of distances from two fixed points is a constant is

known as a hyperbola. A series of hyperbolas may be drawn for a pair of stations each representing a constant time difference. While this line is theoretically a hyperbola, the term does not strictly apply when plotted on the surface of the earth and the term used is "Loran line." The time difference would be zero on the center line and a maximum on the base line extension beyond either station.

A difficulty would arise with both stations transmitting simultaneously, if there was no way of distinguishing between signals from stations A and B. The time difference could be measured but it would be impossible to tell which signal arrived first and the craft might be on either one of two lines of position.

A system of spacing pulses in a special way provides a method of distinguishing the pulses from the two stations. Station A, the Master Station, sends out a pulse. The second station, B, the slave station receives the pulse from the master station, waits an interval greater than one-half the time interval between A's pulses and then transmits its pulse. Because the slave station always waits at least half of the recurrence interval before transmitting its pulse, the interval from receipt of a master station pulse to receipt of the next slave station pulse is always greater than from a slave station pulse to the next master station pulse. This gives a positive method of distinguishing pulses from the two stations.

After a time-difference is obtained, it is necessary only to consult a Loran chart to find the location of the Line-of-position in regard to the earth's surface.

In order to obtain a fix, the ship must obtain lines of position from two pairs of Loran stations in the vicinity. Loran stations are always arranged so that two or more pairs will cover strategic areas. Two operating pairs are usually formed from three stations, by arranging one master station to operate in both pairs, sending out two different sets of pulses to two different slave stations. By establishing two lines of position, the navigator can determine where these lines intersect and find his position. If a third pair of stations is present, it is wise to check the fix by obtaining a third reading and resultant third line of position. Two curved loci will generally intersect in more than one point. However, these points will be located a considerable distance apart. A third fix will eliminate even this ambiguity.

Loran charts, prepared by the Naval Hydrographic Office, are marked for longitude and for latitude and show the position of important land and water areas. Lines of position with the time difference readings are drawn in different colors for each pair of stations in the area. Loran tables may be used instead of charts, and the position must then be plotted on the regular navigation plotting board.

In order to obtain lines of position from a Loran chart, it is necessary to identify the pair of stations from which pulses have been received and measured. This is done by providing each pair with a different pulse recurrence frequency.

A number of pairs of stations in the same vicinity may operate on the same radio frequency, but each of these pairs operates on a different pulse recurrence rate. These different rates are identified by the number 0 to 7 inclusive. All of the stations on one frequency will appear on the [illegible] but will drift across the screen. The receiver may be adjusted to any desired station rate. The pulses from that pair of stations will be stationary on the scope, while the others continue to drift and are disregarded.

Secondary Uses

Two features of Loran make it possible to do more than supply a knowledge of position. New navigational procedures which are not possible by previous navigational methods, and which are highly advantageous in certain situations may be used.

These features are: (1) an accurate knowledge of position is available continuously, and (2) position knowledge is delivered in the form of lines of position which have definite and unchanging location on the earth's surface. Previous systems of navigation have determined position periodically every few hours and used dead reckoning in between. Feature number two allows the setting of the receiver on a particular line. Subsequent visual inspection will show instantly whether the ship is on the line or to the right or left of it. Therefore the ship may be steered along a Loran line by watching the receiver.

Useful applications of these features might be searching an area for a sub or a life-raft and making landfall in fog.

Loran vs Other Systems

Loran has several advantages over radio direction finders. It does not require a directional antenna. Loran is more accurate since it measures time difference and this can be done to the order of 1 microsecond while radio direction systems measure angles. As compared with celestial navigation its principal advantage is that it is independent of weather. Lightning in the near vicinity is about the only type of weather disturbance which will prevent intelligible reception. In addition, it is easier to take Loran readings and easier to interpret them than celestial readings. A well-trained operator can carry out the complete process in three minutes and the expert can do it in about one. The training period is short for an operator—about ten hours. It is about as accurate as celestial navigation.

Like any other radio receiver, Loran is susceptible to interference. This may be due to transmitters. However, the interference problem is not serious, except in the case of transmitters on board the same ship or aircraft.

Unlike radar devices, Loran maintains radio silence since the craft carries only a receiver and does not transmit.

Recently released information on two British systems, "Gee" and "Decca" permits a comparison with Loran. The systems are alike in that they are all hyperbolic, electronic systems. With Gee and Decca, only one observation is necessary because each master transmitter operates two slaves; the signals from both slaves can be compared to the master signal simultaneously, and the measurements made entirely automatic. This advantage is offset somewhat since the Loran operator may choose his pairs of stations to obtain optimum geometrical accuracy. Because of the difference in time measurements used with Decca, one cannot use it unless his approximate position is known. The maximum range of Loran is approximately 1,400 miles while that of Gee is 350 and Decca's is 300. The low-frequency Loran now in the experimental stages has both long range (1500 miles) and accuracy (comparable to trigonometric survey)

"Rockets And Space Travel"*

By Willy Ley

Suppose we wanted to send a rocket to an altitude of several times the height of the atmosphere, say to an altitude of some 800 miles or about 1300 kilometers. How would we go about designing such a rocket, on paper first, so that it can be built afterwards?

Obviously such a rocket would have to have a certain size and would have to be capable of accommodating a certain fuel load. It is also obvious that the rocket itself should be as light as possible and that it should be capable of carrying as much fuel as possible. The rocket will display a certain ratio between empty weight and fueled weight. As we'll see soon in the course of the investigation that ratio will turn out to be the most important single concept in rocket science. It has received a specific name: *mass-ratio*.

So far this name has not been used, but we are already familiar with its meaning. In the meteorological rocket the mass-ratio was 2:1, the weight of the rocket at the instant of ignition was twice as great as the weight of the empty rocket plus instruments, parachute, etc. This weight, which includes the "pay load," is referred to as final weight. In the V-2 the mass-ratio was about 3:1.

It hardly needs to be explained that it is the mass-ratio which, other things being equal, determines the altitude to which a rocket will ascend. If you had two rockets of equal take-off weight and alike in every respect except for the fact that one rocket is in itself lighter than the other and therefore holds more fuel the rocket with more fuel will have a longer burning time and consequently rise for a longer time under power and go higher.

The first requirement, no doubt, is a high mass-ratio.

That statement can be countered with the question: how high?

That depends on the fuel you have at your disposal in a somewhat roundabout manner. The type of fuel determines the mass-ratio required for reaching a certain velocity and the velocity determines the height to which the rocket will rise. Therefore, if we want to send a rocket to 1300 kilometers we first have to find out what velocity the rocket requires for that altitude.

Here a rather simple natural law comes to our aid. It states that the velocity of impact from a given altitude and the velocity of departure for that altitude are equal. If there were no air resistance that law would mean that a bomb dropped from 30,000 feet on an antiaircraft battery would strike the ground with the same velocity with which a projectile fired against that bomber and capable of climbing to 30,000 feet leaves the muzzle of the gun. Because of air resistance the law does not appear to hold true, in fact air resistance not only slows down the antiaircraft shell very quickly, it also prevents the bomb from attaining a high velocity.

But this does not make the law itself invalid; air resistance is merely a complication which calls for a correction. Unfortunately the correction is rather difficult to make, so for a purely theoretical investigation air resistance might be neglected at first. Our conscience can bear this neglect all the more easily since air resistance corrections are required mainly for the densest strata of the atmosphere, say for the first 15 miles. We can accept the following by simply imagining that we are speaking about an actual altitude of about 15 miles when we say "ground."

Now it is possible to draw up a simple table, listing the impact velocities from different altitudes. This table looks as follows:

Altitude (Kilometers)	Velocity of impact (Kilometers per second)
51	1
204	2
458	3
813	4
1274	5

Beyond an impact velocity of about 3 miles per second (about 4.8 km/sec.) the formula used becomes so unreliable that figures do not hold true even approximately. The reason is that gravity decreases with altitude.

We notice, in passing, the interesting facts that a fall from twice a given altitude does not produce twice the former impact velocity and that a fall from infinity does not produce an infinite impact velocity. The figure which interests us at the moment is the fifth in the column. A fall from 1274 kilometers would result in an impact velocity of 5 kilometers per second, about 3 miles per second. That is the velocity our rocket would have to attain in order to climb to that altitude.

The next step would be to find out what mass-ratio is needed for that velocity, and here we run into the first minor complication. There is not just one answer to that question, there are many answers to it. Theoretically any figure at all can represent the mass-ratio required for a rocket velocity of 3 miles per second. The reason is that the answer depends on the velocity of the rocket exhaust. Change the figure for the exhaust velocity and you get a different figure for the mass-ratio. Our dilemma now is this: unless we agree upon an exhaust velocity first we cannot get an answer. But if we do agree on any specific value for the exhaust velocity we get an answer for that specific exhaust velocity only. What we want is a general answer.

The way out of this dilemma is simplicity itself. It con-

*Extracted with permission of The Viking Press from Mr. Ley's Book of the same title "Rockets and Space Travel."

sists in using the exhaust velocity, whatever it may be, as a yardstick. To be able to do that we need to know just one thing and that is the mass-ratio required to give to a rocket a velocity equal to its own exhaust velocity. That ratio is clearly always the same. If you have a higher exhaust velocity you'll get a higher rocket velocity. If you don't have a high exhaust velocity you'll get a low rocket velocity. But whatever the velocities are, the mass-ratio of a rocket which is to attain its own exhaust velocity must be a standard value.

It is customary to call the rocket velocity by the letter "v" while the exhaust velocity is usually designated by the letter "c." Now we can phrase our problem more conveniently by asking: "What is the mass-ratio for $v = c$?"

The answer is 2.72 to 1. A rocket weighing 272 units (pounds, or ounces, or kilograms) at take-off and 100 units when empty will attain a velocity equal to its own exhaust velocity. This figure is familiar to any student of mathematics and mathematicians call it "e." Its correct value is 2.71828183 . . .; it is easier to call it 2.72.

Fine. So "v" equals "c" if the mass-ratio is "e," no matter what the value of c is. Now we have a general answer to our problem. But what if c, the exhaust velocity, is not high enough? We need 3 miles or 5 kilometers per second for our example. What if there is no fuel that will produce such an exhaust velocity?

It does not matter much, at least on paper, because a rocket can move faster than its own exhaust velocity, provided that it still has some fuel left when it gets to that point. Provided, in other words, that it has a mass-ratio higher than 2.72. We may conclude that there must be a standard mass-ratio for a rocket which will move twice as fast as its own exhaust velocity; a mass-ratio for $v = 2c$. There is, it is the square of "e," in figures approximately 7.4. The cube of "e" is 20.1 and a rocket with that mass-ratio can and will attain thrice its own exhaust velocity.

Theoretically you can go on in that manner: "e^4" would give you four times the exhaust velocity, "e^5" five times the exhaust velocity, and so on. It is as simple as that on paper; the trouble is that engineering practice will probably have to stop at "e^3," if it can go that far at all. Whether a rocket with a mass-ratio of 20:1 can still be actually built is a problem for prolonged discussion. It might be possible, or it might not. But anything higher than 20:1 is clearly out. It can't be done.

For a rocket like the one we set out to investigate, that does not trouble us. We want to go to about 1300 kilometers, a little over three times the height of the atmosphere, and for that we need a velocity of 4 kilometers per second.

This sudden switch to 4 kilometers per second, although the table seems to indicate a value closer to 5 km/sec. for that altitude, has a good reason. As has been stated earlier, that table is not quite accurate for high altitudes because it neglects the fact that the value of g decreases with increasing distance from the surface. But with regard to rockets it is inaccurate to an even larger extent for the simple reason that a rocket does not attain its maximum velocity at once. During the time needed to attain maximum velocity it has risen for a certain number of kilometers or miles and when the velocity of the rocket is high, that number is high too. Assuming that the rocket ascends with 3 g effective acceleration, and taking the diminishing gravitational force of the earth into account, the table looks as follows:

Max. vel. of rocket, (km)	Altitude attained including altitude reached under acceleration of 3 g until max. vel. is reached. (km)
1	68
2	277
3	640
4	1310
5	1970

For the following discussion the values of this more correct table are used.

The exhaust velocity of the V-2 was a little over 2 kilometers per second. Therefore we have a case of asking for a velocity equal to twice the exhaust velocity and our mass-ratio, consequently, must be the square of e or about 7.4.

A rocket with an exhaust velocity of 2 kilometers per second and a mass-ratio of 7.4 to 1 would ascend to 1310 kilometers or about 820 miles. It would ascend to 820 miles, that is, if you could cast a spell which creates an airless shaft a quarter of a mile in diameter in which your rocket can climb against the pull of earth's gravity without the unfair interference of air resistance. Or else, if you are not good at casting such spells, you may find a non-miraculous method of transporting your rocket to a height of some 20 miles first. In that case the figures would hold true without the aid of additional miracles.

Before we try to improve upon our theoretical methods we'll pause and consider the question of whether such a mass-ratio of 7.4 to 1 can actually be built and how it could be done. And it is at this point that we realize why those fuel pumps of the V-2 rocket were so important.

The meteorological rocket had two fuel tanks made of aluminum or magnesium tubing, and we forced the fuels from the tanks into the rocket motor by the simple device of using the pressure of a compressed gas, like nitrogen. That was simple and easy, but it did have a drawback: the whole tank had to be sturdy enough to withstand an internal pressure of some 300 pounds per square inch. Naturally such a tank has to be heavier than a tank which just holds the fuel in the manner in which the tank of an automobile holds the gasoline. However, since the mass-ratio of a meteorological rocket only needs to be of the order of about 2:1, that method, even with this drawback, is usable.

It might still be made to result in a rocket of a mass-ratio of about 3:1, the same as V-2, provided the whole rocket is small. But to go beyond that you need light tanks which will not be able to stand much internal pressure. Hence it is necessary to provide a method of forcing the fuel into the rocket motor without pressurizing the tanks too much.

That method is the fuel pump.

Goddard realized the need for fuel pumps in one of his early patents. Oberth kept harping on the theme of fuel pumps from the very outset. But it seemed almost impos

sible to build such a fuel pump. It had to fulfill a whole set of rather exacting demands. It should be able to pump the fuels (one of them a liquid gas) with a delivery pressure in the neighborhood of 300 pounds per square inch. It should pump very large amounts, 50 gallons and more per second. It had to be simple enough in construction to eliminate malfunctioning if at all possible. And it had to be light, very light, since the pumps for both liquids and whatever mechanism drove them had to weigh much less than the saving in tank weight. One redeeming factor was that the pumps had to operate for only short intervals of time, a few minutes at the most.

The pumps are not the last word by any means; the main "childhood disease" that comes to mind is the fact that the turbine needs special auxiliary fuels which, in turn, need tanks to carry them in, instead of being capable of operating on the alcohol and oxygen which powers the rocket itself.

But these pumps show the way and it is safe to prophesy that it will be possible to build a mass-ratio of 7.4 to 1 with improved pumps. And it is likely that even a mass-ratio of 10:1 might eventually be accomplished. The mass-ratio of 10:1 would result in a rocket velocity of 2.3c and the altitude would be, if c is 2 kilometers per second and v consequently 4.6 kilometers per second, about 1600 kilometers or almost precisely 1000 miles.

As far as the mass-ratio for a single rocket goes we may confidently expect to be able to send a rocket to an altitude of 1000 miles in the foreseeable future.

If we want to go higher (and we'll want to) we'll have to concentrate our attention upon another point. We already know by implication that mass-ratio and exhaust velocity can be exchanged to a large extent. If for a given case you would need twice as high a mass-ratio as you can actually build, you can still solve the problem if you succeed in doubling your exhaust velocity. It is the problem of the *exhaust velocity* at which we have to look next.

The exhaust velocity of a given fuel is limited by the amount of energy imprisoned in that fuel. Alcohol and oxygen in proper proportion cannot produce a higher exhaust velocity than 4180 meters per second. Gasoline and oxygen can produce 4450 meters per second. But these figures are theoretical figures, they cannot be expected to materialize in actual practice. So far the actually obtained exhaust velocities are precisely half of these theoretical figures. With improved rocket motor designs one may hope for exhaust velocities of about 2500 meters (2.5 kilometers) per second from these fuels. Three thousand meters per second might be just barely possible; if that value is ever obtained it will represent the limit for these common fuels.

Still, for an assumed mass-ratio of e^2 that would mean a rocket velocity of 6 kilometers per second instead of 4 and a theoretical altitude of 3820 kilometers instead of "only" 1310 kilometers.

A more powerful fuel is known. It is hydrogen with a theoretical exhaust velocity of 5170 meters per second. Only one isolated experiment with hydrogen has been made so far (by Oberth), and it seemed to indicate that an exhaust velocity of four thousand meters per second may actually be obtained.

But hydrogen is not as ideal a rocket fuel as this figure may lead one to believe. It has quite a number of unpleasant characteristics which are, to say the least, annoying. One of these characteristics is that even the temperature of liquid oxygen is still some 70 degrees Centigrade too warm for liquid hydrogen, which is to say that hydrogen is still colder than oxygen when liquefied and proportionately more difficult to handle and to control. Anything of even approximately normal temperature will set it boiling furiously.

Another drawback is that hydrogen, even when liquid, is very light and consequently bulky. This means larger tanks which, of course, means greater weight. A rocket that will have a nice mass-ratio for heavier fuels will not have that same nice mass-ratio for hydrogen. And to make that factor even worse, hydrogen does not behave quite "properly" in the combustion chamber. It will be necessary to have a considerable hydrogen surplus so that the exhaust consists of water vapor (burned hydrogen) and unburned hydrogen. This, of course, means still bigger and consequently still heavier tanks. As a matter of fact, Oberth decided that hydrogen would not do for rockets at all as long as the rockets were still in the atmosphere. Hydrogen, in short, cannot be counted upon as a rocket fuel right now.

For the more distant future one may speculate on monatomic hydrogen as a rocket fuel. Monatomic hydrogen is hydrogen in which each atom is independent instead of being tied to another hydrogen atom to form a normal hydrogen molecule (H_2). Purely on paper monatomic hydrogen will yield a theoretical exhaust velocity of 21,000 meters per second; actually a little more than half of that might be attainable. So far, however, this is pure speculation; it is not even certain whether monatomic hydrogen could be manufactured and stored in appreciable quantities.

Just to forestall possible false hopes, I wish to point out that high explosives like nitroglycerin, guncotton, or TNT are far weaker than gasoline or alcohol. They are destructive by virtue of the rapidity of their combustion; if they could be slowed down to useful speeds they would be inferior fuels. The theoretical exhaust velocity of nitroglycerin is 3880 meters per second, that of dynamite 3300 meters per second, that of picric acid 2600 meters per second. Compare this with the values for alcohol (4180 meters per second) and for gasoline (4450 meters per second).

To repeat, high explosives are weaker than ordinary fuels and would, therefore, be inferior even if they could be used. The only exception from this rule is the atomic explosive Plutonium (Pu-239) which, in the course of time, slowly changes into the rare uranium isotope U-235. Both these substances hold endless promise for almost everything, and rocket propulsion is no exception. But the utilization of atomic energy for rocket propulsion will probably take some time. Besides, the whys and wherefores of an atomic-powered rocket could hardly be understood without knowledge of the whys and wherefores of chemical-fuel rockets. For this reason I'll go on with the discussion for some time as if atomic energy did not exist.

For the present and for the near future the most likely rocket fuels are the very ordinary liquids alcohol and gasoline. But there is, there conceivably is, something better

than liquid oxygen. Theoretically, at any event, there is something better: liquid ozone.

Ozone, discovered by the same chemist Schönbein, who had that adventure with guncotton, is a modification of oxygen. Ordinary oxygen has two oxygen atoms per molecule and is called O_2 for that reason. Ozone has three oxygen atoms per molecule, hence is called O_3. It is, to all intents and purposes, a kind of concentrated oxygen. It has a higher specific gravity—a tank which can hold 6 pounds of liquid oxygen can hold almost 10 pounds of liquid ozone. This alone, as can easily be seen, will increase the mass-ratio, since the tank itself weighs the same, no matter what it contains.

Connected with the higher specific gravity is the fact that liquid ozone does not have to be quite as cold as liquid oxygen to stay a liquid. Liquid oxygen boils at minus 183 degrees Centigrade; liquid ozone boils at minus 119 degrees Centigrade.

As far as tank capacity goes, liquid ozone simply means more oxygen in a given space. As far as the combustion chamber is concerned, liquid ozone means even more. It means more energy and a higher exhaust velocity. Liquid ozone can be formed only if it can absorb energy (719 calories per gram) which may be supplied by ultraviolet radiation, electric discharges, or heat. But when the ozone enters the combustion chamber it reverts to ordinary O_2 releasing the energy it absorbed before. Alcohol with ozone, for this reason, develops a theoretical exhaust velocity of 4630 meters per second (4180 with oxygen), and hydrogen 5670 meters per second instead of 5170. Burned with ozone alcohol may deliver 3500 meters per second instead of 3000 meters per second which appeared to be the possible maximum.

But ozone, a dark blue liquid, is unstable. If it gets a bit too warm it may revert to ordinary oxygen with explosive suddenness. This, as the handbook on chemistry puts it, "will be accelerated catalytically by the presence of water, alkalies, metal oxides, metals of the platinum group, organic substances, and chlorine." It is a thoroughly untrustworthy substance.

However, the case is not yet hopeless.

The transformation of ozone into oxygen apparently is not only brought about by catalysts, of which there are many in this particular case, but also seems to take place occasionally without a catalyst around.

The point I am trying to make is that the latter is not absolutely certain. For the simple reason that many different substances can serve as catalysts for this particular reaction, it is extremely likely that there was a catalyst around every time the reaction took place. It is quite possible—though of course not certain—that liquid ozone which is free of all impurities (at least of those that can act as catalysts) will be stable and reliable. Not enough research has been done on that question yet to permit judgment.

But if it should be found that the number of possible catalysts is so large and so widespread that contamination is impossible to avoid, there is still another hope left. There are not only catalysts, there are also anticatalysts, substances that prevent the catalysts from making their presence felt. If a reliable anticatalyst for the ozone reaction could be found, the problem would be solved. Until then ozone in lieu of liquid oxygen is a beautiful but unreliable hope.

Let's see now how far we have progressed.

Fuels: still alcohol or gasoline, with a top exhaust velocity of 3000 meters per second and 500 meters more if ozone can be tamed.

Mass-ratio: about 10:1 as likely top limit, resulting in rocket velocities of 6900 meters per second or (with ozone instead of oxygen) 8000 meters per second. Which would produce altitudes of 6000 kilometers and 12,000 kilometers, respectively. These figures are already such that they are hardly "altitudes" any more but begin to be "distances" in the sense in which we speak of the distance at which a comet passes the earth. They are still short distances as far as astronomical distances go, but by the same token they are astronomical distances, even if short ones.

After Burner Adds More Thrust To Jet Engine

Emergency spurts of speeds of jet-propelled combat planes will result from a development of the Ryan Aeronautical Company which the makers call an "after burner."

It is a type of a ram-jet engine attached, as an integral part, to the after end of the jet engine. It will be used when needed by the flip of a switch.

The combination might be described as a ram-jet attached to a turbo-jet power plant. The turbo-jet develops the high-pressure gases that give thrust to the plane and also operates the compressor that gathers in the air whose oxygen is needed for combustion.

The ram-jet effect is obtained by spraying fuel into the special tailpipe where its burning adds mass and velocity to the speeding gases of the jet stream. It burns because there is a plentiful supply of unburned oxygen in the jet stream from the turbo-jet.

Ryan officials claim that this is the first device of the sort specifically designed for regular use in flight. It can also be used in take-off. The added thrust, with jet planes already flying at more than 600 miles an hour, may assist a plane in breaking through the so-called air compressibility barrier encountered as planes approach the speed of sound. The device adds more than one-third to the power plant's normal propulsion thrust.

The development and testing of the device has now about reached the end of ground-test stages. The tests were made in fixed engine stands on the earth. In them the stainless steel combustion chamber of the after burner becomes a roaring blast furnace shooting out a colorless, searing jet stream, revealed only by heat waves, at over 1,000 miles an hour.

(Reprinted courtesy *Science News Letter*.)

INTEGRATION OF THE FIELD ARTILLERY AND COAST ARTILLERY

It has been brought to my attention that many officers of the Coast Artillery and Field Artillery are not familiar with steps being taken to form a single artillery arm. I am taking this opportunity to outline the current situation relative to the integration of the two artillery branches.

As early as a year ago it became generally known throughout the Army that the War Department favored combining the Coast Artillery and the Field Artillery into a single arm. Plans for proposed legislation to effect integration were prepared by the War Department but were not presented during the last session because other items had higher priority. It is anticipated that legislation to accomplish the integration of the Coast Artillery and Field Artillery will be sought as early as it is practicable to do so.

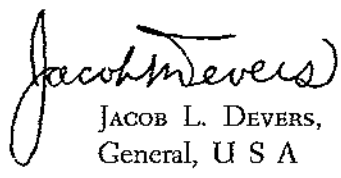
In the meantime, I have taken certain preliminary steps in anticipation of legislative approval of integration of the artilleries. These included the redesignation of the Field Artillery School at Fort Sill as the Artillery School with an Antiaircraft and Guided Missile Branch at Fort Bliss, Texas, and a Seacoast Branch at Fort Scott, California. Instruction at the Artillery School in both the basic and advanced courses has been altered to include all types of artillery weapons. Similarly, the ROTC Program has been revised and a common artillery course will be taught beginning in the fall of 1947.

During 1946 the War Department Seacoast Armament Board made a survey of harbor defenses and installations. As a result some harbor defenses were entirely eliminated and obsolete weapons in others were declared surplus. Only certain types of modern fixed guns and submarine mines were recommended for retention. Units of the civilian components assigned to armament declared surplus were recommended for reassignment to mobile artillery designed to fire at moving or fixed targets.

Officers assigned to the Coast Artillery Corps or to the Field Artillery are considered first to be Ground Force officers, second artillery officers. Newly commissioned officers of the Regular Army assigned to either artillery branch receive the same basic course. They will serve in antiaircraft, field, or seacoast artillery units and will attend the same advanced course. It is considered impractical within the time available to them for officers of the civilian components to receive basic training in all artillery weapons. However, the associate advanced course is designed to give field officers a well rounded knowledge of field, antiaircraft and seacoast artillery employment. It will provide a valuable foundation for officers in command and staff positions requiring a knowledge of the employment and capabilities of the various artillery weapons.

Regular officers who through age or length of service would not normally take the regular advanced course present a different problem. The associate advanced course is open for such officers and they are urged to apply for it. In addition, consideration is being given to the establishment of short indoctrination courses which will give the Field Artillery officer a working knowledge of antiaircraft, seacoast artillery and guided missiles and the Coast Artillery officer a corresponding knowledge of field artillery.

It is my intention that first, the future artillery officer have a general knowledge of all artillery weapons and a specialized knowledge of some; second, the integrated artillery be a closely knit component of the Army Ground Force team; third, neither of the present branches be absorbed by the other; and last, every artillery officer, regardless of present or future assignment have an opportunity for advancement equal to that of any other artillery officer.



JACOB L. DEVERS,
General, U S A
Commanding

Rocket exploration of the stratosphere at White Sands is opening a new superterrestrial chapter to science

By Harold Berman

Into the IONOSPHERE*

Can a rocket or a space ship be shot to the moon? Can we neutralize the gravitational force of the earth with self-propelled missiles?

Perhaps; but before interstellar space can be reached the ionosphere must first be traversed. Experiments at the White Sands Proving Grounds in New Mexico have demonstrated that penetration of these regions is now feasible. The tests in the desert have also made it clear that human cargo will have to be protected against physical conditions pertaining in the ionosphere and beyond.

The rocket and guided missile program, under the direction of the AAF, has many interesting tangents leading into pure research concerning the ionosphere.

The Ionosphere

Also known as the Kennely-Heaviside layer, the ionosphere is a region of ionized and other radio reflecting strata without which long-distance transmission and reception at high frequencies would be quite impossible. A series of these electrified layers envelop the earth at heights varying from about 25 to 250 miles. To better understand this envelope it should be remembered that great variations may occur within it.

The layers change from daylight to darkness; they vary at different seasons of the year; and they are not identical in all sections of the earth. During daylight the ionosphere begins at the "C" region, at a height of about 25 miles. Just above is the "D" layer, beginning at 35 miles and rising to 50 miles. Separated by a 10-mile interval, the "E" layer extends to some 90 miles above the earth. At 100 miles are found the last two *known* layers, the "F" regions: the "F-1" and the "F-2," at 250 or more miles above the earth.

But after sunset, conditions change. The D and E regions disappear and the two F layers merge at the height of the F-2. Each of these strata, night and day, has specific

*Reprinted, courtesy of *Signals*.

electrical characteristics and density and will affect electromagnetic propagation in a manner peculiar to itself. That is one reason why different frequencies are chosen for particular types of communication.

Radio waves at high frequencies travel in straight lines like light beams. If they were not reflected by the ionosphere they would not follow the earth's curvature as they do, but would shoot off the horizon into space. Radio frequencies are chosen to best reflect from a most suitable ionospheric layer back to the earth's surface, where they rebound to the reflecting layer, completing the cycle continuously en route to the receiving station. This skipping "sky wave" is sometimes named according to the number of hops and the layer used for reflection: "two hop E's," or a "four hop F." Since transmitting antennas radiate at all angles, an infinite number of sky waves are constantly in motion, reaching the destination with a varying number of hops, dependent upon the angle of radiation. Although only microseconds are involved, there is enough time for phase shifts and under certain conditions the staggered waves will cancel out at the receiver. This phenomenon is the "selective fading" common in short-wave reception.

Meteorology

Many factors affect the character and reliability of radio reception. The useful science of meteorology strives to define these changing conditions in order to furnish one of the most important links in the maintenance of radio communications. To this end, the modern meteorologist seeks to detect in the air and in layers surrounding our planet new effects or variables heretofore unknown that will go far beyond the past knowledge of these regions.

At White Sands meteorology will be served by instrument-carrying rockets like the "WAC Corporal," which is shot into the lower ionosphere and will transmit information about the temperature, pressure, composition of the air, and the electrical characteristics of the C and D layers.

But the ionosphere is important not only for the effect on radio transmissions and possible passenger-carrying space ships, but because of its vital influence on human existence. The ionosphere protects the earth and its inhabitants. It is an insulating medium; without its filtering action the sun would probably instantly roast us. Solar radiations, which are the basis of all organic life, contain certain ultraviolet rays capable of burning us to a crisp without the dampening effect of the ionosphere and the lower atmosphere.

The Rocket

If the time ever comes when a rocket is built to leave the earth for the moon or one of the planets, problems arising from penetration of these peripheral layers will have to be considered. According to Dr. Michael Ference, head of the Meteorological Branch of the Signal Corps Engineering Laboratories, "one of the most important problems that has plagued meteorologists for years has been the nature of the atmosphere at the very high altitudes of approximately 100 miles or higher. Scientists have long been trying to determine the density and pressure of the air at these elevations and from such measurements make deductions as to the temperatures that may exist. *Rather indirect evidence* has indicated that temperatures may reach values as high as 1000 degrees absolute."

The meteorological sounding rocket such as the Signal Corps expects to use at White Sands becomes important in upper atmospheric studies because the data it secures is a check on theory. For example, beyond the C region, 25 miles above the earth, only 1/64th of the total weight of the atmosphere remains. The entire atmosphere, all 300 or so miles of it, presses down upon the earth's surface and the atoms and molecules composing it are all packed tightly together at ground level, while similar particles in the far upper levels are widely scattered. Molecules and atoms of oxygen, nitrogen, helium and the many other gases which make up the atmosphere in varying proportions, are packed tightly together by the weight above them; the most dense portion being at ground level.

The density is a measure of the distance each atom or molecule must travel before colliding with its neighbor within a gas. With temperature and pressure known, physicists can calculate the average distance such particles will travel, and this "mean free path" is a factor in understanding the structure of the atmosphere. When meteorologists know the exact significant values of the atmosphere's characteristics at all levels, and rockets help to reveal just how filtering of solar radiation occurs, long-distance forecasting and weather control will be much nearer to realization.

It should be obvious, therefore, that the rocket experiments at White Sands far transcend their military significance. Signal Corps equipment carried by rockets will help in an understanding of solar, lunar and stellar radiations. Sounding rockets will carry instruments capable of precise and rapid measurements and which will be ejected at the top of the trajectory and probably suspended from fireproof parachutes made of asbestos and spun glass. These precautions are necessary because a free fall from such altitudes would destroy an ordinary 'chute because of the friction encountered in the dense lower levels.

Upper atmosphere studies, as highlighted by the experimental rocket firings at White Sands, are part of the scientific era—the first feeble gropings into the Atomic Age. They are but the beginning. Soon the V-2, the WAC Corporal and other rockets will seem as primitive as Stephenson's locomotive or Langley's flying machine are today.

The Fort Bliss ROTC Summer Camp

By Colonel E. W. Timberlake, CAC

The postwar ROTC program with its attendant high academic and practical standards as well as its contemplated increased integration of ROTC graduates into the Regular Army has given impetus to ROTC training throughout the Army.

Upon receipt of the notification letters that the ROTC camp was to be held at Fort Bliss, detailed plans were initiated to include every phase of camp preparation, reception, processing and training of students. A compact self-containing barracks area (old WAC) providing administration headquarters, supply, housing and mess facilities in the geographical center of Fort Bliss' training, administrative and recreational activities, was chosen and rehabilitated. The arrangements were completed two weeks prior to the opening of camp and the Executive of Training and his Chief of Staff, who had reported on 1 June 1947, together with a trained post administrative overhead were moved into the area on 10 June 1947, prepared to start instruction smoothly and efficiently. Recreational and athletic activities, to include three dances at the Officers' Club, trips to Chihuahua City, Carlsbad Caverns, White Sands Proving Grounds, and bull fights in Juarez City, were planned and executed. Softball, bowling, volleyball, baseball, tennis, golf and swimming competitions were staged during the course of the camp. Suitable individual and team trophies were awarded.

A total of ninety-three advanced course AAA ROTC cadets (96% combat veterans) reported to this camp on 21 June 1947 and cleared camp on 2 August 1947. Twenty-seven cadets from Utah State Agricultural College, twenty-six cadets from University of San Francisco, twenty-one cadets from University of California, fourteen cadets from Agricultural and Mechanical College of Texas and five cadets from University of California at Los Angeles comprised the group.

The training of cadets was intensive in character and was conducted in clearly defined stages according to a progress scheme of instruction which supplemented and followed in progression the first year of the advanced course at their institutions. Applicatory methods were used and subjects were presented by demonstrations, application by individual, team performance, examination by performance, tests and problems, followed by a critique with student participation to develop initiative and leadership. All students were rotated under careful supervision in positions of responsibility and command.

The technique of firing individual and/or crew-served weapons was stressed by demonstration troops of the 267th AAA Group. Advantage was taken of the superior training facilities existent at this center as well as expert instructors from the Artillery School, White Sands Proving Grounds, and AGF Board No. 4, who supplemented the regularly assigned ROTC instructors. The ten per cent deviation authorized from the training program was utilized in sixteen hours of instruction in guided missiles and recoilless weapons, four hours of electronics and four hours of use of antiaircraft weapons in the ground role, *i.e.*, field artillery. There were no major deviations from the approved training schedule of the camp.

ACCOMPLISHMENTS.

a. All cadets qualified in marksmanship with an unusual percentage of experts and sharpshooters.

b. All targets presented at the 90mm AAA practices in the field artillery role, and in the antiaircraft role, were destroyed. These included moving ground targets, towed sleeves and P.Q. radio-controlled planes. Targets were similarly destroyed in the automatic weapons practice in ground and air roles.

c. There was a net increase of ten pounds in weight per cadet.

d. Cadets upon arrival were given officer status with attendant privileges and responsibilities. This was most favorably received and acted upon by the cadets. The camp under these conditions proved an ideal testing ground in the determination of social and other necessary character traits essential to commissioned officers.

e. Cadets were thoroughly indoctrinated through precept and example with postwar army standards of leadership, living conditions, responsibilities and privileges.

f. Cadets were given the highlights of postwar army progress in research and development with a view to further disseminating this information in their respective communities.

g. An excellent course in guided missiles preliminary to the regular course to be given by the AAA & GM Branch of the TAS at Fort Bliss next fall was given to the cadets with instructors from the Artillery School, AGF Board No. 4, and from White Sands Proving Grounds collaborating. A zest was added to this course by the observation of two V-2 firings at White Sands Proving Grounds and by an informal conference with Dr. Von Braun, the designer and builder of the original V-2 (A-4-5-6-7-8-9), and other leading German physicists. In addition to the regularly assigned ROTC instructors, some thirty officers from the AAA & GM Center were utilized in training of ROTC cadets.

h. That the season was a success is officially borne out by the commendations of all inspectors and there is no question that the first postwar ROTC camp at Bliss reinstigated summer training of cadets in a most auspicious and progressive manner.

MEET THE NAVY

By Leonard J. Grassman

Despite a history almost as long as our Nation's the United States Navy, its customs and its traditions are great mysteries to non-Navy people. And despite the Navy's great wartime establishment, and still extensive peacetime structure, the average Army man's knowledge of the Navy is either an impression or a series of impressions gained through casual acquaintance with Navy personnel, brief conversations with sailors, or gained while experiencing transportation aboard a Navy vessel. Those few Army people who know the Navy well are those who have had the opportunity of serving on some joint Army-Navy activity.

The U. S. Navy Department, in organization, personnel, and activities, are all patterned after similar elements aboard ship, and designed for but several specific purposes—to keep the ship operating, to guide it on its missions, to provide for it and to nurse its wounds.

One could go into a ten-thousand-page analysis of the Navy, tracing each and every specific characteristic of the Navy or a component of it, and come up with the same result. The Ship is the foundation of the Navy. However, it is not necessary to go into such an analysis. Upon realization of that simple fact, anyone has achieved the key to the understanding of the Navy and its personnel, and their customs, language and tradition.

The day of unification of our Armed Services has arrived. True, the unification is a high-echelon affair, but as the mutual dependence, interdependability of the Armed Services among themselves and the Armed Services and the civilian populace grows—as it is doing and must in these times and in the future—the spirit of unification will grow, and understanding among individuals of the various services will grow, too. The key provides an excellent aid in understanding the Navy.

Consequently, it is not too far off when our "pride of service" will be submerged by "pride of result" from unified and co-ordinated effort; when one will stop saying: "We've got the best damned Army (or Navy, or Air Force) in the world," but ". . . the fittenist, fightinist outfit ya ever saw . . .!" And it will be a team—one which we need badly.

Much of the teamwork in the future will depend on this understanding. Resultingly, it behooves every soldier to understand the seagoing members of the team. It is therefore hoped that this article will serve as an aid toward a better understanding of the Navy. Only the surface of the subject is scratched in this article since an attempt at a comprehensive coverage in a magazine of the JOURNAL'S constituency would be impossible. If it serves as an introduction and a stimulant it will have performed its mission.

THE NAVY IN THE FUTURE

Headlines of postwar 1946 presented one of the most romantic but confusing panoramas ever known to man. They portrayed fantasy as military logic, imaginative dreams as military planning, and, all in all, it was a year which saw the impossible possible and the imaginative promised as our National Defense. Although they made nice reading, these headlines jumbled the issues at hand, and, in many ways, cost much in time and effort toward gaining the appropriations and legislation necessary in maintaining a sound military policy and the maximum in national protection.

The year 1947 saw the demise of the foolhardy notions and the air cleared for more sensible planning, and much progress has been made. However, many scars remain from the fantastic portrayals of yesteryear, one of them being the role of the United States in the future.

There are still a great number of people who, convinced that "push-button" warfare is just around the corner, question the wisdom of maintaining a strong Navy, which, according to the "Buck Rogers" enthusiasts, is obsolete. They wonder if we maintain our huge Navy to preserve a worthy tradition, loath to cast aside a military force which has saved our Nation so much in the past.

Gallant as the Navy tradition is, its life is not dependent on its fine history; it is retained in our military organization because now, more than ever before in our history, we need it. Contrary to those who claim Naval warfare is obsolete, our Navy remains our first line of defense, and, if war should come, with the science of warfare at its present stage of progress or within the next apparent stage of the science of warfare, the Navy will bear more of the brunt of war as the first line of defense than ever before in its history.

Before proceeding with the portrayal of the probable role the Navy will play in a future war, it is only fair to grant at least passing consideration to the arguments put forward by the push-button enthusiasts. It is certain that these men, most of whom must be recognized for their brilliance in the past, did not become enthusiastic without reason, and reasons there were aplenty. Our science of warfare, and our weapons of war had made such remarkable ad-

vancements during the war, it seemed likely that the whole picture of war would change drastically in the near future. That is possible but it is definite that such advancements are not generally achieved during peacetime. The stimulation of war and the tests war offers for weapons of war all tend to speed up the progress in warfare, cause new weapons to be invented; old ones to be improved. However, in peacetime, when genius is directed into other fields of endeavor, when moneys are appropriated for more humane benefits, such progress is retarded immeasurably. Consequently, it is safe to assume the advancement toward the rocket days will not be as rapid as we believed it might during the war. Equally true, peacetime productive facilities are not hinged to the production of the weapons of war and consequently limit advancement in that field.

In the future we will have faster planes with greater range and greater load capacity. Peacetime living demands that progress. Communications will progress equally, and our military research and development programs will reap newer, better, and more devastating weapons, but none of this will make what we have obsolete overnight. The process of obsolescence will be gradual—at a rate relative to the rate of progress in the perfection of new weapons. Consequently, as a nation, we must improve on our present weapons, and the Navy may develop into an arm of our services greatly changed from what it is. However, until our whole civilization is changed drastically—until most of our transportation is through the air, we will need our Navy in the defense of our Nation.

The true picture was amply presented earlier this year by Rear Admiral Paul F. Lee, Chief of Naval Research, when he stated: "The day of the 'push-button' war is not just around the corner. . . . The only component of the 'push-button' war which has been fully developed is the push button itself. All of the other components required for this type of warfare are still many years ahead of us. The fact of the matter is that today we do not possess the scientific knowledge which is absolutely essential for the development of the weapons which are to be controlled by the 'push buttons.'

"In considering the many problems associated with naval policy, one of the most difficult to solve is that of the emphasis which should be placed on the development of new naval weapons as compared to the maintenance of a fleet-in-being. But this is not a new problem. It has been present since the earliest days of our Government. However, it is more acute today, due to the increased tempo at which the world is moving and the tremendous importance which science now has on our security. This problem could be easily solved were we able to judge accurately, when, if ever, we would again be involved in war. But this we are not able to do. Twice in the 20th Century this country has been drawn into war by acts of other nations. Twice we have been forced to fight not at a time of our own choosing, but at a time our enemies have considered most advantageous to them.

"Should war come again it will come at the moment our enemies are prepared to make war and it will descend upon us without warning. This places a nonaggressive nation such as ours at a distinct disadvantage. Should war come in the near future it would be fought substantially with the weapons we used in World War II. Should it be delayed for a period of 20 years, it might well be fought with the so-called 'push-button' weapons. But at the time of the attack it will not be our choosing and we must therefore be prepared to defend ourselves at whatever time it comes.

". . . I wish again to emphasize that as of today, and for the immediately foreseeable future, the best defense this country has are those weapons with which we fought the closing battles of the last war. There is no scientific basis for the scrapping of these weapons. But we are desperately in need of new scientific knowledge in order to develop the new weapons which may some day make obsolete the ones we now possess, and it is imperative that we bend every effort toward the creation of this knowledge and these new weapons."

Recognizing these facts the Navy has entered into an extensive program in basic research. As early as March of this year, the Office of Naval Research had over 400 projects under way in 90 universities, nonprofit institutions and industrial laboratories. All fields of physical science are being explored as well as many in the medical sciences. Over 70 per cent of the projects are in universities and all are in the hands of thoroughly qualified scientists.

Consequently, one of the roles the Navy is playing now and will play in the future will be in the peacetime development, insofar as permitted by funds voted by the citizens of the U. S., of methods and elements of warfare. It doesn't discredit the idea of a remarkably different type of warfare —in the future—one which might make the Navy obsolete and, it will develop our Navy to the utmost to keep it superior and capable of combating weapons of the future.

Since the war, the Navy has advanced rapidly in some fields of armaments development. It has perfected a gasoline tank, self-sealing when hit by .50 caliber and 20mm projectiles. Also are the new three-inch automatic antiaircraft machine guns, designed to throw a heavier, faster, proximity-fuzed stream of fire into fast-flying aircraft and missiles.

Another advancement in "future" weapons is the Navy's fully automatic rocket launcher, which can maintain a continuous stream of accurately aimed five-inch rockets at a rate of about 40 per minute. The new automatic six-inch double-purpose mounts and eight-inch turrets for cruisers will make that craft more formidable than ever. The six-inch mount is the first rapid-fire antiaircraft gun of such large caliber. The eight-inch rapid fire triple turret, which is completely automatic from ammunition handling room to gun chambers greatly increases the fire power of heavy cruisers. It is capable of loading fuzed projectiles at all angles of elevation.

Naval aviation researchers, along with constant work in the perfection of aircraft, have been busy perfecting combat techniques, and have been successful in producing a new toss-bombing method, safer and more effective than dive bombing, rocket firing and strafing by aircraft. New high-velocity aircraft rockets give fast-flying planes the fire power of a destroyer.

Navy Bureau of Ships has been active in research and development, too. In May, it set up three organizations for the handling of nuclear matters, the Radiological Safety Section, Atomic Warfare Defense Section and the Nuclear

Power Section, all of which will work toward defeating the effects of atomic bomb attack and the protection of ships and personnel from such attack.

Naval researchers in the atomic field operate on the proven premise that to every weapon a counterweapon is developed. Whether this will prove true with the atom bomb is conjecture at this point, but Navy planners also can depend on the one weakness in the atomic bomb—its delivery. Despite fearful destructive effectiveness, the atomic bomb has the same limitations of our standard bombs—it must depend on some other element for delivery, an element not too hard to combat with a similarly effective element, *i.e.*, plane against plane; guided missile against a guided missile with an atomic warhead.

Relative to combating weapons of the future, the possible and probable guided missiles, the Navy has gone all out in the perfection of Radar. Recently, they have contracted for 100 new airborne radar sets for airplanes. The airborne radar set, which will provide pilots with positive safety and navigational checks when flying blind over hazardous terrain, gives indication of being developable for detection and interception purposes in combating guided missiles and enemy aircraft.

Advancing to meet the future, the Navy has ordered the 45,000-ton battleship USS *Kentucky* and the 27,000-ton battle cruiser USS *Hawaii* converted into the Navy's first guided missile warships. This conversion is progressing right now.

"The Navy's experiments with guided missiles have always contemplated eventual shipboard installation, although design studies were handicapped until the Navy had made more progress in the development of guided missiles," Vice Admiral E. L. Cochrane, Chief of the Bureau of Ships, has explained. "The problem parallels our studies of aircraft which necessarily had to precede the design of an aircraft carrier."

"Our recent progress in the field of guided missiles has been relatively rapid, and the Army, science and industry have made important contributions to the Navy's fund of knowledge. The design studies now being made for the *Kentucky* and the *Hawaii* together with the development of missiles guided by carrier-based aircraft, will lead to revolution in the striking power of naval warships. It is still too early to make any forecast of the ultimate design characteristics of these ships except that they will be guided missile warships."

Nearly 25 years ago, work was suspended on two battle cruisers pending design changes which led to their completion as the aircraft carriers USS *Lexington* and USS *Saratoga*, ships which gave invaluable service in World War II.

While major conversions of ships started in another role are expensive, these two big carriers proved the advantage of such a step in making new types ready for service test as soon as possible. Similarly, the first aircraft carrier in the Navy, the USS *Langley*, was converted from the outmoded collier, *Jupiter*, thereby permitting our Naval aviators to gain experience in carrier flight operations much sooner than would have been possible if the study of aircraft carrier tactics had had to wait upon the authorization, design and construction of a new ship.

Highly indicative of the role of the Navy in the future was Secretary of Defense, James V. Forrestal's testimony, as Secretary of the Navy, before the Senate Committee on Naval Affairs last year. Secretary Forrestal stated: "The Navy is a major component of the military strength with which this Nation must defend itself and to discharge its responsibility in the international maintenance of peace. In each of the past two world wars our enemies failed to control the seas. They were defeated. Their defeat, I believe, was made inevitable by their failure to control the sea lanes. In the future as in the past the key to victory and to the freedom of this, a maritime nation, will lie in the mastery of the seas and of the skies above them. Attacks upon us or by us must cross on, over, or under the sea. No enemy can reach us without crossing ocean areas, nor can we reach the enemy; neither can we join with our friends in the international enforcement of peace unless we can move across the sea. Therefore, whether peace comes to depend primarily on international cooperation or whether we must rely principally on our own strength—in either event, we shall need a Navy to discharge its traditional mission: control of the seas and the skies above them.

"The time may come when war will be waged without the transportation of men or materials or when such transportation can be achieved solely by air. We are not presently at that juncture in our plans or our reasonable expectations.

"So far as air attack is concerned, there is a fundamental principle which I believe every responsible official of the Government should accept. Security against air attack can only be achieved by denying to our potential enemies the base areas from which air attacks can be launched against us. This implies the maintenance of an over-all military establishment capable of protecting our military power overseas, quickly and decisively. To this end, powerful Naval forces are essential."

"Atomic power and guided missiles in no way weaken but rather strengthen this fundamental principle. The increase in range and deadliness of new weapons merely accentuates the necessity of plans for immediate advancement of our forward lines of resistance and offense."

In the hundreds of volumes written to declare the Navy obsolete, it is remarkable to note that all those who desired to scrap our Navy and prepare for the "Atomic Age," gave the Navy little credit for defense. It was apparent, in the considerations, that the Navy should sit in its oversized puddles and wait to be hit by atom bombs and guided missiles. Little consideration was given to the fact that the Navy could be improved to conform with the needs made mandatory in advanced scientific warfare.

That is, all but the Navy. . . .

Navy planners, as soon as possible with the end of hostilities, set about learning everything there was to be known about the bomb and guided missiles. Their experiments have advanced both fields perceptibly, and they have learned much from which the type of Navy necessary to combat these new weapons can be developed. Progress is being made all the way down the line.

In one field, submarine warfare, the Navy is making tremendous advances. In experimenting with "outsized" subs, the Navy is developing a system of transportation of troops,

which will enable us to send surprise forces to distant shores, quickly and safely—protected by the great mantle of many fathoms of water.

In that same field, the Navy is perfecting an exceptionally fine "forward thrust" for our guided missiles of the future and their possible atomic warheads. The newer subs give every indication of being good launching sites for such missiles.

One Navy man, Fleet Admiral William F. Halsey, retired, has gone on record as believing that such submarines, armed with guided missiles, may succeed the battleships and carriers as the backbone of the fleet.

In the years since the war, the Navy has shown in its planning and operations it is awake to the fact that one day it may be true that the Navy as we now know it may be obsolete, and rates a vote of confidence for the energy with which it has tackled the problem, giving every indication that if the fleet-in-being is going to become obsolete, the Navy, not the atomic bomb, will make it so—simply by producing a Naval force capable of combating the weapons of the future by superseding its present weapons with more adequate weapons.

It has ascertained many of the effects of the atomic bomb on ships and is now well on the way to devising methods of minimizing such damage or frustrating such attack. It is developing tactics and strategies which will make the ship a worthy opponent of the weapons to come.

With such progressive thinking in evidence, the U. S. if it backs such thinking, can be assured of a naval force superior to any which might ever appear on the seas. Our Nation will have a sea force quite capable of performing whatever missions charged to it in peacetime, and an inestimable bulwark in time of war.

In the foreseeable future, the Navy's job will be somewhat traditional. It will train the nucleus force and maintain its reduced force against emergency and for operations purposes. It will be one of our arms of intelligence, gathering massive information usable in peace and war. The Navy will exhibit the power of the United States abroad, indicating the Nation a good, powerful friend and ally to some; to others illustrating it unwise to attack the U. S. or, attempt to murder the peace of the world. It will, as it has, stand by as a moderator, frustrating unfair pressure on weak nations by foreign powers.

Through its research efforts, it will progress with the times, and, in the event of war, it will protect our coasts against attack. It will enable us, again, to seize advanced bases, if such are necessary. At sea it will detect and intercept air, sea, and submarine attack, and will assist in carrying our offensive across those seas to the enemy shores. If "polar" conceptioneers are right in their conjectures, our Navy will not be too occupied, but it will be a comforting thought to know our coasts are not unprotected.

Beyond the "foreseeable" future, it is anyone's guess. If the predicted gadgets become reality, it is certain, the Navy will have developed a few of its own.

If the science of warfare advances to that point where operations at sea are unfeasible—where air transportation is capable of assuming the full load—then we may see our Navy diminish in importance. But, that possibility is in the realm of conjecture and imagination—hardly a sound foundation for a national defense establishment.

The dreams of war by remote control, delivering mass destruction from a switch panel in South Jersey may become realities one day. However, until such realities become apparent on the horizon of time, it is well that the United States follow the advice of one of the Navy's saints, Commodore Oliver Hazard Perry: "DON'T GIVE UP THE SHIP!"

EDITOR'S NOTE: In the next issue we shall publish a similar article on the Air Forces entitled, "Meet the Air Force."

ARTIFICIAL METEORS*

Rockets Will Provide Tools for Interstellar Experiments

By Dr. F. Zwicky

Rockets will carry shaped charges to extreme heights from where they can be ejected at high speeds to escape from the earth's gravitational field.

The possibility of using rockets as carriers of scientific instruments has long excited the imagination of astronomers, physicists, and engineers. With the advent of jet propulsion and the construction of powerful rockets, this possibility has now become a reality and a tremendous development now in progress promises results of a nature hitherto unattainable.

Today we stand at the beginning of an era of an entirely new type of scientific experimentation. During the past, experiments were essentially confined to the surface of the earth. Of the happenings in the universe at large, we gained some very partial knowledge through the medium of visual light which acted as a messenger between the celestial bodies and the earth. Two very important things, however, were denied us.

In the first place, we could not observe the ultraviolet light, the X-rays, and the radiations of still shorter wave lengths which we know by inference to exist abundantly in the vast interstellar and intergalactic spaces. Neither could we directly record the corpuscular rays consisting of atoms, ions, electrons, protons, and so on, which we also know to be present in great intensity in the spaces between the stars and the galaxies.

Secondly, we had no means whatsoever to experiment with the various celestial bodies such as the moon, the sun, the planets, the stars, and other extraterrestrial objects. Rockets now promise to provide us with the tool to achieve the two goals which thus far we have not been able to reach.

Plans are therefore being laid for research with rockets. These plans include the following items:

1. Large primary rockets such as the V-2, as well as sounding rockets built in this country, are to be used to carry scientific instruments to great heights. With some of these instruments, the physical and chemical characteristics of the upper atmosphere can be explored. Other devices, such as small telescopes and spectrographs, Geiger counters, and so forth, are to record the electromagnetic and corpuscular radiations from the sun, from the stars, and from other celestial bodies.

More details on this type of research are to be found in "Upper Atmosphere Research," Report No. 1, issued by the Naval Research Laboratory. Important results have been achieved using German V-2 rockets at the White Sands Proving Ground in New Mexico.

2. Secondary rockets are to be built and launched from large primary rockets. If this is done at the proper heights where the velocities of the individual rockets are effective, it is hoped to reach heights of from 500 to 1,000 kilometers without too great difficulty. Telescopes, spectrographs, and electronic instruments from such heights will record the primary electromagnetic and corpuscular radiations which are present in interplanetary space but which, because of interference of the atmosphere, cannot reach the earth's surface.

For instance, at the greatest height of about 200 kilometers attained by the V-2 rockets, enough air (nitrogen and oxygen) is still left to absorb most of the light in the far ultraviolet. If radiations from the sun and from the stars in the wave-length region from 1,000 Angstroms to one Angstrom or less are to be recorded, it is necessary to reach heights in excess of 200 kilometers.

Very novel results may be expected at such heights. By inference, we know that there exist many very hot stars with surface temperatures in excess of 100,000 degrees Kelvin. These stars, which emit relatively little visual light, may actually be the brightest objects in the sky. Observers tied to the earth, figuratively speaking, are doomed to the rôle of blind men since the interfering atmosphere prevents them from seeing most celestial objects in their true nature.

Rocket-borne telescopes, therefore, are destined to relegate earth-tied telescopes, no matter how big and powerful, to a secondary rôle. To open up undreamed-of vistas, the construction of very high-flying rockets is imperative and should be undertaken without delay.

3. The next step involves the launching of missiles which are capable of escaping from the earth's gravitational field and flying off into interplanetary space, never to return. Three possibilities suggest themselves. These are: (a) the use of nuclear (atomic) energy, (b) the construction of suitable multiple rockets activated through the energy liberated in powerful chemical reactions, and (c) the ejection of fast, small particles from shaped charges.

The first two schemes, (a) and (b), have been much discussed in recent years. The third scheme, (c), which has long been overlooked, actually is the simplest and now seems destined to provide the first practical realization of the ancient dream of sending missiles away from the earth.

These missiles, at the beginning, will be small, but much information can be gained from them.

While the fastest Ordnance missiles have maximum velocities of from one to two kilometers a second, considerably greater speed is needed in order to reach interplanetary

*Extracted by permission from *Ordnance*.

space. The escape velocity from the earth is 11.2 kilometers a second. We therefore need particles possessing kinetic energies per gram of about fifty to a hundred times those inherent in the fastest Ordnance missiles.

The explosion of properly shaped charges is capable of generating energies of this order of magnitude and to produce fast-flying particles which may be designated as artificial meteors. It was therefore thought advisable to experiment with the ejection of fast particles from shaped charges carried aloft by high-flying rockets. Information may thus be obtained in the following fields:

1. Supersonic and hypersonic aërodynamics. Since the particles ejected from the shaped charges have velocities up to fifty times the velocity of sound in the atmosphere, resistance characteristics of particles in the supersonic region (Mach numbers M = 1 to 6) and in the hypersonic region (M > 6 and up to 50) may be investigated. (Mach No. 1 is speed of sound.) No corresponding observations can be made in any of the existing high-speed wind tunnels which all operate below M = 5.

2. Physical and chemical characteristics of the atmosphere. Optical observations, both telescopic and spectroscopic, of the trajectories of the artificial meteors promise to furnish information about the air at all heights.

3. The artificial meteors are fast enough to circle the earth as "near-by" satellites. Some may even escape permanently from the earth's gravitational field and thus can be used to explore the interplanetary spaces. If the particles can be made large enough, their collisions, that is, the resulting flashes of their landings on the moon, on Jupiter, and other planetary bodies, are conceivably observable with present-day telescopic equipment.

Since we intend to operate in the "vacuum" beyond the earth's atmosphere, a swarm or jet of approximately parallel flying particles acts much as a unit body or meteor. This opens up the possibility of direct spectroscopic prospecting of the surfaces of the planetary bodies.

4. Since many of the artificial meteors may be expected to be electrically charged, they can serve as test particles to explore the electromagnetic field at great heights where combined gravitational and electromagnetic fields, in the absence of aërodynamic forces, determine their trajectories.

Subsequent to these preliminaries, a coöperative program was organized. While the representatives of the Ordnance Department agreed to the necessary night firings of the V-2 rocket, the task of making ready and installing the shaped charges with metal cone inserts in the instrument head of the V-2 was taken over by the Applied Physics Laboratory of the Johns Hopkins University, with Dr. J. A. Van Allen in charge.

The Ordnance Department furnished the shaped charges (rifle grenades) which were actually used in the experiments at White Sands after modification by personnel of the New Mexico School of Mines. The author organized the observational program and obtained the coöperation of the observatories at Tucson, Albuquerque, Flagstaff, and Palomar Mountain.

The first night firing of a V-2 rocket in the United States took place at the White Sands Proving Ground on the night of December 17, 1946. Unfortunately, the shaped charges did not ignite as intended, due to some unidentified failure of the firing circuit. However, the experiment will be repeated.

Much valuable information was nevertheless gained by the astronomers who observed the flight of the V-2 on the night of December 17th.

These results were principally as follows:

(1) Observation of fast particles ejected by the explosion, on the ground, of shaped charges fitted with metal cone inserts; (2) Direct telescopic recording of the jet of the V-2 rocket motor and spectroscopic observations of this jet; (3) Photographs of the trajectory of the V-2 after propellant cut-off by the light of the hot graphite steering vanes and the spectroscopic analysis of the light of these graphite rudders at great heights.

With suitable alteration of the shape and of the chemical composition of the charges and the inserts, we hope to achieve velocities of the fastest fragments of the order of 10 to 15 kilometers a second (50,000 feet a second). These velocities will be sufficient to produce artificial meteors which will go into satellite orbits of the earth or which, if properly directed, will escape from the earth, never to return.

Such missiles may then be used to bombard the moon and to observe the resulting flashes on impact. Spectroscopic analysis of these flashes will provide a method of exploring the moon's surface for its elementary chemical constituents. With large enough particles, the same analysis may be extended to the other members of the planetary system.

Assignment Of Radar Search Sectors To 90mm Gun Batteries In A Defended Area

By Lieutenant Colonel J. M. Culverwell, CA-Reserve

During the early stages of World War II, stress was laid in antiaircraft defense on the principle of all-around coverage, with some concentration on the "most likely avenue of approach." It was quickly found in the combat areas that the most likely avenue of approach, as far as enemy aircraft were concerned, was often the back door, or the way at first thought most unlikely, and so all-around defense assumed its rightful importance. To assure this coverage in the days of manually operated radars (SCR-268 is a case in point), search sectors were assigned by the headquarters directing the gun operations room, as arcs of so many mils, determined by the number of radars and their respective positions around the defended area.

Later, with the field use of radars having an automatic search or scan cycle such as the SCR-584, the assignment of arbitrary sectors as so many mils of azimuth was impractical, as this particular radar searched automatically in a complete circle in azimuth, and covered in its cycle a certain limited arc in elevation (360 mils in the case of the SCR-584). Consequently, search sectors were not generally assigned as a standard practice, except that area defense headquarters might direct that gun batteries "concentrate their attention" in those arcs which might have been assigned under the old arc system. As a matter of actual experience, this meant very little; it was a good general policy to set down which would be useful in a saturation raid. But it meant very little to battery commanders for most aerial raids. Lacking any prepared over-all search directive, they only naturally searched with their radars at low level in the hope of getting an early pickup, well out of range, coming in. As a consequence of this (and this happened on numerous occasions to the various defenses of which this officer was a part), hostile aircraft made an entry into the GDA without pickup until they were on the outgoing leg, sometimes well out of gun range. That this might have been caused indirectly by delayed long-range warning, or high-speed aircraft, or simply by dead time in the announcement of the long-range plot, seemed hardly to excuse the local defenses for failure to make a pickup simply because the target was already in the immediate area when the alert got fully under way. And so there resulted a reconsideration of the search capabilities of the radars, and of the problem of how they could best be employed *together* for search, with the assurance that the greatest possible area would be covered regardless of where the hostile target might be; restated, the solution sought for was one enabling the quickest possible pickup by a gun-laying, accurately plotting radar.

Consider first the space searched out by a radar such as the SCR-584. It is a space in three dimensions between two concentric, inverted cones whose apexes are at the radar. When set for low-angle search (0-360 mils), the radar reaches out to its maximum range; consequently, long-range search is best accomplished in this zone, and duty radars generally use it, properly so. But note further that there is a large cone-shaped volume centering directly over the radar which is not searched at all. At an altitude of 10,000 feet this blind spot is about 10 miles across; at 20,000 feet it is over 20 miles broad; and at 30,000 feet it is over 30 miles across. Now even with the radars and gun batteries placed on the perimeter of the defended area, such extensive blind areas might extend well over a defended area of average size. And a greater number of radars in the area, similarly located and following the same search tactics, won't remedy the situation at all. If for any reason the general warning is slow or incorrect, or the target does in fact get by the duty set undetected, then it may be over the defenses while they are hopefully, but a little late, watching for it coming in, and the radars not searching in his vicinity at all.

Now in the solution which the author proposes, the antiaircraft defenses will not be utterly dependent upon long-range warning. But let us assume here that such warning is available, and has been given. Then of all such data as that warning may furnish, the least precise is the target's position, generally because of the time lag in receiving it. And the most dependable, because it is less likely to change (an old, and still fairly reliable AA assumption), is the target's altitude, even if designated only as low, medium, high, or very high. Then we really have something to work on, a zone in the sky which for practical purposes we may call the altitude of the plane, a flat, plane area. And it is the complete search of this plane which this report sets forth can be done by a sort of radar porcupine, called into effect by the area defense commander at the outset of a raid to get the quickest pickup and most accurate plot.

What these porcupine radar zones shall be are controlled by two factors: 1) the number and location of the various

radars about the defended area, and 2) the altitude plane to be searched. Consider now the area searched out by any one radar at a particular altitude. It is the intersection of the search volume previously spoken of, with the plane of the target's altitude, or a flat area between the two concentric circles. The pre-raid determination then is how best to assign *vertical* search zones with the automatic SCR-584's so that as much as possible (and reasonable) of this blind zone over each radar can best be covered by overlapping. As a starter, the first principle should be that those radars closest to the center of the defended area should be assigned the lowest zones (0 to 360 mils, or thereabouts), and those farthest from the center, the highest zones (not necessarily to the highest limit of the set; more about this in a moment). At first glance this may seem unsound, as some pickup range would seem to be lost if the battery closer in picked up an in-coming target first; but remember that if the closer batteries are assigned the higher zones, the area they will search out may be so small that a high-speed target could pass through it before a search cycle had been completed. A second general principle to follow in assigning these elevated search zones is that all radars should be kept in as low a range as possible, and yet as much of the overhead blind area covered as is possible without unduly confining one or more sets. The best determination of these zones can be made with the use of paper disks cut to scale to represent the area searched at say 5,000 ft increments of altitudes at various elevation zones, in 100 mil increments for example, such as 0 to 360 mils, 100 to 460 mils, 200 to 560 mils, etc. They should be placed over each radar position on the gridded control board until the most reasonably complete coverage is obtained, much as one's effort at a carnival to cover a painted circle on the counter with three small disks. If there is to be any heavy overlapping, then reason will dictate that this be done farther out from the defended area, for reasons of target engagement.

After trial and error, the S-3 staff of the area defense commander may determine that the following vertical search bands cover all of the outlying area at an altitude of 15,000 feet (as an example), and also cover over 90% of the area over the defended area and over the otherwise blind spots of the radars themselves; further, they may determine that the simplest alert command to effect this coordinated search is: "All sites, Pickle, 15,000 feet," at which command, all radars are set to search these prescribed zones, and in effect the defenses as a whole are set to a search pattern which really covers the sky:

Hq Btry, 111th Bn:	0-360 mils (this set is close in)
A Btry:	0-360 mils (this unit is close in)
B Btry:	100-460 mils
C Btry:	200-560 mils (this unit has a limiting mask)
D Btry:	200-560 mils
Hq Btry, 222d Bn:	0-360 mils (this set is close in)
A Btry:	300-660 mils (this unit is farthest out)
B Btry:	200-560 mils
C Btry:	100-460 mils
D Btry:	200-560 mils

Note that although we have talked of higher elevation zones than those at which most batteries would normally search, nevertheless none of these sample zones above are so high when compared to the capabilities of the set, or so high as unduly to limit the search area swept by any particular set, and yet the area is very well covered. Naturally, as the target altitude becomes higher, these zones must become higher also, but with careful selection of the overlap, none of the sets need be set at the ultimate limit of over 1,000 mils angular height.

It should be stated again that these zones are only initial search zones. In determining them, and in prescribing them for coordinated search, the area defense commander is not usurping the duties or responsibilities of the battery commanders. They are determined for his use when there is reason to believe that the target is close in, or even over the defended area (as often did happen on hostile high-speed reconnaissance), and there has been no radar pick-up by the duty set. The area defense commander cannot, and should not be responsible for the individual search and firing of the several batteries, but it is believed that it most certainly is his responsibility to assure that any and all hostile targets are picked up and engaged as quickly as possible. Before this can be done, the target must have been tracked by an accurate, gun-laying type radar. And so this porcupine system for all the radars of the command will enable him to direct a coordinated search for that pick-up, and to search more completely than has heretofore generally been done. It is helpful that the determination of the proper zones for any defense area is a simple one to make and put into effect.

After the best zones have been determined for each of the 5,000-foot increments of altitude, then the S-3 staff should further study the coverage obtained by these settings at other altitudes. For example, how well do the zones prescribed for 5,000 feet cover the area at 10,000 feet, or how well do those prescribed for 20,000 feet hold for 10,000 feet, etc. A pre-raid study of this will avoid unnecessary changes in the porcupine during a raid.

Another important determination to be made is the use of the headquarters batteries' radar. Since these are always available for directed search (they need never track a target continuously except to assist a gun-laying radar to get on target), then how can these sets, when most or even all of the gun radars are busy tracking targets, best be employed for maintaining a fairly satisfactory umbrella over the area, acting as a guard while the gun radars are engaged? This is really quite an important determination. They will, as others, generally track too low unless directed.

It is interesting to note that the navy apparently had some difficulty with this same problem in the Pacific. Admiral Halsey tells, in his recent series of articles in the *Saturday Evening Post* entitled: "Admiral Halsey Tells His Story" how the Japanese managed at times to get by the navy radars. He tells how ". . . they were making a long, fast glide from high altitudes, through the nulls—blind spots—on the radars; . . . we countered this by sending the combat air patrols higher and farther. . . ." Note that there is no indication that they changed their radar tactics to meet the threat, but then perhaps this was due to some limiting characteristic of the navy radars. However that may be, there is nothing wrong with our SCR-584 which the application of a little solid geometry will not correct.

THE ARMY IN THE DESERT*

By Major Hal D. Steward, Cavalry

In the sun-baked desert of Southwestern Arizona, Army Ground Force members of Task Force Furnace completed their job in September. Since May they had been testing both men and equipment against the extreme hot weather and desert terrain.

A follow-up of Task Force Frigid, which tested men and equipment in the extreme Arctic cold at Fairbanks, Alaska, and Task Force Williwaw, which tested against cold wet weather on Adak Island in the Aleutian chain, the Army designed Furnace to test the third type of climate that would present major problems to military forces—hot and dry.

Located at Laguna Air Strip, which is 30 miles Northeast of Yuma, Arizona, and near the Colorado River, the task force had a strength of 300 men and officers.

Selected because of its hot and dry climate, Laguna Air Strip was considered by Army Ground Force experts to be the most suitable site in the United States for these particular tests.

Results of preliminary tests that have not yet been evaluated in their final form, have proven satisfactory in the most part, according to Lieutenant Colonel Walter B. Richardson, Furnace commander.

"Most equipment tested here in the desert of Arizona has stood up remarkably well," says Colonel Richardson. "The tests have been well worth the Army's investment."

Charged with testing the equipment at Furnace were test sections from three of the Army Ground Forces four boards. AGF Boards No. 1, 2, and 3 were represented with full-time staffs.

AGF Board No. 1 test section, headed by Major Thomas J. Bishop, tested signal equipment common to artillery and airborne equipment. One item of note checked at Furnace by this Board was a new and lighter type radio for forward artillery observers. This radio has an average range of about six miles, however, it actually has reached a range of 11 miles on cloudy days and nine miles at night. This Board section also tested an infrared airborne beacon, which is visible up to about two and one-half miles.

Another Board No. 1 item tested was the Helicopter XL-13 (Bell). It underwent motor heat and weather tests to see how it is affected by high temperature and sand. So far, after tests, it operates about the same in the extreme hot weather area as it does in a temperate zone. However, because of the dust, it needs a little more maintenance than normal. The Helicopter was also tested for possible use as an artillery observation plane.

Directed by Major Richard J. Grondona, the test section of AGF Board No. 2, the Armored Board, had 29 projects that it tested at Task Force Furnace. Tests conducted under this board's supervision were concerned with the general serviceability, comfort, and ability of armored vehicle crews to operate in extreme hot weather.

AGF Board No. 3 test section under the supervision of Lieutenant Colonel Clifford L. Woodliff was primarily interested in testing individual equipment and infantry weapons under the extreme heat. This Board tested about 50 items which included: food containers, mess trays, new type of Lister bag, rations, T-shirts, new combat boot, new type tropical helmet, new fatigue clothing, bath unit, mobile laundry, ice cream plant, kitchen tentage and truck, modified M-1 rifle, 60mm mortar with trigger, new 81mm mortar (with sectional tube and two section loose base plate), new heavy machine-gun tripod with recoil mechanism, and many others.

The soldier's uniform at Task Force Furnace consisted of a T-shirt, nylon or herringbone twill trousers, and a mechanic's cap. This uniform has proven so far to be the most satisfactory for the terrific heat and sand of the desert.

As part of the soldier's "desert uniform" of the future, a new three-ounce nylon fatigue uniform and tropical cleated boots with canvas "breather" tops were tested. Some of the Furnace soldiers also tested an "airflow" tropical helmet. Shaped like a Chinese coolie's headgear, it is made of canvas and protects the back of the neck.

Oddest test items observed at Furnace were two Canadian Snowmobiles that were sent by the Canadian Army for tests in desert sand and heat. Similar in purpose only to the U.S. Army Weasel (the reconnaissance tracked vehicle that performed so well in the Arctic), these Snowmobiles are being tested as the possible solution for an all-purpose, all-weather Army vehicle.

Contrary to what many persons would think, cases of sunstroke or heat exhaustion at Furnace were nonexistent. The general health of the task force was excellent, with only about 10 per cent of the command reporting on sick call for minor illnesses and injuries. No cases of snakebite were reported in the rattlesnake and gila monster infested desert.

Scientific studies were made to determine how the hot dry climate in Arizona compared with the information already known on the effects of hot weather upon men. Doctor Robert W. Clarke, a civilian physiologist, who is assigned to AGF Board No. 2 at Fort Knox, Kentucky, conducted the tests.

"Temperatures would have to go much higher in the Arizona desert climate before large-scale human physical failures would amount to anything," said Doctor Clarke.

It is also the opinion of Doctor Clarke, that marching soldiers cannot hike in the hot desert without water for more than four continuous hours. After that they would begin to stagger and fall because body fluids exhaust rapidly and dehydration proves fatal unless quickly corrected. It has

*Reprinted, courtesy, *Armored Cavalry Journal.*

been estimated by Furnace experts that the average soldier assigned to the task force drank about eight to nine quarts of fluid a day. About 90 per cent of this fluid escaped the body through normal perspiration.

Doctor Clarke also stated that, with the proper amount of fluid, tank crewmen in their vehicles could go all day under the burning sun at temperatures averaging around 115 degrees above zero without losing any great degree of efficiency. Water of a temperature about 60 degrees is considered best for drinking by persons operating in the extreme heat. As a rule, the drinking of ice water in the extreme heat is considered injurious, however, it didn't seem to have any ill effect on the Furnace soldiers. No one became ill enough from the drinking of ice water to be hospitalized.

The M-44 armored personnel carrier with a full load of men (27) might generate in two or three hours enough humidity inside the carrier from body moisture to be dangerous in extreme hot temperatures. This, however, is still just a theory.

Water for Task Force Furnace was carried in pipes above the ground from the Gila Canal, located about four and one-half miles from the main camp. During the day the water became so hot that it was impossible to use it for bathing. At times it reached a temperature of 130 degrees in the pipes. Since 95 degrees is about the normal temperature for bathing the soldiers had to wait until the water in the pipes cooled in the evening before taking a bath.

The highest air temperature recorded at Task Force Furnace during its operations was 121 degrees above zero. However, the sand temperature at times reached near 150 degrees.

A somewhat lighter-than-standard diet has been found advisable in the heat. Experts estimate that a diet of about 2,400 calories a day per man would just about fill the bill. And this diet should consist of lots of fruits, fluids, vegetables, etc.

Experiences of Task Force Furnace soldiers will result in better ventilation for many vehicles, cooler tents, cooler drinking water from Lister bags made of porous material that lowers temperature by increasing evaporation, and many other improvements that will make the operations of military units more efficient in the desert wastelands that generate terrific heat.

ULTRAVIOLET SEARCHLIGHTS

A war-developed plan for landing planes on carriers in pitch-black darkness by the use of ultraviolet "invisible" light was never put into actual use because it was discovered that a few eyes can see this so-called invisible light.

The plan, perfect in theory but impractical in war, was revealed by Dr. E. D. Tillyer of the American Optical Company. In the plan, airplanes were to be equipped with searchlights sending out only ultraviolet rays. When returning to their mother-ship these rays would be used in locating the carrier.

The carriers were to be equipped with special reflectors each with a fluorescent button which the ultraviolet rays would cause to glow brilliantly. The diffused fluorescent light from each button would be collected by the complex curves of the mirror and concentrated through a special lens that would send a very narrow beam back to the plane.

This returning visible beam is so narrow that an enemy pilot, flying wing to wing beside the landing plane, could not see the fluorescent light outlining the carrier. Its spread after traveling more than a mile was only a few feet.

Tests made by University of Rochester scientists, who developed the reflectors, revealed that a few persons have eyes that can see the ultraviolet rays used although they are invisible to most eyes. An enemy pilot might happen to have this unusual ability. In that case he could see the beams sent out by the plane and locate the plane. However, he could not see the outline of the carrier unless he were directly within the path of the returning fluorescent beams.

Although the Schmidt-type correcting lens developed for use in the ultraviolet reflector could not, from a wartime standpoint, be used for that purpose, it is used in another instrument still held a secret by the Navy. A similar lens has been developed by American Optical scientists for use in television reception.

Ultraviolet waves are similar to ordinary light waves but are of a different length. They are beyond one end of the so-called visible spectrum, with its seven primary colors. Invisible infrared rays are just beyond the other end. These are often called heat waves, and they were used for "seeing" in the dark in the Army's sniperscope. By electronic means an observer was able to see an object otherwise invisible to the eye.

(Reprinted courtesy *Science News Letter*.)

68th AAA Brigade

(Continued from page 7)

quarters was moved from Guadalcanal to Bougainville, and all units assigned to the brigade were relieved from assignment. Units west of the boundary referred to were assigned to USAFFE (U. S. Army Forces in the Far East) and in turn to Major General W. F. Marquat's 14th AA Command. These units were then attached to the XIV Corps and further attached to the 68th Brigade. The brigade lost the 117th Group and all units remaining at Guadalcanal and Russell Ids.

In August 1944, the brigade was alerted for the Leyte Campaign. However due to the fact that General MacArthur eliminated three steps from his plans for the invasion of the Philippines, the 32d AAA Brigade that had been alerted for operations in Mindanao was finally selected.

In September 1944, the 68th Brigade received information from the 14th AA Command that it would be attached to General Walter Krueger's Sixth Army as the senior antiaircraft command headquarters for the Luzon Campaign, antiaircraft units for the operation to come from Noumea, New Guinea, the Solomons and Emirau Island.

More than 3000 miles of travel was required to make one visit to each unit, consequently brigade headquarters could do little to prepare units for the operation except for those at Bougainville and Emirau. However, conferences were held at Headquarters, 14th AA Command, at Headquarters Sixth Army and at XIV and I Corps and several visits were made to each unit to determine their shortages in equipment. SOP's were revised to conform to Sixth Army policies and plans were prepared for antiaircraft support of the operation.

In anticipation of a wet landing on the Lingayen Coast all motor vehicles that were to travel on LST's were completely waterproofed. SCR 584's were completely waterproofed and sealed but due to a critical shortage in waterproofing materials, other equipment was splashproofed only. Ninety millimeter guns were moistureproofed by a team composed of Ordnance personnel from Frankfort Arsenal who were on duty with the brigade.

As a rapidly moving situation was contemplated, K-60 Vans were furnished to brigade and group headquarters for use as radio vans and mobile AAOR's. Two SCR 543's, one SCR 188, one SCR 177, one SCR 245 and a switchboard were installed in the brigade radio van. The 144th Operations Detachment was furnished a trailer type K-32 van for a mobile AAOR, in which were installed two SCR 188 radios, an operations board, AWS board, status board and a raised platform for the AAOO. This equipment proved invaluable in the rapid move of the XIV Corps from Lingayen Gulf to Manila. Certain other additional equipment such as extra motor vehicles, bulldozers and communication equipment, was authorized by the two corps and by the 14th AA Command.

The XIV Corps convoy moved from Bougainville on 16 December to the vicinity of Lae, New Guinea, where it picked up the 40th Division and the 209th AAA Battalion (Self-propelled) and then joined the balance of the Sixth Division Convoy at Manus Island.

There was little enemy air activity over the convoy en route to the objective area until Philippine waters were entered. Automatic weapons had been emplaced on the decks of all ships to supplement the ships' antiaircraft and several Jap airplanes were shot down en route, three of which were officially credited to the 951st and 469th AW Battalions. Several bombs were dropped near ships of the convoy, one hitting an aircraft carrier that was seriously damaged with the loss of some members of the crew.

Initial Stages of the Operation

In the Sixth Army attack plan, I Corps with the 6th and 43d Infantry Divisions attached, and XIV Corps with the 37th and 40th Infantry Divisions attached, were employed as assault troops. In reserve were the 25th Infantry Division and the 158th Regimental Combat team. The mission of the assault forces was to secure beachheads in the Lingayen—San Fabian—Rabon areas and then launch an attack to secure the Central Plain and the Manila area. The Corps were to land abreast, XIV Corps on the right and as rapidly as possible to consolidate and form one beachhead. The antiaircraft troops were assigned the mission of reinforcing ships' antiaircraft afloat and upon landing to furnish antiaircraft defense for landing beaches, air strips, bridges, supply installations, troop concentrations, and other vital objectives.

All antiaircraft units for the operation were 14th AA command troops. On 20 November 1944 they were attached to Sixth Army and further attached to Corps and Divisions for the water movement and initial landing.

S-Day Landing (9 January 1945)

The landing on S-Day was practically unopposed by enemy ground forces though artillery fire was received by units landing on the I Corps beaches. The greatest difficulties encountered in landing resulted from the heavy surf and unsuitable beaches. Most landing craft beached a hundred to a hundred and fifty feet from the shoreline and debarking troops and equipment went ashore through water up to five feet in depth. The waterproofing of vehicles saved most of the antiaircraft vehicles loaded on LST's as they rolled ashore under their own power. Unloading from LST's was complicated by the heavy surf and swift current. Pontoon barges used as unloading causeways were swept sideways, in many cases causing innumerable delays in getting rolling stock ashore. These difficulties prevailed throughout the first few days of unloading on the western beaches and delayed the landing of much antiaircraft equipment. An advance echelon of Brigade Headquarters and of the 144th AAA Operations Detachment landed on S-Day and began to set up communications for the AAOR.

Initial Defense of Beachheads. Twenty-four machine gunners with eight water-cooled .50 cal. machine guns from the 470th AAA AW Battalion landed on the I Corps beach with the first wave of assault troops and established an initial antiaircraft defense of that beach. The I Corps beachhead had one 90mm gun battery, three searchlights and the equivalent of six automatic weapons batteries in position and ready for action by the night of S-Day. The 198th AAA AW Battalion killed four Japanese snipers during the landing, these being the first enemy casualties from ground action by landing forces. By the night of S-Day, four searchlight and 2½ Automatic

Weapons batteries were emplaced on the XIV Corps beachhead.

Air Warning Service. Air warning service initially was furnished by the Navy, plots being broadcast in polar coordinates from a predetermined point. Additional air warning service was furnished in the XIV Corps zone of action by an early warning party of 251st AAA Group troops which went ashore with the first assault wave and established an air warning center with four OP's. SCR 300's furnished by the Signal Corps provided communication for this air warning net. The Navy prescribed alerts and controlled fire until 1800, 17 January 1945 when the Air Corps controller took over. Navy terminology for alerts and status of fire control, was used throughout the operation.

Enemy air opposition on S-Day was directed against the shipping in Lingayen Gulf and consisted of several one and two plane raids, one plane being destroyed by 40mm fire from a section of Btry C, 198th AAA AW Battalion emplaced on the deck of a LST.

Conditions Affecting Initial Operations

The Lingayen area, assigned to the XIV Corps, was a vast expanse of fish ponds and rice paddies cut through with numerous rivers, creeks and irrigation ditches, the height of land above water level being insignificant in most cases. In the I Corps zone of action, while there were fewer of the objectionable fish ponds and rice paddies, most ground was very low and swampy. Such terrain was unfavorable for proper tactical disposition of the antiaircraft artillery units. Fortifications were affected by the high water table, built up revetments being necessary in almost every case. In few instances could any digging be done deeper than two feet without striking water.

During the early stages of the operation, the entire beachhead area was congested with personnel, equipment, supplies and Filipinos and with convoys moving to the interior. This congestion was immeasurably increased by the great number of bridges destroyed, many of which had been demolished in the American retreat in 1941-42. Pontoon bridges were constructed as rapidly as possible by the Engineers and ferries were operated on some crossings; however travel from one point to another always involved excessive time. The wide dispersal of antiaircraft artillery units called for continual reconnaissance and inspection which was rendered difficult and arduous by the existing road conditions.

Because of the character of the landing beaches, the large amount of shipping involved and changes in priority due to limited enemy air opposition, the originally planned schedules for debarking antiaircraft artillery units collapsed completely early on S-Day, many S-Day units and equipment not being unloaded for several days. Later echelons were even longer delayed.

Radio communications were extremely difficult to maintain during the early stages of the operation. Most of the Army and Navy units in the area were using high frequency channels and assigned frequencies did not have sufficient spread to eliminate interference. Wire communications were difficult to install and more difficult to maintain. However wire was laid to the 251st Group on S (landing) Day, and by S+3, telephone lines and radio communications were in to Sixth Army, XIV Corps and to all antiaircraft units (except the 197th Group which had radio communication only due to the fact it was some 25 miles distant).

The 35th Fighter Control Squadron landed on S+2 and established a fighter control center (FCC. This abbreviation was used throughout the campaign to designate the Active Air Defense Control Center) at Caloocan, and the Brigade AA operations room was established in the same building. However the Army did not take over control of the Active Air Defense until S+8. On S+2 the brigade assumed responsibility for the antiaircraft defense of the entire beachhead area and for alerting all ground units of the Army when air attacks were expected.

Because of the important part it played in the operation, mention should be made at this time of the technical assistance furnished the brigade. Early in 1944, Frankfort Arsenal sent a team of five officers and enlisted men to Guadalcanal to study ordnance conditions in the field. This personnel was with the brigade for about six months and was then replaced by another similar team which included specialists on all types of AA Ordnance equipment. This team, after spending about six months inspecting and repairing equipment and instructing key personnel, at their own request accompanied the brigade to the Luzon operations. They rendered outstanding service in keeping brigade equipment functioning.

During the first week of the operation, the 14th AA Command furnished radar maintenance, mobile searchlight, IFF and Gun and AW instruction teams and sent Mr. Henry Abajian, radar expert from the MIT Electronics Laboratory, to accompany the brigade into action. Mr. Abajian was no stranger, having spent considerable time with us in the South Pacific instructing radar personnel and working on our equipment.

On 20 January 1945 all antiaircraft artillery units on Luzon were detached from Corps and attached to the 68th AAA Brigade which was charged with all antiaircraft defense for the Luzon Operation. As the campaign progressed southward, the mission of the Antiaircraft was expanded to include the Clark Field and Manila areas and the long supply routes from the Lingayen Gulf to Manila.

The 251st AAA Group with the 70th AAA Gun Battalion, 469th AAA AW Battalion and 373d AAA Searchlight Battalion attached, was originally assigned the defense of the Lingayen Airstrip and bridges and other installations in the Lingayen-Bimmaley area.

The 197th AAA Group with the 161st AAA Gun Battalion, 198th AAA AW Battalion, 707th and 708th AAA MG Batteries (Sep), and the 222d AAA Searchlight Battalion (—A & B) attached provided defense for the Mangaldan Airstrip, bridges, unloading beaches, supply dumps and other important installations in the Dagupan—Mangaldan—San Fabian area. The 470th AAA AW Battalion with Battery B, 209th AAA AW Battalion (SP) attached was directed to provide antiaircraft defense for I Corps during its advance and the 209th AAA AW Battalion (SP) (—B & D), to furnish antiaircraft defense for the 13th Armored Group in its zone of action.

The initial Lingayen Gulf antiaircraft defenses extended

Men of the 161st AAA Gun Battalion load a 90mm gun for shelling Jap positions in Balete Pass, Luzon.

more than 40 miles along the beach and included two airfields; a considerable number of highway and railroad bridges in the vicinity of Lingayen, Dagupan and San Fabian and many unloading points and dumps. At no time was there sufficient equipment on hand to give proper protection. However, due to the thorough job done by General Kenney's Far Eastern Air Forces and by planes of Admiral Halsey's Third Fleet in destroying Japanese air installations, and the fact that Japan was conserving her air strength for defense against the expected invasion of Japan, air attacks in the Philippines were light and infrequent.

The Advance To Manila

A Brigade Forward Echelon was formed at this time to provide liaison with the advancing Corps, to furnish air warning and to coordinate antiaircraft activities in the forward zones of action. The 209th AAA AW Battalion (SP) and 951st AAA AW Battalion were detached from their respective groups and placed under direct control of the Brigade Forward Echelon. The mobile operations van of the 144th AAA Operations Detachment which was also included, operated in conjunction with a mobile FCC of the 35th Fighter Control Squadron that accompanied the Forward Echelon. The mobile FCC consisted of an operations and radio van, two transmitter vans, mobile signal air warning radars and one SCR 584. It maintained communication by radio with the FCC at Caloocan.

The Brigade Forward Echelon, under the command of Colonel Preston Steele the Brigade Executive Officer, departed from the Brigade CP at Caloocan on 22 January 1945 (S+13). The initial CP was established near the XIV Corps CP at Tarlac, one of the towns that had been burned to the ground by the retreating Japanese. As the I Corps advance was very limited because of determined enemy opposition in the hills north of the Central Luzon Plain, the Forward Echelon moved forward with the XIV Corps which advanced swiftly south through the Central Plain to Manila, arriving on 8 February.

The initial missions of the antiaircraft units in support of the XIV Corps included antiaircraft and local (ground) defense of highway and railway bridges and supply dumps along the route. With the capture of the Novaliches watershed pumping station and pipe lines that furnished water to Manila, a self-propelled AW battery of the 209th Battalion was committed to its defense. In a two-hour action on the second day it was credited with killing 24 enemy soldiers in a successful defense of the waterworks. In the Manila area the bridges over the Pasig River were given high priority in antiaircraft defense as they were subjected to many enemy artillery and local attacks during the Battle of Manila. Protection was also furnished to the Queson Air Strip, Nichols Airfield and at New Bilibid Prison where Americans released from the Japanese prison at Los Banos, were quartered.

In the rapid move of the XIV Corps to Manila, the great superiority of self-propelled antiaircraft for such operations, was plainly demonstrated. The 951st Semi-mobile AW Battalion had to do much back tracking to keep all equipment in proper defense positions. This involved greater use of highways and of fuel and caused greater fatigue of personnel involved. On the other hand, the 209th Self-Propelled Battalion could keep up with other convoys, fight on the march and operate with little or no backtracking.

The XIV Corps, after its initial sweep through the Central Luzon Plain, encountered determined enemy resistance from well dug in fortifications and from elaborate caves that honeycombed the hillsides in the hilly country east of Manila and in the hills west of Fort Stotsenberg. To augment the Corps Artillery, the 518th AAA Gun Battalion, then attached to the 14th AAA Group, was sent to Manila on 16 February on a terrestrial fire mission. One battery of this battalion furnished support for the 40th Division at Fort Stotsenberg, where it was employed to destroy enemy troop concentrations, fortifications and caves in close proximity to our own troops most of this fire being conducted at ranges of from 2500 to 10,000 yards. Air bursts, using time fuzes, were found to be extremely effective against enemy troops on mountain roads and trails. By 7 March, the infantry had broken through stubborn enemy defenses and this battalion was returned to the 14th Group at Clark Field.

On 22 February, the 14th AAA Group, Colonel J. H. Pitzer, Commanding, was assigned the mission of the defense of four of the Clark Field runways and of establishing a Group AAOR at the 51st Sector FCC at Angeles. The defense included initially only the 471st AAA AW Battalion but was later reinforced by the 518th AAA Gun Battalion and elements of the 373d AAA S/L Battalion. As air action was limited, offensive action on the part of antiaircraft troops consisted principally of repelling small enemy raiding parties from the hills to the west.

The Fifth Air Force became increasingly concerned over the necessity for antiaircraft defense of the Nichols Airfield at Manila which was in constant use by combat and cargo planes. Accordingly the 251st Group, commanded by Colonel J. B. Carroll, with the 951st AW Battalion and elements of the 373d S/L Battalion, were sent to Manila on 6 March to initiate the defense. No guns were available for this defense nor for the defense of docks in the Manila area until some time later However troops in their

AW defense positions around the airfield proved valuable in combating numerous raids by small groups of enemy troops that occasionally infiltrated through our lines from the near-by hills to the east.

Reorganization of Lingayen Defenses

With the departure of the 14th Group for Clark Field and of the 251st Group for Manila, the 197th AAA Group commanded by Colonel Carter took over defense of the entire Lingayen Gulf area. Enemy air attacks consisted for the most part of harassing raids at night during periods of moonlight. Air strikes were directed mainly against the Lingayen and Mangaldan airfields and the supply dumps in the San Fabian area. Only single plane raids were made in all cases except one, the exception being a four-plane low-level attack on the Mangaldan field on 2 March which damaged several of our planes, killed two men and wounded some 40 others. The 198th shot down one plane and the 161st destroyed one and damaged another.

With the exception of antiaircraft troops, there were practically no combat troops in the Lingayen area nor in the Central Plain, antiaircraft and service troops being entirely dependent upon themselves for local protection against enemy infiltration attacks, and enemy soldiers bypassed by our infantry in its rapid advance southward and eastward. During the period of 20 January to 15 March, antiaircraft troops had thirty-eight ground contacts with enemy troops, most of which were close-range fire fights against attacks on our gun positions. The number of enemy troops varied from one to as many as thirty in each attack, the usual number being seven or less. As of 15 March, 68th Brigade troops in local ground actions had killed 121 enemy soldiers, wounded one and captured six.

Operations 15 March to 24 May 1945

During the first half of March the 102d AAA Brigade and other AAA units landed in Manila or were in the harbor waiting to unload. On 15 March 1945, Sixth Army issued orders dividing the defense of Luzon between the 68th and 102d AAA Brigades. The latter at this time assumed the command of the antiaircraft defenses of the Clark Field, Manila, Subic Bay, Mariveles Bay and Corregidor areas. All 68th AAA Brigade units in those areas with the exception of the 209th AAA AW Battalion (SP) were relieved from attachment to the 68th AAA Brigade and attached to the 102d AAA Brigade. Of the newly debarked units, the 35th and 119th AAA Groups, 163d AAA Gun Battalion, 382d AAA AW Battalion and 277th AAA S/L Battalion (—B & C) were attached by Sixth Army to the 68th AAA Brigade. The Brigade was assigned the antiaircraft defenses of airstrips, dumps and bridges in the Lingayen Gulf area and in the Zones of action of I Corps, XI Corps and XIV Corps.

On 15 March 1945 the 35th AAA Group, Colonel Hardy, commanding, was assigned the mission of furnishing automatic weapons defense for the Lingayen and Mangaldan airstrips, unloading and supply points in the Dagupan—San Fabian area, and vital bridges in the Lingayen Gulf area. The group had only AW units attached. The 197th AAA Group continued to furnish gun and searchlight defense for the Lingayen and Mangaldan air-

Moving forward into Cordon, Luzon, half-tracks of the 209th AAA AW Battalion (SP) return severe Jap fire.

strips and automatic weapons defense for bridges in the I Corps zone of action. The Mangaldan airstrip was never hard surfaced and operations had to be discontinued when the first heavy rains fell in the middle of April. At this time, General Innes P. Swift, Commanding I Corps, requested antiaircraft units for ground support missions, so the lettered batteries of the 161st AAA Gun Battalion and the 198th AAA AW Battalion were gradually removed from the Mangaldan area and used to fill I Corps needs.

The last enemy air raid in the Lingayen Gulf area occurred on 22 March 1945 when three enemy planes entered the GDA and were engaged by antiaircraft. Three bombs were dropped on an ammunition dump near Rabon destroying five ammunition bays containing some 7000 tons of much needed field artillery ammunition. During the raid one plane was destroyed and one was damaged by antiaircraft fire. The only remaining aerial attacks occurred during the second week in April when, on several occasions, enemy fighters bombed and strafed our ground forces in the Balete Pass area.

During the last half of March, the Air Corps began using Laoag Airfield as an emergency landing strip and established a FCC there under the control of Detachment G, 86th Fighter Wing. This airfield was approximately 115 miles north of U. S. forces at San Fernando (La Union) but was in guerrilla-controlled territory and had a perimeter defended by Colonel Volkman's guerrillas. In April, fighter planes were based at the strip. Initial defense of the airfield was established during the first week in April by Btry A, 102d AAA AW Battalion. This battery had originally landed with the 11th Airborne Division at Nasugbu on 31 January 1945, but at the request of the Air Corps was detached from the division, transported by air to Laoag airfield and attached to 68th AAA Brigade. On 23 April two searchlight sections of Btry A, 227th AAA S/L Battalion were flown to the strip to serve as beacon lights, and as spread beam lights for the AW defense. The only addition to the defense for the strip was furnished the first week in May when the 708th AAA MG Battery (Sep) made an overland trip from San Fabian to Laoag, a road distance of about 160 miles, some of which was in close

proximity to Japanese forces and unprotected by our troops.

By the end of March 1945, guerrilla forces had secured San Fernando (La Unión) and Base M was making preparations to move from San Fabian to San Fernando, which was later the major port and supply point on the northwestern coast of Luzon. On 23 March the 119th AAA Group, Colonel Touart Commanding, was assigned to furnish gun, searchlight and automatic weapons defense for the San Fernando area. Attached to the group for this defense were the 163d AAA Gun Battalion, 227th AAA S/L Battalion (—B & C) and the 209th AAA AW Battalion (SP). The 163d AAA Gun and 227th AAA S/L Battalions at this time were aboard LST's en route to San Fabian, and the 209th was moving overland from the Manila area. By 25 March, the 209th had batteries A and B in the San Fernando area, Btry D furnishing defense for the bridges near Aringay and Bauang, and Btry C en route from Manila to San Fernando. The 163d and 227th had debarked on 23 March and moved into bivouac in the Mangaldan area. By the end of March these two battalions had moved to San Fernando and a complete antiaircraft defense for the San Fernando area had been established.

On the 15th of March 1945, the 382d AAA AW Battalion was assigned the mission of furnishing antiaircraft protection for the XIV Corps. Initially the battalion provided protection for the docks, bridges and supply dumps on Batangas Bay and at Lemery on Balayan Bay. During April and May, the battalion was used primarily to furnish ground defense around towns open to enemy infiltration attacks. From 15 March 1945 until its relief from the mission with the XIV Corps on 25 May 1945, the battalion had 60 ground contacts with enemy troops, during which it killed seventy-eight enemy soldiers, wounded six and took seven prisoners of war. The battalion casualties as a result of these actions were one man killed and two wounded.

The majority of ground contacts between 68th AAA Brigade troops and enemy troops during this period occurred in the XIV Corps zone of action, however, a total of nine contacts were made in the San Fernando (La Union) area and the Lingayen Gulf area. As of 24 May 1945, 68th AAA Brigade troops in ground action on Luzon had killed a total of 207 enemy soldiers, wounded eight and captured twenty-three. Brigade casualties as of 24 May 1945 were six killed and fifty wounded.

With the lack of enemy air opposition to operations on Luzon, antiaircraft units were available for ground support missions. The need for them continued to increase in the I Corps sector when determined enemy resistance from well dug in fortifications was met in the hills north of the Central Luzon Plain. The end of March found the 25th Infantry Division attempting to penetrate strong enemy defenses guarding the approaches to Balete Pass while on their left, the 32d Infantry Division was driving forward along the narrow, winding steep Villa Verde Trail in an attempt to outflank Balete Pass. The 33d and 37th Infantry Divisions, with the 37th on the left, were pushing toward Baguio from Route No. 3, between Damortis and San Fernando (La Union) to capture that strongly held Japanese key position. The attack was supported by air bombardment which, combined with our artillery fire, almost totally destroyed Baguio, the beautiful summer capital of the Philippines. Elements of the 163d and 161st AAA Gun Battalions and the 209th, 469th and 198th AAA AW Battalions supported these attacks. Battery A, 209th had been converted to 40mm guns by the 14th AA Command but the other three batteries had multiple .50 cal. only. Shortage of trucks and lack of road space hindered the movement of the semi-mobile units. To improve the situation, provisional platoons composed of half self-propelled and half semi-mobile 40mm guns were organized. By this arrangement both 40mm and .50 cal. fire could be delivered by all platoons and in emergencies, the self-propelled could act as prime movers thus increasing the platoon's mobility.

On 29 April, Battery A, 163d emplaced an SCR 584 along the Villa Verde Trail for the purpose of locating defiladed enemy artillery positions and succeeded in pinpointing one position. Accessory equipment for this purpose had been improvised and developed in the battalion. Similar work along this line was carried on with some success, under Captain Brown, assistant brigade radar officer at Balete Pass, using personnel and equipment of Captain Sherman's Battery A, 161st. The successful movement of these heavy unwieldy ten-ton radars and guns along Villa Verde Trail and to positions on the high ground southwest of Balete Pass, is a great tribute to the ingenuity and resourcefulness of battery and battalion personnel. The Villa Verde Trail is a narrow winding one-way dirt road cut from the sides of the mountain. It is full of hairpin turns and steep grades and became impassable even to a jeep during rains. The routes to position in the Balete Pass area were even worse. Most of them were hastily constructed for the purpose and in some cases were so steep that they could not be climbed even by jeeps. Equipment was moved to positions by tractors equipped with grousers.

Prior to 16 April, the ground support requirements of XI Corps were furnished by the 102d AAA Brigade, however, on that date the 68th AAA Brigade was ordered by Sixth Army to relieve the gun battalion of the 102d AAA Brigade that was with XI Corps. Initially, Btries B and C, 161st AAA were moved to the Laguna de Bay area for a mission of firing on enemy barges loaded with troops attempting to penetrate our lines. Btry D, 161st was used in support of the 6th Infantry Division which was pushing into enemy positions in the hills northeast of Manila. During the first week in May, the XIV Corps made a major shift of their ground forces in preparation for a drive to break enemy resistance in the hills east of Manila. The 43d Infantry Division, with Btries B and C, 161st attached, was placed on the left flank in the vicinity of Santa Maria (Bulacan), the 38th Infantry Division with Btry D, 161st attached, was placed in the center and the 112th Regimental Combat Team was placed on the right flank in the vicinity of Antipolo (Rizal).

The effectiveness of the antiaircraft gun support is indicated in a letter from the Commanding General, 43d Division Artillery to the Commanding General, 68th Brigade, concerning the 161st which is quoted in part as follows:

* * * * * * * * *

"Their capabilities in delivering fire on terrestrial targets have been of inestimable value in enhancing the operation of this division. Not only have they been used

for indirect fire missions but one piece under the command of Captain Chester F. Purcell was emplaced on the front lines of our infantry and was most effective in direct fire against pillboxes, caves, and other enemy fortifications."

* * * * * * * * *

On 14 May, *Time* Magazine wrote: "On Luzon they had discovered that the 90mm antiaircraft gun, with its high muzzle velocity and flat trajectory, makes an excellent cave-closing weapon. When the gun is brought into position, its accurate sights permit gunners to draw a sniper's bead on cave mouths thousands of yards away. In twelve days two guns closed over 100 caves on Balete Pass; one cave later yielded 23 Japs, dead of suffocation."

The 163d AAA Gun Battalion received similar letters from the divisions it supported. This battalion did outstanding work in ground support of the 33d Division in its drive on Baguio. On 14 April, one gun section of Battery A moved forward to provide close in support. The division had encountered damaging fire from enemy mortars entrenched on the forward slopes of hills in the foreground and had been unable to reach them with the division artillery. It was decided to try the flat trajectory 90mm AA weapons at short ranges (3700 to 11,000 yards). These guns proved their worth on the first night that they ranged the mountainside with harassing fire and for the first time the enemy mortars were silent all night. On ensuing days, the guns closed cave after cave, destroyed enemy guns and reduced Jap resistance generally in the path of the infantry advance and so pleased infantry commanders that on the final day of the attack, 30 April, it was asked to provide direct support for the attack on Bilbil Mountain, a strong point that had previously been by-passed. Lieutenant H. D. Highfill, Commanding the 90mm gun section, went up in a plane and spent several hours studying the terrain, circling back and forth until he had a clear picture of contours, cuts, ravines and bare spots. He then registered his guns on six suspected enemy strong points. When the attack got under way he was able to place fire from 100 to 200 yards in front of our infantry forward elements which were marked with colored smoke. Nearing the top, the infantry ran into Jap mortar fire from a position which they had encircled. Our troops were within 50 yards of the mortar on either side, however they expressed confidence in the accuracy of the 90mm gun and called for fire. The first round silenced the mortar and our infantry went in to finish the attack and the capture of Baguio.

Pursuant to the Corps' request an automatic weapons battery from the 198th AAA Battalion was attached to the 38th Infantry Division and one to the 43d Infantry Division. Battlefield illumination furnished by searchlights of the 227th proved highly successful in this operation and was enthusiastically greeted by front-line troops. The effectiveness of antiaircraft guns, automatic weapons and searchlights in support of field artillery and of front-line infantry, was commented upon most favorably in G-3 reports of Corps and division and in separate letters by the Commanding Generals of such units.

Operations 24 May 1945 to 30 June 1945

The Commanding General, Sixth Army, effective 0001, 24 May, passed to the Commanding General, Allied Air Forces, the responsibility for the antiaircraft defense of the Laoag Airstrip, and the antiaircraft defenses in the San Fernando (La Union), Central Luzon Plain, Manila, and Subic Bay areas. All of the brigade units, except the 144th AAA Operations Detachment; 35th and 119th AAA Groups; 161st and 163d AAA Gun Battalions; 198th, 209th and 382d AAA AW Battalions; and the 227th AAA S/L Battalion (less Btry B), were relieved of attachment to Sixth Army and the 68th AAA Brigade, and passed to the control of the Commanding General, Allied Air Forces. Brigade troops furnishing antiaircraft defense in the Damortis—Aringay—Bauang—San Fernando area were relieved of that mission by 1 June. For the balance of the operation, brigade units were employed solely in ground support missions.

In late April 1945 the 68th Brigade was notified that it would support Sixth Army operations in the contemplated invasion of Japan tentatively scheduled for 1 November 1945. Consequently a rehabilitation and training center was established at Luna (La Union) on the west coast of Luzon. With the exception of a few units still furnishing ground support of Sixth (and later Eighth) Army operations, all brigade units were moved to the Luna Camp. Refresher school courses were run for all officers and enlisted men. An airplane tow target squadron and a radio-controlled airplane target detachment were attached to the brigade. Firings and exercises of all types to include antiaircraft and field artillery firings and minor infantry tactics, were conducted. Training also included locating of enemy gun positions by radar, embarking and debarking from LST's, waterproofing of equipment and many other phases of preparation for amphibious operations.

The story of the 68th AAA Brigade in Luzon is largely one of front-line ground support of infantry assault divisions. For the first time in the Pacific war, extensive use was made of the high velocity, flat trajectory antiaircraft weapons as field artillery weapons and as infantry support weapons in close support of front-line infantry. Their accuracy, flexibility and mobility made them ideal weapons for ground support not only in attacks against caves and other fortified positions but for counterbattery, for sweeping grassed areas where the enemy was concealed, for defending columns on the march and for spearheading infantry attacks. Nor should the value of searchlights in support of front-line infantry be overlooked. Combat team commanders were loud in their praise of the effectiveness of searchlights in illuminating areas occupied by enemy troops while leaving our own troops in darkness.

With the cessation of hostilities in August certain changes were again made in the brigade staff and attached units. A considerable number of officers and enlisted men with long service overseas were transferred from the brigade for return to the United States.

On 15 August 1945, the brigade was alerted for the occupation of Japan. Advanced elements which included brigade headquarters, the 35th Group, 161st Gun Battalion, 579th AW Battalion (SP), the 382d AW Battalion and the

144th Operations Detachment moved with the first convoy to Japan and commenced going ashore at Yokohama on 3 September 1945 with the initial troop landings. The brigade Supply Officer, Captain Henry H. Hege was kept busy for a few hectic days, turning in antiaircraft equipment that was no longer in demand, and re-equipping units for the occupation. Units took with them only a part of their antiaircraft equipment as their principal occupation duties consisted of security guard, military police and the operation of prisons (including Sugamo Prison for Japanese war criminals).

The brigade was inactivated on 28 February 1946 at Yokohama having spent its entire career in the combat zone which took it from Noumea, New Caledonia, to Tokyo, Japan. Space does not permit enumerating the many cases of superior leadership, competence, ingenuity, and courage in action, displayed by officers and enlisted men. These were the factors that made the brigade an effective fighting combat unit.

Some Statistics Concerning the Luzon Operations

The small number of enemy planes destroyed in the Luzon operations was due principally to the fact that air activity was almost non-existent. Only 31 Japanese planes came near AA defended areas and some of these were beyond the range of our weapons. Six of these were destroyed (this is in addition to 3 destroyed en route) and 4 damaged.

It is not possible to determine the number of enemy killed in long-range ground support action though the number was undoubtedly large. In local defense of antiaircraft positions and in automatic weapons defense of bridges and in other close-range action, 268 enemy soldiers were killed and 101 captured, by 68th Brigade units on Luzon. In addition the following destruction of enemy equipment was credited to the brigade:

3	barges carrying enemy troops
11	motor vehicles
2	tanks
50	pillboxes
208	caves containing soldiers and equipment
4	O.P.'s
32	houses containing soldiers
2	bridges
1	road block
78	guns
5	ammunition dumps.

ABOUT OUR AUTHORS

Colonel Charles A. French activated the 68th Brigade overseas and commanded it as a Brigadier General through its campaigns. (Page 2.)

Dr. C. K. Stedman, after being associated with Purdue and Harvard Universities, joined the Boeing Aircraft Company in 1943 and is now Chief of Physical Research for that Company. (Page 8.)

Lieutenant Colonel William S. Marks, Jr. joined the staff of the Signal Corps Laboratories as a radio engineer in 1930. He was commissioned in the Signal Corps during the war and rose to his present rank. He is now Chief Engineer of the Coles Signal Laboratory which is the communications laboratory of the Signal Corps Engineering Laboratories. (Page 11.)

Norman Abbott has been associated with the research and development of Army radar equipment since 1940 as Chief Engineer on ground radar in the Engineering and Technical Division, Office of the Chief Signal Officer. (Page 17.)

Lieutenant Colonel J. M. Culverwell served overseas with the 62d AAA Gun Battalion as battery commander, S-3, battalion executive and finally as commanding officer. During that period he participated in seven campaigns. (Pages 19 and 41.)

Lieutenant Lawrence Sanders favors us with another excellent fiction story. During the war he served both as an enlisted man and an officer in the Marine Corps. (Page 20.)

Lieutenant Colonel Leonard M. Orman returns to our pages after missing his first issue as a contributor in a year and a half. He is an instructor in the Department of Electronics and Electricity at the United States Military Academy. (Page 25.)

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 1933 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. (Pages 27 and 53.)

Harold Berman, after being affiliated with *Esquire*, joined the Signal Corps Engineering Laboratories and served with the laboratory during the war. At present he is Technical Editor of that installation. (Page 32.)

Colonel E. W. Timberlake is P.M.S.&T. at Utah State Agricultural College and was Executive of Training for the R.O.T.C. at Fort Bliss during the past summer. (Page 34.)

Leonard J. Grassman is well known to our readers. He is Chief of Public Information, Army and Navy Munitions Board. (Page 35.)

Dr. F. Zwicky is Professor of Astrophysics at the California Institute of Technology and Director of Research at the Aerojet Engineering Corporation in Azusa, California. (Page 39.)

Major Hal D. Steward is Associate Editor of the *Armored Cavalry Journal* and made a special trip to the Desert to gather the material he has written about Task Force Furnace. (Page 43.)

SEACOAST SERVICE TEST SECTION

Any individual, whether or not he is a member of the service, is invited to submit constructive suggestions relating to problems under study by the Seacoast Service Test Section, Army Ground Forces Board No. 1, or to present any new problem that may properly be considered by the Section. Communications should be addressed to the President, Seacoast Service Test Section, Army Ground Forces Board No. 1, Fort Baker, California.

Items pertaining to Antiaircraft Artillery should be sent to the Antiaircraft Test Section, Army Ground Forces Board No. 4, Fort Bliss, Texas.

Any recommendations made or views expressed herein are those of Army Ground Forces Board No. 1 and are not to be construed as representing the opinion of all War Department or Army Ground Forces Agencies.

Wanted: Ideas

The following is quoted from War Department Circular 126, 17 May 1947:

"b. A statement of proposed military characteristics for a required item of material may be initiated by any unit or individual in the Army. All commands will encourage submission of such statements and of constructive criticisms of matériel and techniques, even if fragmentary in nature, for consideration by appropriate War Department agencies."

As in the past, this Section is always seeking means of accomplishing the Seacoast Defense mission more efficiently. Readers are urged to submit ideas and suggestions to this Section. All ideas will be given careful consideration and, if appropriate, authority for a project will be requested for further test or study with the ultimate aim of standardization.

Visitors

During the past two months the Section had several visitors, all of whom were extremely interested in the projects under test and new development trends. These visitors were:

Lieutenant General LeR. Lutes, President, Coast Artillery Association.

Colonel W. L. McNamee, Headquarters Army Ground Forces.

Lieutenant Colonel C. E. Spann, Developments Division, Headquarters Army Ground Forces.

Doctor A. V. Focke of the U. S. Navy Electronics Laboratories. He discussed effects and measurements of underwater explosions.

A conference was held with 25 members of the ROTC class at which the history, mission and present duties of the Section were discussed. These students represented Fordham University and University of Washington.

Lectures

Mr. George Grieshaber, Mechanical Engineer, of this section prepared and delivered two-hour lectures on guided missiles to each of the three Reserve Officer Indoctrination courses at the Seacoast Branch of the Artillery School. Mr. Grieshaber holds a commission in the Ordnance Reserve, and his active service has included duties as a test officer associated with the V-2 Rocket Test Program.

Mine Handling Equipment—Present mine handling equipment, and practice, is inadequate because the weight of the matériel handled far exceeds the rated capacity of the handling equipment. Too, there is a wide dissimilarity in the equipment now being utilized by mine commands. This is due primarily to the inherent problems encountered by the various commands. Climate, terrain features, installation dispersal, permanent facilities, maintenance facilities, and size of the activity govern the equipment used.

In normal mine handling operations, matériel is lifted, transported, and transferred by several different types of equipment. No one piece of equipment having the required desirable military characteristics to perform all of the necessary operations has been utilized to date.

Mine handling equipment should have at least ten tons lifting capacity, a high degree of mobility, and a boom reach sufficient to load the mine planter.

It is doubtful that one vehicle can meet the requirements. However, it is certain that the number and types of vehicles used can be reduced to a minimum. This will result in greater economy, and efficiency. A project has been assigned this Section, and tests are underway, to determine the suitability of the following equipment for mine handling:

(1) Ten-ton motor crane.
(2) Seven and one-half-ton, one hundred twenty inch Fork Lift Truck.
(3) Fordson-baggage tractor and seven-ton trailers.
(4) Pallets and Pallet truck.
(5) Two and one-half-ton, six by six Cargo truck.

This equipment is expected to use improved and unimproved roads, and maneuver into and out of buildings while under load.

German Test Firing Of The V-2*

The rocket which was designed and tested first at Peenemunde had the code number A-3-Aggregate No. 3. There had been A-1's and A-2's, of course, at Kummersdorf and at Borkum. The A-1, designed in 1933, soon after von Braun and Dornberger had joined hands, weighed about 330 pounds (150 kilograms) and was comparatively small, a foot in diameter and 4 feet 7 inches long. One year later, in 1934, it was redesigned as A-2, only slightly larger in size, but differing in many essentials. It had a 300-kilogram (660 pounds) rocket motor, and the fuel supply lasted for 16 seconds. When fired, at Borkum, it reached an altitude of 6500 feet.

A-3 was a long step forward as far as size went, 25 feet long and 2½ feet in diameter. It weighed, ready for take-off, 1650 pounds, and the rocket motor developed a thrust of 3300 pounds for 45 seconds. It was controlled by vanes operating in the exhaust jet, and, when kept on a vertical course, reached an altitude of 40,000 feet (in 1938). When fired at an angle a range of about 11 miles was attained.

That was still far below artillery performance, but justified trying for a still larger rocket the design of which had slowly grown through the year 1939. In 1940 it was actually built; the name was A-4, or, more precisely, Fernrakete A-4. Peenemunde called it by that name and so did official correspondence. But the Propaganda Ministry changed the designation into Vergeltungswaffe Zwei, V-2.

The experimenters did not have much pleasure with A-4, or V-2, at first. The first was fired on July 6, 1942 and rose precisely 3 feet off the ground. Then it exploded with enormous violence, destroying the testing station. The second A-4 rocket exploded too, but at a height of 16,000 feet. No. 3 behaved like No. 2. But number 4 was a success; in October 1942 it covered a distance of 170 miles. Number 5, fired a short time later, also functioned quite well, covering almost full range. However, it could not be found.

There followed a series of thirteen disappointments. The reasons varied: some failed to take off at all, a few exploded, some took off and broke in two before the eyes of the experimenters. If No. 19 had not performed as predicted the development might have been stopped. But No. 19 did and so did most of the others to follow. In the series from No. 20 to No. 120 only twenty rockets misperformed.

During 1943 Count von Braun went to see Hitler at his headquarters at the eastern front. With him he had rolls of film, documenting the research work done. Apparently both von Braun (who happens to look like the picture of the "perfect Aryan Nordic" invented by the Nazis) and his films impressed Hitler sufficiently to make him change his mind. He ordered mass production of Fernrakete A-4 which then changed its name to V-2.

It is said that this order was almost rescinded once more by Himmler when a demonstration of V-2 was staged for the edification of high army officers and leading party members with Himmler presiding. The 46-foot V-2 staggered slowly into the air for hardly ten times its own length, then suddenly tipped over and crashed. But since the one-ton warhead had been replaced by a one-ton block of concrete, not much damage was done.

Not all these tests took place at Peenemunde. A large number were performed in Poland where the little town of Blizna was evacuated by the SS in order to make room for the rocket experiments. That had been done in March 1943, a few months before the big raid on Peenemunde. During the six weeks from May 15 to the end of June 1944 over a hundred V-2's were fired from Blizna, fully armed with warheads. The target was the town of Sarnaki, 150 miles due north of Blizna, with about 1000 inhabitants. The SS forced the Poles living in Sarnaki to stay in their town and to lead as much as possible a normal life. The purpose of these test firings was to see what damage a V-2 would cause to an inhabited town and how many casualties would be caused by a direct hit.

The result must have been disappointing. The hundred rockets did destroy a number of houses, but only one man was killed and one woman seriously injured. The town was never hit directly; the closest a V-2 came to making a direct hit was 300 yards from the point aimed at. The town was too small for long-distance rockets.

While one section of the V-2 group dedicated itself to target practice in Poland the other continued research and improvement work in Peenemunde. One rocket, fired in June 1944, exploded high in the air over Swedish territory, showering the countryside with two tons of metal fragments. They were eagerly collected and turned over to the British who succeeded in reconstructing all the important features of V-2 from these fragments.

*Extracted from "Rockets and Space Travel" by Willy Ley, permission of The Viking Press.

Coast Artillery Journal

Fifty-fifth Year of Publication

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The United States Coast Artillery Association

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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 cover shows a position of Battery "A," 746th AAA Gun Battalion which was one of the 68th AAA Brigade's units on Bougainville.

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.

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.

Survey to Guide Army On Use of Scientists

The War Department has announced results of the first of a series of nation-wide surveys designed to insure more economical use of scientific talent in event of another war.

The survey, conducted by the American Chemical Society in conjunction with the War Department's Research and Development Division, indicated that the armed services in the last war did not make full use of the nation's scientifically trained manpower. As a result of this survey and others to follow, the Army expects to revise its classification systems so as to place trained scientists in positions suitable to their educational and practical backgrounds.

The poll of 31,000 recognized American chemists will be followed by similar surveys now being conducted or being planned by the Institute of Physics, the Union of Biological Societies, the Geological Society of America, the American Association of Petroleum Geologists, the Association of Professional Geographers, the American Mathematical Society, the Engineers Joint Council and the American Psychological Association.

In addition to being polled on their educational qualifications and fields of endeavor, the chemists were quizzed on their war work, with emphasis on the question of effectiveness of their chemical work in World War II. The survey showed that of the younger chemists in the military service during the war, about 47 per cent considered their scientific know-how to have been used only a small part of the time or not at all. Older scientists who served in uniform, however, found their talents to have been used adequately in war work in 75 per cent of the cases.

Streets To Be Named After Deceased CAC Personnel

A board of officers has been appointed by the Commanding General, Seacoast Branch, The Artillery School, for the purpose of selecting names for the streets and roads of Fort Baker, Fort Barry and Fort Cronkhite, California in honor of deceased personnel of the Coast Artillery Corps.

Suggestions are solicited and should be addressed to Lieutenant Colonel E. Carl Engelhart, Fort Baker, California.

When forwarding names, it is requested that the following information be included: full name, rank, serial number and organization; place, date, and manner of death. Any other pertinent remarks which are considered appropriate should likewise be included.

The cooperation of all readers and members of the Coast Artillery Corps in this worthwhile cause is strongly requested.

Navy and Marine Officers Attend Course at Bliss

Thirty Navy officers and three Marine Corps officers are among the students in the current Guided Missile Course at Fort Bliss. This is the first time that naval and marine officers have attended a guided missile course there.

Included in the group are six commanders, 13 lieutenant commanders, and 11 lieutenants. In addition, four Navy instructors in guided missiles have been assigned to the Antiaircraft and Guided Missile Branch of The Artillery School for duty here.

The course will be of 37 weeks' duration, closing 3 June 1948. Besides the Navy and Marine Corps personnel, about 40 Army officers from all branches of the service are enrolled in the class.

The course includes the study of higher mathematics, electronics, jet propulsion, aerodynamics, and the tactics and techniques of guided missiles. Field trips will be made to White Sands Proving Ground, New Mexico, to various universities and colleges where guided missiles research is being carried on, and to Navy and Air Force guided missile experimental stations.

Commander Keith E. Taylor, senior naval instructor, is in administrative charge of the Navy group.

Instruction in the guided missile course is under direction of Lieutenant Colonel L. W. Byers of the Guided Missile Department, AA&GM Branch, TAS.

Movies of Antwerp X

A 25-minute sound film covering the antiaircraft defenses of Antwerp against the V-1 will be distributed within the next few months to all film libraries.

This Signal Corps production is entitled "Defense of Antwerp Against the V-1" and it is a very fitting tribute to the Antiaircraft Artillery.

Announcement of the distribution of the film will be made to the various army installations. At that time individuals are invited to attend showings.

Groups of individuals or units may procure the film, when it is available, by contacting the officer in charge of the film library in the Headquarters of the Army area in which they reside.

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

General Lawton Assumes Command of Seacoast Branch

Upon the assignment of Major General Robert T. Frederick to the Air University, Maxwell Field, Alabama, as Chief, Ground Section, Brigadier General William S. Lawton assumed command of the Seacoast Branch of the Artillery School.

General Lawton attended the United States Military Academy at West Point from 4 November 1918 until 13 June 1922 and was graduated as a second lieutenant in the Air Service as the present Air Force was then called. In September 1923 he transferred to the Coast Artillery Corps and has continued his service in that branch.

In September of 1939 he was assigned to Fort Ruger, T.H., and at the time of the Pearl Harbor attack was Assistant to G-3 for the Hawaiian Department. He remained in the Hawaiian Islands serving as Assistant G-3 and Assistant Deputy Chief of Staff of the Hawaiian Department from 1941 to 1943. In 1943 he became Deputy Chief of Staff of Headquarters, United States Army Forces, Middle Pacific, and in this assignment was promoted to Brigadier General in 1944. In this same year, General Lawton was in command of the 70th AAA Brigade for a brief period.

General Lawton remained in the Middle Pacific until January 1947 and was then ordered to Chicago as a member of the General Staff of Headquarters, Fifth Army. He served in this capacity until 19 August 1947 when as Assistant Commandant of the Artillery School, he assumed command of the Seacoast Branch at Fort Winfield Scott.

ORC Guided Missile Battalion Activated in Philadelphia

To the Editor:

With the information, material and help given by the Journal and Association, we are organizing, along the lines of the suggested T/O & E you furnished us, a Provisional Guided Missile Battalion, which will be located here in Philadelphia and which will be known as: 64th EP Guided Missile Battalion (Provisional), commanded by Lieutenant Colonel Richard D. Gerges, CA-Reserve.

We are fortunate to have in our group several officers who have completed the Anti-Aircraft Guided Missile Basic Course at Fort Bliss. The knowledge they gained while attending this course has proven very helpful to us in our endeavor to get this unit a going outfit.

As I said before, we certainly appreciate all the help you have given us in our activities.

Sincerely yours,

/s/ Daniel L. Sullivan, Jr.
Captain, CAC
Unit Instructor

* * *

New Club To Be Built at Bliss

The Fort Bliss Officers' Club, which was destroyed by fire in June, 1946, will be reconstructed on its original site, with the work of rebuilding scheduled to start soon.

The War Department has appropriated $73,787 for the new building from the Army Club and Mess Fund. This fund is composed entirely of surplus monies accruing from the activities of officers' clubs throughout the Army. No appropriated public funds will be used.

The new building, similar in architecture to the old clubhouse, will be of stucco masonry in Spanish style, with a tile roof. It will include a large ballroom, dining room, kitchen, lounge rooms and office and will be adjacent to and connected with the present guest rooms which were not affected by the fire.

Modern fireproofing and fire prevention measures will be included in the construction.

Final construction plans are now in the hands of the U. S. District Engineer at Albuquerque, N. M., who will have charge of issuing specifications and of the actual construction. As soon as plans are given the final approval by the engineers and by the commanding general of Fort Bliss, bids for construction will be solicited.

Built in 1919 of brick, concrete and adobe, the old club had been enlarged several times before its destruction. Greatest single loss was the nine by 16-foot painting of "Custer's Last Stand," painted on a canvas wagon cover by Cassilly Adams and originally valued at $35,000. Murals in the dining room, painted by Mrs. Camille Kibler Craig and depicting early Fort Bliss history, were destroyed in the fire and caricatures of early Cavalry life, painted by Herc Ficklin, were damaged severely.

The old Club had been the scene of many brilliant social events and high-ranking military officials and other famous guests had been entertained there.

Fort Bliss officers at present are using a former service club on the Post as an officers' clubhouse.

Additional ORC Units

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

Illinois:
- Btry. "F," 84th Abn AAA Battalion, Chicago.

Louisiana:
- 412th CA Gun Battery (HD) (6"), New Orleans.
- 413th CA Gun Battery (HD) (6"), New Orleans.
- 414th CA Gun Battery (155mm Gun), New Orleans.

Maryland:
- 363d CA Gun Battery (HD), Baltimore.

New Hampshire:
- Headquarters & Headquarters Battery, 398th AAA AW Battalion (SP), Manchester.
- Battery "A," 398th AAA AW Battalion (SP), Manchester.
- Battery "B," 398th AAA AW Battalion (SP), Nashua.
- Battery "C," 398th AAA AW Battalion (SP), Concord.
- Battery "D," 398th AAA AW Battalion (SP), Dover-Portsmouth.
- (NOTE: This battalion was activated 21 February 1947 but has been omitted from previous lists in the JOURNAL.)

New Jersey:
- 339th CA Searchlight Battery (HD), East Orange.
- 344th CA Mine Planter Battery, East Orange.
- 349th CA Mine Planter Battery, East Orange.

Washington:
- 415th CA Gun Battery (HD) (6"), Seattle.

ORC & NG Refresher Courses to Continue

Due to the excellent reception which they have received, the various refresher courses of instruction for Reserve and National Guard officers will probably be reinstigated in January 1948. The current series of courses expired in September.

Under present plans it is contemplated that one course a month will be conducted when the program is revived.

National Guard and Reserve Personnel to Participate In Operation "Seminole"

Officers and enlisted men of the National Guard and the Organized Reserve Corps will participate with Regular Army personnel in the joint AGF-Navy-Air Force amphibious exercise "Seminole" scheduled for this Fall in the Gulf of Mexico, Texas and Florida coasts, it has been announced by General Jacob L. Devers.

In addition to 26 officers of the National Guard and Reserve who are scheduled to serve with Headquarters, Fourth Army, approximately 66 officers and 171 enlisted men will be given the opportunity, on a voluntary basis, to take part with the 2nd Armored Division, a Regular Army unit, during the exercise.

National Guard units and individuals taking part in the exercise must be ordered to active duty by the Governors of their respective states with the concurrence of the National Guard Bureau, for periods not to exceed 40 days for units and 90 days for individuals. Active duty orders for Reserve personnel will be issued through normal Army channels.

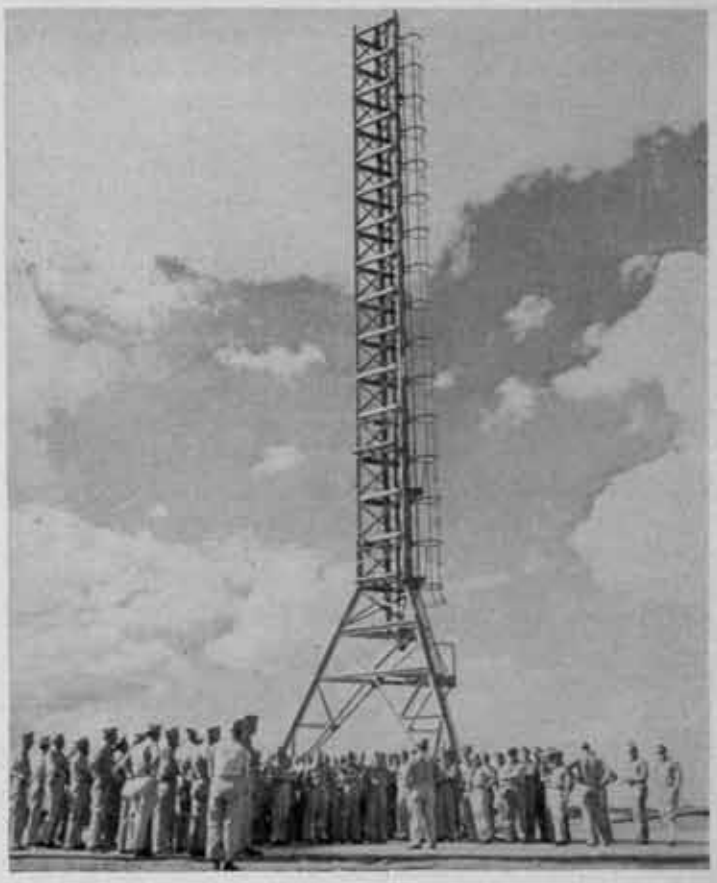
ORC and ROTC Training at Bliss

Summer training of Army Civilian Components at the Antiaircraft Artillery and Guided Missile Center, Fort Bliss, Texas, this year included three ORC classes of two weeks duration each and one six-week ROTC class.

Courses were conducted under the supervision of Major General J. L. Homer, Commanding General of the AAA and GM Center, with Colonel J. H. Madison, Director of Instruction at the Antiaircraft and Guided Missile Branch of The Artillery School, in direct charge. Instruction was presented by officers of both the Center and School staffs.

More than two hundred seventy-five ORC officers, representing virtually every branch of the Army and every state in the country, graduated from the three classes, which extended consecutively throughout the summer. Included in the classes were 60 colonels, 100 lieutenant colonels, 116 majors and three captains.

The two-week ORC classes were designed as refresher courses to bring the Reservists up-to-date on current War Department developments and plans. In addition, officers in the three classes received instructions in electronics, guided missiles, communications, tactics and other related antiaircraft artillery subjects. All three classes visited the White Sands Proving Grounds and two of the classes witnessed a V-2 rocket shoot. (See page 34 for ROTC story.)



ORC officers, attending two-week summer course at Fort Bliss, Texas, visit the launching site of the WAC Corporal, U.S. made guided missile, at White Sands Proving Ground.

Unit Histories Received

The history of the 74th AAA Brigade has been received since the last issue of the JOURNAL.

Additional National Guard Units

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

California:
- Battery "B," 271st AAA AW Battalion, San Francisco.
- Battery "A," 681st AAA AW Battalion, San Mateo.
- Medical Detachment, 682d AAA AW Battalion (SM), San Pedro.
- Headquarters & Headquarters Battery, 682d AAA Battalion, San Pedro.
- Battery "A," 720th AAA Gun Battalion (SM), Long Beach.
- Medical Detachment, 730th AAA S/L Battalion, El Cajon.
- Battery "A," 730th AAA S/L Battalion, El Cajon.
- Battery "C," 951st AAA AW Battalion (SM), Vallejo.
- Battery "D," 951st AAA AW Battalion (SM), Vallejo.

Delaware:
- Battery "A," 945th AAA AW Battalion (SM), Laurel.
- Battery "C," 945th AAA AW Battalion (SM), Milford.

District of Columbia:
- Battery "A," 260th AAA Gun Battalion (SM).
- Battery "A," 380th AAA AW Battalion (SM).

Florida:
- Medical Detachment, 692d AAA AW Battalion (SP), Jacksonville.
- Battery "A," 712th AAA Gun Battalion (SM), Key West.

Georgia:
- Headquarters & Headquarters Battery, 214th AAA Group, Washington.
- Headquarters & Headquarters Battery, 101st AAA Gun Battalion (SM), Statesboro.
- Battery "A," 101st AAA Gun Battalion (SM), Statesboro.
- Battery "B," 101st AAA Gun Battalion (SM), Hinesville.
- Headquarters Battery, 250th AAA S/L Battalion, Augusta.
- Battery "A," 250th AAA S/L Battalion, Augusta.
- Battery "A," 950th AAA AW Battalion (SP), Elberton.
- Battery "D," 950th AAA AW Battalion (SP), Gainesville.

New Mexico:
- Headquarters & Headquarters Battery, 111th AA Brigade, Albuquerque.
- 181st AAA Operations Detachment, Albuquerque.
- Separate Detachment, 515th AAA Group, Santa Fe.
- Separate Detachment, 697th AAA AW Battalion, Carlsbad.
- Battery "D," 697th AAA AW Battalion (SP), Hobbs.
- Battery "B," 716th AAA Gun Battalion (SM), Silver City.
- Headquarters & Headquarters Battery, 717th AAA Gun Battalion (SM), Albuquerque.
- Battery "D," 717th AAA Gun Battalion (SM), Gallup.
- Headquarters & Headquarters Battery, 726th AAA S/L Battalion, Albuquerque.
- Battery "B," 726th AAA S/L Battalion, Las Vegas.
- Battery "B," 804th AAA AW Battalion (SM), Raton.

New York:
- Hq & Hq Battery, 102d AAA Brigade, Bronx.
- 102d AAA Operations Detachment, Bronx.
- Hq & Hq Battery, 105th AAA Brigade, Buffalo.
- 105th AAA Operations Detachment, Buffalo.

North Carolina:
- Headquarters & Headquarters Battery, 677th AAA AW Battalion (SM), Red Springs.

Pennsylvania:
- Battery "A," 707th AAA Gun Battalion (SM), Philadelphia.

Rhode Island:
- Battery "D," 243d AAA AW Battalion (SM), Woonsocket.
- Battery "D," 705th AAA Gun Battalion (SM), Westerly.

South Carolina:
- Medical Detachment, 107th AAA AW Battalion (SP), Newberry.
- Battery "C," 678th AAA AW Battalion (SM), Greenville.

Virginia:
- Battery "A," 691st AAA AW Battalion (SP), Suffolk.

Washington:
- Battery "C," 700th AAA AW Battalion (SP), Olympia.
- Battery "D," 700th AAA AW Battalion (SP), Orchard.
- Battery "C," 770th AAA AW Gun Battalion (SM), Seattle.
- Medical Detachment, 770th AAA Gun Battalion (SM), Seattle.

* * *

Underground Factories Require Underground Supporting Facilities

On the basis of an investigation made by the Air Matériel Command analysts at Wright Field, Ohio, the Army Air Forces has learned that one of the paramount requirements of an underground factory is to have a broad segment of supporting and related activities within the underground site.

Experience of the Germans proved that if surface transportation were weakened and the deliveries of war materials to factories were prevented, the condition of the factories would make little difference. Similarly, bombing of electric power systems could render production facilities useless.

The Germans did not have the opportunity to place underground the full range of supporting activities such as power plants, transportation systems, forges, and others.

Electric power was generally furnished by existing local facilities, and transformed to the desired voltage by underground transformer stations. Three underground generating stations were reported in the Clausthal grid, near Clausthal, Germany, which supplied power to mines and towns in the area.

National Guard to Participate in Selective Service Training

The National Guard will take a leading part in the training of key personnel to staff any future selective service system needed to mobilize the manpower of the Nation in an emergency, Major General Butler B. Miltonberger, Chief of National Guard Bureau announced recently.

Tables of Organization of National Guard state staffs have been expanded to include selective service sections, General Miltonberger said.

In most instances, trained former selective service personnel will form the nuclei of the new sections.

Adjutants General of the various states, as representatives of the Governors, will be responsible for the preparation of state selective service plans and for training in emergency mobilization activities.

They will have at their disposal the full assistance of the Office of Selective Service Records, successor to the selective service systems which mobilized American manpower during the war.

Purpose of the program is to utilize knowledge gained in operating past selective service systems to conduct a progressive training program that will assure a civilian mobilization organization prepared to go into immediate operation when needed.

This is in line with the basic purpose of the National Guard which is an M-Day force trained and equipped for immediate call to service in national emergency.

Office of Selective Service Records national headquarters, through their field staffs, will cooperate and coordinate with the National Guard in training of selective service personnel, by providing training material and assistance during field and armory training periods.

* * *

Young National Guard Officers May Try For Regular Army Commissions

Commissioned officers of the National Guard may compete for commissioning in the Regular Army under the new competitive program recently announced by the War Department, Major General Butler B. Miltonberger, Chief of the National Guard Bureau announced recently.

"This is an excellent opportunity for qualified young National Guard officers to win Regular Army Commissions," General Miltonberger said.

Appointments would be made under a new program for bringing large numbers of young officers into the Regular Army. It is estimated that during the next several years approximately 2,000 appointments will be made yearly from all civilian components.

National Guard officers applying for the competitive tour of duty must have successfully completed two years of college and be between the ages of 21 and 25 years and six months at the time application is filed through State Adjutants General.

Competitive tours will be for a period of one year with applicants agreeing to remain on active duty for a minimum period of two years. Applications must be filed 60 days prior to January 1, 1948 and July 1, 1948, which will be the starting dates of competitive tours.

National Guard Convention

The National Guard Association of the United States held its 69th Annual Conference at Columbus, Ohio, 17 to 20 September. Agenda of the conference included 43 subjects, among which were system of promotion, age-in-grade policy, pay of Air Corps National Guard personnel injured or disabled, pay of general officers and the status of the National Guard Bureau under unification.

Among the principal speakers were many National Guard general officers and War Department and Army commanders, including General Jacob L. Devers, Commanding General of the AGF; Lieutenant General J. Lawton Collins, Deputy Chief of Staff; Major General Manton S. Eddy, Chief of Information, War Department; Major General E. E. Partridge, Assistant Chief of Air Staff-3; Lieutenant General Raymond S. McLain, War Department Special Staff; Major General Robert S. Beightler, Secretary of War's Personnel Board; Lieutenant General LeRoy Lutes, Director of Service, Supply and Procurement, War Department General Staff; Major General Kenneth F. Cramer, Chief, National Guard Bureau; Brigadier General John E. Dahlquist, Deputy Director, Personnel and Administration Division, War Department General Staff; Lieutenant General Walton H. Walker, Commanding General of the Fifth Army.

General Devers, addressing the Association 19 September, said:

"The first element of the National Guard's development in point of time and importance is recruitment. Your two-month program of intensified recruiting now under way, known as the National Guard Assembly, is well planned and should accomplish its objective if all of you support this program to the best of your ability. Voluntary enlistment in the National Guard, as well as in the Regular Army, brings men to the service of their country who willingly submit their time and effort to the task of national preparedness. The morale and interest of these men are correspondingly high and they will serve their country well.

"But the thought occurs to me, 'Will a voluntary enlistment program be enough?' Your expressed goal in the National Guard is to have a force of 682,000 men by 1951. Now, at the risk of sounding pessimistic, but with the avowed purpose of being a hard and fast realist, I take the position that Universal Military Training is the ultimate answer to the recruiting problem."

General Collins emphasized that the civilian components must be strong. The actual size of the Army—less Air Force—he said, is 670,000

Resolutions passed by the conference are divided into three classes, namely, Policy, Pay and Funds, and Administration and Supply. These resolutions are too many to enumerate here, but will be covered comprehensively in the next issue of the *National Guardsman*.

* * *

2,000 National Guardsmen Will Attend AGF Schools During 1947-48

Approximately 2,000 National Guardsmen assigned to ground force units are expected to attend Army Ground Forces training schools during the academic year 1947 to 1948, according to General Jacob L. Devers.

National Guard Day Inaugurated Recruiting Campaign

The first National Guard Day, proclaimed by the President to honor those who served and are serving their country as citizen soldiers, was observed throughout the nation 16 September by parades, celebrations, armory open-houses and speeches.

National Guard Day also marked the opening of a two-month recruiting campaign directed by the President because of the importance of the National Guard to the national defense. Objective of the campaign, known as "Operation 88,888," is to recruit an additional 88,888 men, or approximately a man a minute.

The strength of the National Guard as of September 1 was 117,123 men. It has been assigned the mission of an M-Day (Mobilization Day) Force of 682,000, more than three times its prewar strength, whose units will be at or near full strength, equipped with the most modern weapons, trained to the highest efficiency and capable of immediate mobilization in the event of an enemy aggression.

Civic, patriotic and veterans groups are cooperating on a national and local basis in the opening ceremonies and in support of the recruiting drive. The Veterans of Foreign Wars and the American Legion are taking an active part in the campaign. The United States Army and Air Force Recruiting Service is making its facilities available to the National Guard.

The champion enlisted recruiter from each State, the Territory of Hawaii, Puerto Rico and the District of Columbia, will come to Washington as the guest of the Secretary of War. During the four-day visit, the group will tour the nation's capital, meet President Truman, Secretary Royall and General of the Army Eisenhower and, on November 29 will attend the Army-Navy football game at Philadelphia as the guests of the Superintendent of the United States Military Academy.

Many of the States have set their goals higher than those assigned them and are offering additional prizes as an incentive to meet and beat their quotas.

Advance AGF Units Move to Pine Camp

Advance units of AGF troops scheduled to participate in oversnow exercises this winter began arriving at Pine Camp, New York, on August 15 to start preparations for the cold weather operations, it was announced by General Jacob L. Devers, Commanding General, Army Ground Forces.

Approximately 150 officers and men are included in the initial complements being sent from Camp Campbell, Kentucky, and Fort Meade, Maryland. By the time the exercises get under way on November 1, about 2800 soldiers will be quartered at the upper New York camp site.

The winter maneuvers, which will be directed by General Courtney H. Hodges, Commander of the First Army, with headquarters in New York, have been labeled Operation "Snowdrop." They will comprise a complete airhead operation.

Climaxing the operation will be the building of an airstrip in virgin country covered with deep snow. Following this, troops will be brought into the airhead by plane.

Reserve Officers' Committee Studies ORC Problems

A group of fourteen Reserve Officers from all the Army Areas attended a conference at Headquarters Army Ground Forces, 7-21 September to study the various problems consistent with the administration and training of the Reserves.

A welcome address was given by General Devers.

During the two weeks' session, the delegates listened to addresses by various officers on Personnel Problems, Supply and Facilities, Proposed Promotion Plan, AGF Responsibility for the ORC Program, ORC in General and Extension Courses.

At the conclusion of these indoctrination talks, a committee of delegates was formed to work on the problems presented, and the remainder of the session was devoted to this activity.

Studies were conducted in the following subjects:

- The requirements of eligibility to remain in the Active Reserve.
- An analysis of War Department Circular 81, 1947, with a view to improving the ORC supply system.
- Ways and means of safeguarding and maintaining ORC equipment.
- Review of existing training policies and programs with a view to revising these policies and programs, tying in training requirements for inactive duty pay, and the possible use of extension courses in training.
- Standards of eligibility for inactive duty pay based on the inactive duty pay bill before Congress.
- The means to provide instructor personnel for the ORC under the present shortage of instructor personnel.
- Home training facilities.
- Promotion policy.
- The schools program for the ORC.
- Assignment of ORC personnel.
- Any other problems or studies desired by the committee.

The completed work of the committee was presented to Army Ground Forces before the delegates returned to their home stations.

It is hoped that this active participation by Reserve Officers in the formation of plans affecting the Reserves will prove very valuable in making the ORC program a success.

V-2 Fired From USS *Midway*

The Navy fired a captured German V-2 rocket from the flight deck of the 45,000-ton aircraft carrier USS *Midway* on 6 September. This marked the first time that such a large bombardment rocket had been launched from ships or from a moving platform.

"The primary purpose of the experiment," the Navy announced later, "was to ascertain if large bombardment rockets could be fired from modern aircraft carriers without requiring modifications that would affect flight operations."

Immediately after the firing, the *Midway* conducted flight operations.

The launching, held at sea several hundred miles off the East Coast of the United States, was observed by leading military and civilian personnel in the field of guided missiles.

To the Editor:

I believe that the *Army and Navy Journal* should be congratulated for its fine editorial remarks concerning the Coast Artillery Corps appearing in the June 14th issue.

It is indeed unfortunate that many individuals in high places, as well as others throughout the services, are prone to think of the Coast Artillery Corps in terms of the seemingly outmoded functions of fixed seacoast artillery. By the same token, many weapons of other arms have also passed into limbo.

However, these critics apparently forget the pioneering of the Coast Artillery Corps in the development of modern, accurate fire-control methods, high-velocity artillery, radar, and guided missiles. They forget the Coast Artillery Corps' valiant contribution to the defense of the Philippines. They forget the conversion of the Coast Artillery Corps to an antiaircraft role and the splendid record of these units and their equipment during World War II. They forget the fine performance of antiaircraft units and equipment in ground artillery, infantry and other roles.

It is to be hoped that these same critics of the Coast Artillery Corps may some day realize the value of a corps that has so successfully adapted its weapons and tactics to the requirements of modern warfare, has served so effectively in a variety of roles during World War II, and has given so much impetus and talent to the program for development of the guided missile—a weapon that may well render obsolete the other weapons of war.

Very truly yours,

BRILSFORD P. FLINT, JR.,
Major, CAC.

Journal Complimented On Guided Missile Articles

The following extract from a letter written by Lieutenant Colonel Lawrence W. Byers, Director of the Guided Missile Department of AA & GM Branch at Bliss, is reproduced herewith as an indication of the esteem in which JOURNAL authors are held:

"We find the articles dealing with the subject of guided missiles, published in the COAST ARTILLERY JOURNAL during the past twelve months to be excellent reading material for the students taking this course. The articles in the JOURNAL are extremely well written and we believe technically correct."

Recapitulation of Articles on Guided Missiles Which Have Already Appeared in the Coast Artillery Journal

1. Launching.
   (The Launching of Guided Missiles by Dr. Gibson and Dr. Kossiakoff, March-April 47.)
2. Propulsion.
   (Jet Propulsion Devices by Captain Drewry and Dr. St. John, November-December 46.)
   (Jet Propulsion—Past, Present and Future by Captain Tosti and Mr. Tuzen, May-June 47 and July-August 47.)
   A. Rockets.
      (1) Solid Propellant.
      (2) Liquid Propellant.
         (Rocket Propulsion by Dr. Porter, September-October 46.)
         (Rocket Propulsion by Dr. Dunn, July-August 47.)
   B. Jets.
      (1) Mechanical.
         (Jet Propulsion—Past, Present and Future by Captain Tosti and Mr. Tuzen, May-June 47.)
      (2) Thermal.
         a. Intermittent.
            (Jet Propulsion Devices by Captain Drewry and Dr. St. John, November-December 46.)
            (Jet Propulsion—Past, Present and Future by Captain Tosti and Mr. Tuzen, May-June 47.)
         b. Ramjet.
            (The Flying Stovepipe—How It Works by Major D'Arezzo and Major Sigley, January-February 47.)
         c. Turbo-jet.
            (The Turbo-jet by Mr. E. S. Thompson, July-August 47.)
3. Guidance and Control.
   (Stabilization and Control of Rockets by Dr. White, July-August 46.)
   (Guidance for Missiles by Dr. White, November-December 46.)
4. Explosives.
   (Warheads for German AA Guided Missiles by Mr. Wallace, March-April 47.)
   (Colonel H. S. Morton (Retired), Applied Physics Laboratory, Johns Hopkins University, has promised us an article for a future issue.)
5. Aerodynamics.
   (Articles by Dr. von Karman, California Institute of Technology, and Colonel Paul Dane, Aircraft Laboratory, Wright Field, Dayton, Ohio, will appear in future issues.)

Coast Artillery Newsletters

ANTIAIRCRAFT SECTION, GHQ, FEC

TOKYO, JAPAN, APO 500

BRIGADIER GENERAL WILLIAM F. MARQUAT, *Antiaircraft Officer*

During the week of 14-19 July 47 a conference of representatives of the major commands in the Far East was held in Tokyo for the purpose of drafting a standard SOP for antiaircraft artillery units. The following officers attended the conference:

General Headquarters, Far East Command
Brigadier General W. F. Marquat, AA Officer
Lieutenant Colonel R. C. Leslie, CAC, Executive AA Section
Lieutenant Colonel R. T. Cassidy, CAC, Equip & Tng Officer, AA Section
Chief Warrant Officer R. P. Gilmore, USA, Adm & Pers Officer, AA Section

Far East Air Forces
Lieutenant Colonel G. W. Croker, CAC, Air Defense Section, A-3 Division.

Eighth Army
Lieutenant Colonel A. L. Fuller, Jr., CAC, C.O. 138 AAA Group
Major G. W. Best, CAC, S-3 138 AAA Group.

Philippines-Ryukyus Command
Colonel Volney W. Wortman, CAC, C.O. 87 AAA Group (PS)
Lieutenant Colonel L. H. Brownlee, GSC, G-3 Sec PHILRYCOM

Marianas-Bonins Command
Lieutenant Colonel L. J. Staub, CAC, 69 AAA Group
Major R. S. Ballagh, FA, 69 AAA Group

XXIV Corps
Lieutenant Colonel E. E. Lockhart, CAC, C.O. 865 AAA AW Battalion
Lieutenant Colonel H. E. Michelet, GSC, G-3 Sec XXIV Corps

The need for a standardized SOP for antiaircraft artillery units has long been recognized. It should be possible to transfer any antiaircraft artillery unit from one command to another within the Far East Command without causing the personnel to learn new and conflicting terms in carrying out the unit's air defense role.

The recommendation to the War Department to publish a Training Circular covering the use of the present personnel and equipment of an antiaircraft artillery operations detachment to perform the functions of a range and records detachment was not favorably considered. The War Department said that there is no objection to using operations detachments in a secondary role of training for duties as record sections when no interference with primary duty training occurs.

The first contingent of the War Department Antiaircraft Artillery Technical Instruction Teams has arrived in the theater and courses of instruction have been set up by the Antiaircraft Artillery Groups in the major commands for the use of the teams. The War Department approved the recommendation to train and ship instruction teams automatically at six months' intervals subsequent to May 1948.

The Antiaircraft Section, GHQ, FEC, lost two of its key officers on 27 July 1947 when Lieutenant Colonel R. C. Leslie, (Executive), and Lieutenant Colonel R. T. Cassidy, (Equipment & Training Officer), returned to the U. S. after completing their 30 months on foreign service. Replacements have not yet been received.

OKINAWA, APO 331-6

COLONEL VOLNEY W. WORTMAN, *Commanding*

During the period of this report, Antiaircraft Artillery Training continued to receive top priority. All organizations available for training have made marked progress.

The 532d AAA Gun Battalion (PS) moved to the Gun Firing Range at Bolo Point on 14 July and established a field bivouac which has lasted for eight weeks. Unfavorable weather conditions and difficulties in maintaining targets have extended the battalion's stay at the firing point. The battalion, under the command of Major J. R. M. Covert, has established an enviable record in its firing. This is the first time that the 120mm guns have been fired in the Pacific Theater by Philippine Scout Troops. Battery "A," commanded by Captain W. E. Smith, knocked the target out of the sky at a range of 19000 yards and at an altitude of 4000 yards on the second round fired. Battery "B," commanded by Captain John D. Skipper, scored direct hits on six out of eight courses flown to date. Towing missions and "mother ships" for PQ-14 planes have been furnished by the 301st Fighter Wing. One B-25 and two A-26s have been flying the target and tracking missions and a C-45 is used as "mother ship" for the PQ-14's. Mr. W. J. Eichorn, from the Ordnance Office, PHILRYCOM, arrived in August to work on Gun Fire Control equipment for a period of thirty days. It is anticipated that another specialist will be detailed with the Group upon the departure of Mr. Eichorn, as the Gun Battalion has no Radar Officer and is lacking in trained Fire Control Electricians.

The 511th AAA AW Battalion (PS) engaged in a five-day four-night field exercise in accordance with its Mobilization Training Program training from 21 to 25 July 1947, inclusive. The state of training attained during this exercise in reconnaissance, selection and occupation of positions, field fortifications, communication, camouflage, security, gas and convoy discipline was highly satisfactory. Frequent air attacks were made on the positions of this battalion at the request of this Headquarters. The battalion played the problem well, became combat conscious, showed unusual interest and made outstanding progress in spite of a marked shortage of officers available for duty.

Unfortunately, due to the great overhead demands, the Mobilization Training Program Training of Battery "A," 541st AAA Searchlight Battalion (PS), had to be suspended about 14 July 1947 to enable this organization to maintain and supervise the dependents' housing area in the old Naval Operating Base area, guard the Marine Barracks area and inventory and maintain the equipment released by the Marines in the Marine Barracks area.

Battery "A," 511th AAA AW Battalion (PS) was likewise required to suspend its Mobilization Training Program Training to enable it to maintain, supervise and guard the Okinawan Educational Center and moved to the university area to assume its new duties.

Moreover, a small amount of personnel from Battery "A," 511th and three gun sections from Battery "C," 532d were obliged to suspend their Mobilization Training Program Training to enable them to typhoonproof buildings in the RYKOM Headquarters and affiliated areas and to engage in construction of projects in connection with the RYKOM Women's Compound.

Automatic Weapons Instruction Team No. 2, commanded by Major Charles R. Elam, Jr., arrived from the ZI on 31 July 1947 and was assigned to the 511th. Formal instruction began in the 511th on 7 August 1947, with all available personnel attending. A model automatic weapons school set-up was arranged by Colonel V. W. Wortman. Four quonset huts serve as classrooms, each classroom having an office for the instructor with an additional office in one of the buildings for the team commander. Facilities for the instruction also include folding tables, folding chairs, instruction platforms, newly constructed blackboards, PA systems and concrete walks.

The 11th Army Band (PS) has now developed into a very excellent organization under the leadership of Staff Sergeant Dominador Bautista and gives a good account of itself at all ceremonies on the Parade Grounds.

Enlisted men's dances are held once each week and carefully chaperoned Okinawan girls are utilized as dance partners. These dances have attracted considerable favorable attention and are a source of lively recreation for the men.

Other forms of wholesome recreation for enlisted men are provided, encouraged and enthusiastically engaged in. These forms of relaxation are the following: swimming on the beautiful beaches, baseball (soft and hard), basketball, volleyball, tennis, badminton, library facilities.

ARRIVALS

Majors Charles R. Elam, Jr., Edward H. Holdsworth, Roland E. Denby; Captains James F. McGovern, Hugh C. Baker, Edward J. Sterken, Jr., Herbert J. Childress, Jr., Jesse C. Howard; First Lieutenants August M. Fons, Jr., George Pettigrew, Warren C. Mahr, Edmund Scheibe; Mrs. William Chas. Barlow.

DEPARTURES

Lieutenant Colonel and Mrs. Frederick T. Berg, Lieutenant Colonels Cecil U. Bradley, I. A. Peterson; Major and Mrs. H. J. Turner, Jr., Major and Mrs. R. H. Fitzgerald, Majors W. W. Mize, J. G. Healy; Captains G. Fitzpatrick, Hugh E. Jordan, Emory L. Goggans, J. L. Smith, Jr., George H. Farne; First Lieutenants Alfonso Lea, Michael Sorbello, Truman L. Bennett.

138TH ANTIAIRCRAFT ARTILLERY GROUP

YOKOHAMA, JAPAN, APO 503

LIEUTENANT COLONEL ARTHUR L. FULLER,
Commanding

Having completed thirty-six months of overseas service in the Pacific Theater, Colonel Donald C. Tredennick, Group Commander, departed these shores on the USAT *General Collins* for stateside duty, 12 July 1947. Lieutenant Colonel Arthur L. Fuller, Jr., formerly Commanding Officer, 76th AAA Automatic Weapons Battalion (SP), assumed command. Prior to coming to Japan, Colonel Fuller was Chief, Organization Branch, War Department General Staff.

The group is suffering from a severe shortage of enlisted personnel and since the primary mission continues to be security guard, only essential training requirements are being met. It is hoped that before long the situation will clarify and antiaircraft training will be resumed on a minimum basis of one battery per battalion.

The last session of the Troop Officers' School required by WDTC No. 9, 1946, will terminate 6 August 1947. At this time all courses will have been completed with the exception of Course "M", Troop Movement. This course will be conducted by Headquarters Eighth Army, beginning 29 September 1947. Group officers will attend this final course in September when it is presented by Eighth Army Headquarters to its assigned officers.

At long last, the arrival of twenty-four officers from the Class of 1946 of the United States Military Academy became a fact. They were welcomed by the Commanding Officer and after being briefed by the Group Executive were assigned to battery duties throughout the group.

Early in June, Group Headquarters moved about eight miles from central Yokohama. Specifically, it is now located in the Nippei Sangyo Industrial Area, Katabuki, Tomiokamachi, Isogo-ku, Yokohama-shi, Kanagawa-ken, Honshu, Japan (Yatsuzaka Railroad Station). This area was once a center for the machining of tools and dies for use in the manufacture of airplane parts and ammunition. Approximately five thousand people once toiled here, and to judge from the spacious buildings and cave-type air raid shelters spread among the surrounding hills and valleys, the area played an important part in Japan's war economy.

An elimination firing will be conducted by the 138th AAA Group to determine the team which will represent Eighth Army non-divisional troops in the 1947 Far East Command Small Arms Tournament. First Lieutenant Gordon A. Robbins, 76th AAA AW Battalion (SP), has been detailed as Officer-in-Charge. The first phase of eliminations will begin at the Eighth Army Replacement Training Center Range, ATSUGI, on 4 August 1947. A considerable number of entries have been received and indications point to a highly successful tournament.

A unit from March of Time, Inc., filmed, in the vicinity of OPPAMA, a road march, emplacement and simulated firing of a composite battery from the 753rd AAA Gun Battalion. Due credit is given to the enlisted personnel of the battalion who participated and to the personnel from the 933rd AAA AW Battalion (SM) and the 76th AAA AW Battalion (SP) who accepted additional security guard duties in order to insure the filming of this action. The work was under the supervision of Captains E. R. Stark, Group Headquarters, and R. K. Routh and P. P. Genero, 753rd AAA Gun Battalion. The sequence in the completed picture, which will deal with the occupation of Japan, has a running time of three minutes.

Colonel M. A. Hatch, Chief, AA Section, Eighth Army, departed for stateside duty late in June. Upon the departure of Colonel Hatch, the AA Section, Eighth Army was discontinued. Lieutenant Colonel K. C. Smith and Major Carl O. Loos, formerly of the AA section have been transferred to Fort Leavenworth and G-1 Section, Eighth Army, respectively. Lieutenant Colonel R. M. Nelson has been transferred from group to the newly formed Artillery Section, G-3, Eighth Army.

The 933rd AAA AW Battalion (SM), Lieutenant Colonel R. L. Morgan, Commanding, having been organized one year, celebrated "Organization Day" on 30 June 1947. Inclement weather prevailed hence the scheduled review and parade was called off. Later in the evening a movie and dance were held in the battalion theater for the enlisted personnel.

The 76th AAA Automatic Weapons Battalion (SP), formerly the 209th AAA Automatic Weapons Battalion (SP), is still in the advanced cadre stage and is ready for immediate expansion upon the arrival of replacements. The majority of training given in the battalion has been devoted to intensive on-the-job training. This program was inaugurated to train personnel for key positions and to allocate time for the maintenance of equipment. The battalion is now commanded by Major David B. McFadden.

The 162nd AAA Operations Detachment received a visit from the Inspector General in June and emerged with a rating of "Excellent." The Johnson Field units are exempt from security guard requirements hence they have been in the process of training personnel in the use of searchlights and radar. Mr. Kane and Mr. Mastich, civilian radar technicians from Headquarters Fifth Air Force, are conducting a radar school which is progressing favorably. Before going to Johnson Field they spent a month with the 753rd AAA Gun Battalion instructing and assisting with radar maintenance problems.

During the months of June and July, 20 additional families of officers and enlisted men in the group arrived in Japan, swelling the aggregate to 66 families. The effect upon the morale is wonderful.

The following officers have arrived in Japan since the submission of the last newsletter and were assigned as follows:

933rd AAA Automatic Weapons Battalion (SM): Cap-

tain Shadie Simon, Captain Robert E. Kahn, First Lieutenant Athelson A. Bellamy, Second Lieutenant Stanley J. Love, Second Lieutenant Eugene V. Pfauth, Second Lieutenant Horace F. Derrick, Second Lieutenant John W. Dwyer III, and Second Lieutenant Elmo E. Cunningham.

753rd AAA Gun Battalion: Captain John F. Fulton, First Lieutenant Martin V. Anderson, Second Lieutenant Ernest A. Pepin, Second Lieutenant Prentice E. Whitlock, Second Lieutenant Thomas V. Hirschberg, Second Lieutenant Henry L. Ingham II, and Second Lieutenant Robert V. Kane.

76th AAA Automatic Weapons Battalion (SP): Captain Fred C. Evans, Second Lieutenant Alexander J. Papatones, Second Lieutenant Howard E. Pleuss, Second Lieutenant Thomas G. Provenzano, Second Lieutenant Dudley S. Stark, Jr., Second Lieutenant Philip A. Farris, Second Lieutenant Meredith W. Ghrist, Second Lieutenant Harold W. Horne and WOJG George McDonald.

538th AAA Searchlight Battery: Second Lieutenant Alvin Ash and Second Lieutenant Shirley S. Ashton, Jr.

The following Officers have left the group: Colonel Donald C. Tredennick, Lieutenant Colonel Russel M. Nelson, Major William J. Williams, Major Robert A. Moore, Captain George E. Koury, Captain William Z. Finley, Captain Hart S. Odom, Captain Leroy W. Hutchins, Captain William V. Smith, First Lieutenant Ray Glenn, First Lieutenant Roy G. Pagnello, First Lieutenant Harley W. Brown, First Lieutenant Charles F. Tuttle, Jr., First Lieutenant Sigmund R. Herschback, CWO Vernon K. Carle and CWO Clarence L. Larkin.

The Seacoast Branch, The Artillery School

BRIGADIER GENERAL WILLIAM S. LAWTON,
Officer in Charge

The following changes occurred during the month of July 1947:

ARRIVALS

Name	*Department*
Major Earle Mountain	Instructor, Gunnery, Dept. of Gunnery & Tactics
Major Stockton D. Bruns	Instructor, Gunnery, Dept. of Gunnery & Tactics
Captain Clifton Chamberlain	Instructor, Gunnery, Dept. of Gunnery & Tactics
Captain Maynard P. Wood	Writer, Dept. of Engineering
Captain Karl Harris	Tech Tactical BD Member, Sc Sv Test Section

DEPARTURES

Name	*Destination*
Major Charles Brown	Trfd to Fourth Army 4001st ASU, Ft. Bliss, Texas
Captain Russel Hutchison	Trfd Stu Det The Engr Sch The Engr Ctr, Ft. Belvoir, Virginia.
Captain Blaine E. Young	Trfd Stu Det, Abn Sec Inf Sch, Ft. Benning, Georgia
Captain Daniel W. Jopling	Trfd to Hqs, Sixth Army, Presidio of San Francisco, California
Captain John P. Spickelmier	Trfd to O/S Repl Depot
Captain Lucius Hill	Trfd to O/S Repl Depot
Captain John F. Redfield	Trfd to O/S Repl Depot
First Lieutenant John Zito	Trfd to O/S Repl Depot
CWO Paul E. Genson	Trfd to O/S Repl Depot
WOJG Robert J. Dunn	Trfd to O/S Repl Depot

The following changes occurred during the month of August 1947:

ARRIVALS

Name	*Department*
Brigadier General William S. Lawton	School Commandant, Hq & Hq Detach.
Lieutenant Colonel Kenneth L. Yarnall	Instr Tactics, Hq & Hq Detach.
Major Marshall H. Armor	Student, Hq & Hq Detach.
Major John W. Thames	Instr Tactics, Hq & Hq Detach.
Captain Tom W. Barnett	Student, Hq & Hq Detach.
Captain John J. DeRosa Jr.	Instr Radar, Hq & Hq Detach.
Captain Bernard C. Elders	Instr Sub-Mine, Hq & Hq Detach.

DEPARTURES

Name	*Destination*
Major General Robert T. Frederick	Trfd to 41st AAF Base Unit, Air University, Maxwell Fld, Ala.
Major Edward Robinson	Trfd to AC 4117th AAF Base Unit, Robins Fld, Georgia
Captain Daniel Jopling	Trfd to Headquarters, Sixth Army, Presidio of San Francisco, California
Captain William G. Mathews	Trfd to Stu Det AA and Guided Missile Br Arty Sch, Ft. Bliss, Texas
Captain John P. Spickelmier	Trfd to Stu Det CMB Wash., D.C., with Station at Plymouth, England
Captain Elmer Twining	Trfd to Stu Det Comd Staff College, Ft. Leavenworth, Kansas
Captain William A. Youngberg	Trfd to Stu Det AA and Guided Missile Br Arty Sch, Ft. Bliss, Texas
First Lieutenant John Zito	Trfd to Cp Kilmer, New Jersey
WOJG Harold Cramer	Trfd to Cp Stoneman, Pittsburg, California

The Antiaircraft Artillery and Guided Missiles Branch, The Artillery School

FORT BLISS, TEXAS

MAJOR GENERAL JOHN L. HOMER, *Officer In Charge*

The following changes occurred during the month of July 1947:

ARRIVALS

Name	*Department*
Brigadier General Charles E. Hart	Director (Not joined)
Colonel Ernest B. Thompson	Tactics
Lieutenant Colonel Philip V. Doyle	Not joined
Lieutenant Colonel Joseph C. Moore	Not joined
Lieutenant Colonel Lamar C. Ratcliffe	Not joined
Major Willard W. Mize	Not joined
Major Frank G. Moffett, Jr.	No duty assigned
Captain Theodore J. De Franco	No duty assigned
Captain Woodrow H. Jones	Not joined
Captain Jerald J. Moody	No duty assigned
Captain Gerald E. Renegar	Gunnery
First Lieutenant Ernest J. Arnold	Electronics
WOJG Bertie L. Stringfellow	Not joined

DEPARTURES

Name	*Destination*
Brigadier General Robert M. Montague	Armed Forces Special Weapons Project, Albuquerque, N. M.
Lieutenant Colonel Irving D. Roth	Student Detachment, Headquarters, 1st Army, Governors Island, N. Y.
Major Elbert M. Kidd	Antilles Department
Captain Daniel L. Blue	WBGH, El Paso, Tex.
Captain James F. Keenan	Airborne Section, TIS, Ft. Benning, Ga.
Captain Henry A. Lowe	AGFPAC, Ft. Shafter, T. H.
Captain Donald A. Monroe	NOPE, New Orleans, La.
First Lieutenant Joseph J. Macko	NOPE, New Orleans, La.
First Lieutenant Eugene C. Cox	NOPE, New Orleans, La.
First Lieutenant Paul J. Kohanik	NOPE, New Orleans, La.
WOJG Frank Dudowicz	87th Rkt FA Bn., Ft. Bliss, Tex.

The following changes occurred during the month of August 1947:

ARRIVALS

Name	*Department*
Lieutenant Colonel Dorsey E. McCrory	Tactics
Lieutenant Colonel Elmer B. Kennedy	Guided Missiles
Lieutenant Colonel Lincoln H. Simon	Not yet joined
Lieutenant Colonel Richard G. Thomas	Guided Missiles
Lieutenant Colonel Martin L. Webb	Not yet joined
Major John T. Elliott	Not yet joined
Major Gerald A. Lake	Not yet joined
Major Franklyn J. Michaelson	Research & Analysis
Captain Lawrence W. Cyr	Not yet joined
Captain Robert E. Shipp	S/D AGF Bd. No. 4, Ft. Bliss, Texas
Captain Charles M. Young	Guided Missiles
First Lieutenant Robert P. Merchant	Guided Missiles

DEPARTURES

Name	*Destination*
Lieutenant Colonel John G. Buerkle	Separated from Service
Lieutenant Colonel Pat M. Stevens, III	Command & Staff College, Ft. Leavenworth, Kans.
Major Paul A. Anson	Command & Staff College, Ft. Leavenworth, Kans.
Major John T. Browne	Student Det., Ft. Sill, Okla.
Major Bertram J. Ellis	Student Det., Ft. Sill, Okla.
Major Simon L. Grimes	Separated from service
Major Bob B. A. Haenel	Student Det., CMB, Washington, D. C.
Major Patrick J. Healy	Command & Staff College Ft. Leavenworth, Kans.
Major Charles C. Jefferies	Student Det., Ft. Sill, Okla.
Major Julius A. Marwitz	Separated from service
Major Willard W. Mize	Student Det., Ft. Sill, Okla.
Captain Wheeler B. Bowen	1209th ASU, Pine Camp, New York
Captain Albert V. Cito	Student Det., CMB, Washington, D. C.
Captain James L. Gordon	Student Det., Ft. Sill, Okla
Captain Robert B. Jaffa	Student Det., AA & GM Br TAS, Ft. Bliss, Tex.
Captain Rollin A. Lanpher, Jr.	Student Det., Ft. Sill, Okla
Captain Frederick A. Lingner	Student Det., Ft. Sill, Okla
Captain Max R. McCarthy	Student Det., CMB, Washington, D. C.
Captain Joseph P. McElligott	Student Det., Ft. Sill, Okla.
Captain Robert G. Pickens	Student Det., AA & GM Br TAS, Ft. Bliss, Tex.
First Lieutenant John D. Healy, Jr.	Student Det., AA & GM Br TAS, Ft. Bliss, Tex.
CWO Louis J. Arnau	Separated from service.

South Sector Command

FORT RUGER, HAWAII, APO 956

BRIGADIER GENERAL JAMES E. MOORE, *Commanding*

Colonel Clarence H. Schabacker arrived early in July to become Chief of Staff of this command. He relieves Colonel Earl J. Murphy who has been assigned to Governor's Island, New York.

Several members of the reserve components of the Army, both officers and enlisted men, have reported for duty with the South Sector Command during this period for tours of 15 to 60 days.

35TH COAST ARTILLERY MAINTENANCE DETACHMENT

FORT RUGER, HAWAII, APO 956

LIEUTENANT COLONEL FRANK D. GREBE, *Commanding*

During the period covered by this newsletter, the personnel in the command has been gradually decreased due mainly to the constant movement of personnel to the ZI for discharge and rotation. Due to the lack of personnel, only two roving maintenance teams located at the Batteries Hatch and DeMerritt are performing maintenance.

On 8 July 1947, Lieutenant Colonel Frank D. Grebe, newly assigned Executive Officer, assumed command of the 35th CA Maintenance Detachment during the temporary absence of Colonel Donald C. Hawley, who was taken ill.

Among the new arrivals are First Lieutenant Ira S. Eintracht, until recently stationed at Fort Mason, California and First Lieutenant Weldon A. Rogers who was stationed at Sand Island, APO 455. Lieutenant Eintracht is the new S-4 and Lieutenant Rogers has been assigned as Assistant Artillery Engineer.

98TH ANTIAIRCRAFT ARTILLERY GROUP

FORT KAMEHAMEHA, HAWAII, APO 956

COLONEL JOHN HARRY, *Commanding*

Training—with the accent on classroom and blackboard—progresses apace. Officers now attending the Oahu Troop and Staff School out windy Schofield-way, include: Captain Arthur D. Douglas and Captain Edgar A. Kneese; and First Lieutenants James O. Cary, Vincent D. Earl, Weldon G. Lawrence, Franklin H. Tuscany and John M. Whitbank; all of the 98th Group staff.

From the 97th AAA Gun Battalion, O.T.&S. students are: Major Frank L. Coleman, Captains James F. Beers, Delbert O. Carpenter, Norman E. Fine, Benson Grant and Karl W. Lehman; and First Lieutenants Archie D. Brown, William M. Dicke, Jr., Harry J. Kammel and Raymond P. Ruppel.

The 867th AW Battalion contingent includes: Major Joseph C. Cox, Captains Thomas E. Campbell, W. Allen Chavet, Bob G. Olsen, and William S. Wall; and First Lieutenants Alex E. Berger, George J. Coleman, Louis P. Kershinar, James O. Langstaff, Jr., Anthony S. Serpe and William Wempren; with headquarters at Ft. Ruger.

Other Group officers attending the school are: First Lieutenants Kenneth R. Balsley, Paul F. Marcyes and Ralph B. Raperto; all of the 88th Searchlight Battery; Captain Leo P. Ticheli, AGFPAC RCTU 1; and First Lieutenant Cyril C. Disney of the 31st Operations Detachment at Ft. Kam.

First Three-Graders who completed a two-week course at the Troop and Staff School are: Master and First Sergeants Amil Del Biaggio, Homer E. Spivey, Frank Vickers, William C. Caldwell, Francis P. Dockery, Richard R. Stockler, Frank C. Carpino, Antone Martines, William M. Heffner, John W. Mielke, Alvin D. Sutton, Walter Murrel, Jesse W. Wood, Rex L. Roberts and Allen J. Dirret.

Completing the three-up-and-three-down roster are: First Sergeants John Jackson, John Cybulski, William Lassiter, Michael Maletzki, William R. Strappel, Edward Harris, Joseph Vahey and Lewis Bloom.

Technical Sergeants completing the school are: Albert J. Kisho, Robert H. Unruh, Louis J. Jurasits, Mitchel J. Polovich, Frank T. Evartowski, Dewey Cooper, Max C. Wood, Mack S. Price and William J. Munyer.

Staff Sergeants Joseph M. Schloss, Benjamin A. Clark, Clyde E. Jones, John J. King, Eugene Glenn, King J. Rutherford, Joseph A. M. Young, Otto Gross, Bennie Gunter, Ernest H. Bowers, Mack A. Thompson, Richard S. Moy, Sam C. Smith, George L. McAdams, Bill Ellis, Earl L. Phillips, Michael Dzurikanin, Emmet M. Ivy and Kenneth E. Elstad; and T/3s Lloyd Sitch and Theodore Borden, also attended the school.

At an earlier ceremony this month, First Sergeant Rex Roberts, "B" Battery, 97th, was awarded the Croix de Guerre by the French government for personal heroism during the battle of France.

Newly arrived from the mainland is Captain John F. Redfield, former instructor with the Diesel Engineering School at Ft. Winfield, California. Captain Redfield has been assigned to the 88th Searchlight Battery at Schofield Barracks. Another recent arrival is CWO Leland F. Benham, at present on the AGFPAC orientation tour of the islands. Mr. Benham was formerly Personnel Officer of the 213th AW Battalion at Orlando Army Air Base.

Among officers recently reassigned are: Major Harold E. Deems, former CO of the 31st Operations Detachment at Ft. Kam. Major Deems, who has been with AAA on Oahu since May 1946, has been reassigned as CAC instructor with the New York Organized Reserve, Brooklyn, N. Y. He leaves shortly with his wife, Patricia Mae, and daughter, Mary, for his new duties.

COAST ARTILLERY ORDERS

WD and AGF Special Orders covering the period 23 June 1947 through 23 August 1947. Promotions and Demotions are not included.

Colonels

Allen, Ralph C., to European Comd, Bremerhaven, Germany.
Anderson, Robert Loomis, to Trfd to AGD.
Barker, Wayne L., to Dept of State, Washington, D. C.
Blackwell, Herbert H., to Sixth Army 6606 ASU, Ft. Lewis, Wash.
Bullene, Lathrop R., to First Army 1202d ASU Rctg Det No. 2, 39 Whitehall St., New York, N. Y.
Cameron, Henry M., to Retired.
Conway, Eugene T., to Retired.
Dalao, Esteban B., to Retired.
Featherston, John H., to 2304th ASU Virginia Mil Dist. 331 Parcel Post Bldg, Richmond, Va.
French, Charles A., to Fifth Army 5107th AUS Mo. Mil Dist, St. Louis, Mo.
Gibson, Manly B., to Retired.
Gleim, Robert F., to Detailed in TC.
Hause, Francis A., to AGO Casuals, Washington, D. C. for dy w/WD Pers Records Bd.
Haw, Joseph C., to European Comd, Bremerhaven, Germany.
Hayden, James L., to Retired.
Heathcote, Earl W., Hq Fifth Army, Chicago, Ill.
Holder, William G., to 1153d ASU Office Sr NG Instr for New Hampshire, Concord, N. H. Detailed as CA Instr.
Jones, Allison W., to Retired.
Lazar, Aaron M., to OC of S, Washington, D. C.
McCarthy, William J., to AGO Casuals, Washington, D. C. for dy w/WD Pers Records Bd.
Myrah, Halvor H., to European Comd, Bremerhaven, Germany. Mailing Address New Arrivals Sec 25th BPO APO 743, c/o PM, New York, N. Y.
Nelson, Paul B., to Panama Canal Dept. Mailing Address Reception & Separation Center, APO 837, c/o PM, New Orleans, La.
Ostenberg, Frank T., to AGO Casuals, Washington, D. C. for dy w/Secretary of War's Discharge Review Bd.
Perkins, Robert, to Retired.
Sevilla, Pacifico C., to Retired.
Smith, Donald H., to Hq Third Army, Atlanta, Ga.
Simmons, Joe F., to Retired.
Snell, Verne C., to Retired.
Stubbs, Guy H., to Stu Det AA & GM Br Arty Sch, Ft Bliss, Texas.
Swett, Francis S., to Retired.
Todd, Harold Elworthy, to Trfd to AC.
Villaret, Eugene, to AGO Casuals, Washington, D. C. to atchd to MDW for dy w/ARB.

Lieutenant Colonels

Bane, John C., to Second Army, Ft Geo G Meade, Md, w/sta Univ of Pennsylvania, Philadelphia, Pa.
Bellonby, Emery E., to European Comd, Bremerhaven, Germany.
Bond, Thomas M., to Detailed in Sp S.
Bowers, Alvin T., to AA & GM Br Arty Sch, Ft Bliss, Texas.
Cassidy, Richard T., to 3355th ASU Florida NG Instrs St Augustine, Fla. w/sta Pensacola, Fla. Detailed as CAC Instr.
Davis, Paul C., to First Army Governors Island, N. Y. w/sta Yale Univ. New Haven, Conn.
Defrees, Lindsay J., to Fourth Army, Ft Sam Houston, Texas, w/sta Rice Institute, Houston, Texas.
DuVal, Cammille H., to Hq Fifth Army, Chicago, Ill.
Furbish, Chester A., to Relieved fr active duty.
Gamble, Andrew S., to European Comd, Bremerhaven, Germany.
Gile, David A., to Stu Det Arty Sch, Ft Sill, Okla.
Gillette, Chauncey A., to Retired.
Gurley, Franklin, to Retired.
Guthrie, Robert E., to Retired.
Hale, Harry R., to European Comd, Bremerhaven, Germany.
Hayne, Dallas F., to First Army, Governors Island, N. Y. w/sta Yale Univ. New Haven, Conn.
Hoffman, Theodore F., to Det "R" ID Wd, Washington, D. C. w/sta at Oberammergau, Germany.
Jordan, Ralph E., to Stu Det Arty Sch, Ft Sill, Okla.
Kallis, Stephen, to 6707th ASU ORC Instr Gp 755 Central Bldg, 810 3rd Ave, Seattle, Wash. Detailed as asst to Sr Instr.
Kenerick, Kenneth R., to AGF Pacific, Ft Shafter, TH.
Kessler, Robert H., to Second Army Ft Geo G. Meade, Md. w/sta Univ of Pa., Philadelphia, Pa.
Kiel, Arthur G., to Stu Det AA & GM Br the Arty Sch, Ft Bliss, Texas.
King, Edward A., to Alaskan Dept.
McCoid, Chester B., to Detailed in Sp S.
Molloy, Robert W., to The Ground Gen Sch Ctr, Ft Riley, Kans.
McDuff, Alvie L., to 1242d ASU Office Sr State Instr ORC Instr for NY.
Moore, Joseph C., to AA & GM Br the Arty Sch, Ft Bliss, Texas.
Pohl, Marion G., to Stu Det Armed Forces Staff College, Norfolk, Va.
Rackes, Adams E., to Stu Det Second Army, Ft Geo G. Meade, Md.
Rauch, Alfred R., to Sixth Army 6901 ASU Sv Det SFPE, Ft Mason, Calif. w/sta Oakland Army Base, Oakland, Calif.
Richards, Harris T., to Retired.
Ritterbush, Milton Frederick, to Trfd to AC.
Roth, Irving D., to Stu Det Hq First Army, Governors Island, NY w/sta Naval War College, Newport, R. I.
Schmidt, Victor G., to European Comd, Bremerhaven, Germany.
Shumate, Bruce E., to Detailed in Sp S. asgnd to Sp S Sch, Ft Monmouth, N. J.
Smith, Robert G. Jr., to 5418th ASU ROTC Northwestern Military & Naval Academy, Lake Geneva, Wis.
Stone, John E., 1242d ASU Office Sr State ORC Instr for N. Y. 90 Church St., New York, N. Y. Detailed as CAC Instr.
Thompson, Maxwell H., to OC of S, Washington, D. C. for dy in Office Dir of Pers & Adm.
Underwood, George V., to Detailed as member of GSC and asgd to WDGS.
Wald, John J., to Second Army, Ft Geo G. Meade, Md. w/sta Univ of Pa. Philadelphia, Pa.
Ward, Edgar R. C., to Panama Canal Dept.
Woodbury, Kenneth J., to Stu Det Armed Forces Staff College, Norfolk, Va.

Majors

Baker, Marshall W., to Second Army 2124th ASU Ft. Monroe, w/sta Oceana, Va.
Banks, John M., to Antilles Dept, Detailed at ROTC Univ of Puerto Rico, Rio Piedras PR Temp mailing address. Casual Pers Center, APO 846 c/o PM Miami, Fla.
Bayer, Kenneth H., to Second Army Ft. Geo. G. Meade, Md. w/sta Univ of Pa. Phila., Pa.
Beyer, Robert W., to Stu Det Army Fin Sch Army Fin Cen OCF Bldg 223-B St. Louis, Mo.
Bird, Stewart, to European Comd, Bremerhaven, Germany. Mail addr to. New Arrivals Sec. 25BPO APO 743 c/o PM New York, N. Y.
Bourdon, Adrian A., to Panama Canal Dept.
Brown, Charles M., to Stu Det MI Sv Language Sch. Presidio de Monterey, Calif.
Bull, Harcourt G., to Fifth Army 5257 ASU Mo Mil Dist, St. Louis, Mo.
Burrell, Walter E., to Btry A 87th Rocket FA Bn Ft. Sill, Okla.
Butler, James L., to European Comd, Bremerhaven, Germany.
Byrd, Cohen B., to Third Army, Atlanta, Ga. w/sta Georgia Inst of Technology, Atlanta, Ga.
Chapman, Daniel J., to Stu Det Arty Sch, Ft. Sill, Okla.
Cummins, William Kneedler, to trfd to AC.
Curtis, Elmer P., to Stu Det Hq First Army, Governors Island, N. Y.
Davis, Gerald W., to detailed as member of GSC & asgd to GS w/trps.
Deems, Harold E., to 1242d ASU office Sr State OR Instr for New York, New York City w/sta Brooklyn, N. Y. Detailed as CAC Instr OR State of New York.
Dentor, Earl L., to 5261st ASU Office State Sr Instr OR Milwaukee, Wis. w/sta Wausau, Wis. Detailed as CAC Instr.
Devaney, Carl N., to Detailed in Cav.
English, Tracy L., to European Comd, Bremerhaven, Germany.
Epley, Albert D., to Stu Det AA & Gm Arty Sch, Ft. Bliss, Tex.
Farrar, William L., to OC of S Washington, D. C. for dy in Office Dir of Intelligence.
Farwick, Harry, to Detailed as member of GSC & asgd to WDGS.
Goettl, John P., to Stu Det Comd & Gen Staff College, Ft. Leavenworth, Kans.
Gregory, Clyde, to Detailed in AGD.
Guth, Henry T., to Hq Antilles Dept, San Juan, PR w/sta Rio Piedras, PR.
Hagemeier, Paul E., to 5254th ASU Office Kans State Sr Instr OR Topeka, Kans w/sta at Dodge City, Kans. Detailed as CAC Instr.
Haviland, Morris E., to Detailed in Sp S.
Holmes, William E., to Stu Det AA & GM Br Arty Sch, Ft. Bliss, Tex.
Hunegs, Harry, to 2457th ASU ROTC Purdue Univ., Lafayette, Ind.
Kirby, Lee M., to 3222d ASU N. C. NG Instr, Raleigh, N. C. w/sta Wilmington, N. C. Detailed as CAC Instr.
Ledford, Lee B., to Detailed in JAGD.
Long, Glendron R., to Detailed AGD.
Long, Heywood J., to 2554th ASU Virginia ORC Instr Gp Richmond, Va. Detailed as CA Instr.
McCalliser, J. L., to Alaskan Dept.
McGrane, Edward J., to Stu Det AA & GM Br Arty Sch, Ft. Bliss, Tex.
Mancuso, Salvatore J., to OC of S, Washington, D. C.
Mayers, Thomas H., to Stu Det Arty Sch, Ft. Sill, Okla.
Meadows, Charlie E., to European Comd, Bremerhaven, Germany.
Mize, Willard W., to AA & GM Br the Arty Sch, Ft. Bliss, Tex.
Moore, Robert F., to Detailed at 3201st ASU ROTC Alabama Polytechnic Institute, Auburn, Ala.
Morton, James F., to RTC Ft. Ord, Calif.
O'Brien, John A., to Stu Det Arty Sch, Ft. Sill, Okla.
Odenweller, Charles J., to First Army 1108 ASU Hq & Hq Det HD of Narragansett Bay & New Bedford, Ft. Adams, R. I.
Overton, Robert H., to European Comd, Bremerhaven, Germany.
Paciorek, Stanley J., to 5309th ASU Wisconsin Rctg Dist, 707 Federal Bldg, Milwaukee, Wis.
Panneck, Theodore W., to Detailed in IGD.

Parsons, Marcus L., to Stu Det AA & GM Br Arty Sch, Ft. Bliss, Tex.
Polifka, Frank J. F., to Stu Det Hq Second Army, Ft. Geo. G. Meade, Md. w/sta Univ of Penna, Phila., Penna.
Robinson, Edward H., to Detailed in AC 4117th AAF Base Unit Robins Fld, Ga.
Roedy, William H., to First Army Governors Island, N. Y. w/sta Harvard Univ Grad Sch of Public Adm, Cambridge, Mass.
Roosa, James A., to Detailed in AC 733d AAF Base Unit Wright Fld, Ohio.
Sullivan, James A., to Detailed at 129st ROTC St Bonaventure College, St. Bonaventure, N. Y.
Salmon, Eugene H., to European Cmd, Bremerhaven, Germany.
Spengler, John T. H., to Panama Canal Dept.
Sigley, Woodrow B., to Second Army Ft. Geo. G. Meade, Md. w/sta Univ of Penna, Phila, Penna.
Smith, Calvin O., to Arty Sch, Ft. Sill, Okla for dy w/Staff & Faculty.
Smith, Bailey B., to OFLC, Washington, D. C. w/sta Basra Raq.
Sullivan, Martin F., to Stu Det Arty Sch, Ft. Sill, Okla.
Turner, Hugh J. Jr., to Hq AGF Ft. Monroe, Va. w/sta Evans Sig Lab, Ft. Monmouth, N. J.
Ward, William D., to 1291st ASU ROTC, St. Bonaventure College, St. Bonaventure, N. Y.
Wingate, James W., to AAF Project PAC ZO295 AAFORD Hamilton Fld, Calif.
Zimmerman, Robert H., to 1272d ASU Offices SR NG Instr for N. Y., New York, N. Y. w/sta Buffalo, N. Y. Detailed as CA Instr.

Captains

Arnold, William B., to detailed in AC, Eglin Fld, Florida.
Barr, James G., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Betts, George, to AA & GM Br, TAS, Ft. Bliss, Texas.
Bianchi, Joseph J., to Stu Det, MI Language Sch., Presidio of Monterey, Calif.
Biery, James H., to First Army Rctg, Dist No. 1, w/sta Troy, N. Y.
Boller, Quellen D., to detailed in CMP.
Brinkwart, Hugo, Jr., to reld fr detail in MI.
Brock, George C., to Fifth Army Rctg Dist, Rm 712 Fed Bldg., Milwaukee, Wis.
Chapman, George A., to RTC, Ft. Ord, Calif.
Coiner, David T., to OC of S, Washington, D. C. for dy w/Civil Affairs.
DeFranco, Theodore J., to AA & GM Br, TAS, Ft. Bliss, Texas.
Dunning, Henry N. to European Comd, Frankfurt, Germany.
Davis, James W., to European Comd, Bremerhaven, Germany.
Eisenhauer, Adam J., to OC of S, Washington, D. C. for dy w/Dir of Intell.
Enfinger, Allen V., to European Comd, Bremerhaven, Germany.
Fitzpatrick, Grey, to Stu Det, The Sig Sch, Ft. Monmouth, N. J.
Flaughter, Thomas E., to detailed in TC.
Fleisher, Charles C., to European Comd, Bremerhaven, Germany.
Gray, Harry A., to Fourth Army Rctg Dist., w/sta Little Rock, Ark.
Haslip, John L., to AA & GM Br, TAS, Ft. Bliss, Texas.
Hawthorne, Frank, Jr., to NC ORC, O of Instr, Raleigh Bldg, Raleigh, N. C.
Healey, John D., Jr., to Stu Det AA & GM, Br, Tas, Ft. Bliss, Texas.
Jaffa, Robert B., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Jennings, Howard M., to First Army Rctg Dist No. 1, w/sta Schenectady, N. Y.
Johnson, Charlie W., to Hq. Ft. Monmouth, N. J.
Johnson, John F., to Second Army, w/sta Univ of Penna, Phila., Penna.
Jones, Harry B., Jr., to detailed in Sp S, Ft. Monmouth, N. J.
Jones, Lee G., to Second Army, w/sta Univ of Penna, Phila., Penna.
Joppling, Daniel W., to Hq. Sixth Army, Presidio of San Francisco, Calif.
Kates, Robert C., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Katsiaficas, Nicholas G., to 267th AAA Gp, Ft. Bliss, Texas.
Keenan, James F., to the Abn Sec, TIS, Ft. Benning, Ga.
Krahn, Roy C., to European Comd, Bremerhaven, Germany.
Kuharic, John J., to Stu Det, MI Language Sch, Presidio of Monterey, Calif.
List, Herbert C., to relieved from active duty.
Lacouture, Arthur J., Jr., to Std Det, the Sig Sch, Ft. Monmouth, N. J.
Lash, Eugene L., to Stu Det, Arty Sch, Ft. Sill, Okla.
Lazzara, Angelo, to European Comd, Bremerhaven, Germany.
Lopez, Raymond A., to CIC Center, Cp Holabird, Md.
McKinnon, Edward F., to AA & GM Br, TAS, Ft. Bliss, Texas.
Marcheselli, Vincent F., to First Army, Hq & Hq Det, HD/Del, Ft. Miles, Del.
Mathews, William G., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Miller, Robert S., to European Comd, Bremerhaven, Germany.
Mohler, William A., to European Comd, Bremerhaven, Germany.
Mumford, Howard F., to Third Army, 3431st ASU, Ft. Jackson, S. C.
Neill, Harold A., to Stu Det, Sig Sch, Ft. Monmouth, N. J.
Nowack, John J., to Third Army Rctg Dist, w/sta Rock Hill, S. C.
Ostlund, William C., to Far East Comd, Korea.
Pavy, Laurent D., to European Comd, Bremerhaven, Germany.
Pensen, David, to 384th AAA Gun Bn, Ft. Bliss, Texas.
Peyer, Gustave A., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Pickens, Robert G., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Ramsey, Kenneth W., to ROTC, Glendale High Sch, Glendale, Calif.
Reese, William G., to RTC, Ft. Ord, Calif.
Renegar, Gerald E., to AA & GM Br, TAS, Ft. Bliss, Texas.
Roton, William F., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Routh, Robert K., to AA & GM, Br, TAS, Ft. Bliss, Texas.
Schimmel, Bernard H., to detailed in Ord. Dept.
Shortall, John L., Jr., to AA & GM Br, TAS, Ft. Bliss, Texas.
Sibilsky, Edward L., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Smith, Frank, to detailed in Spcl Services.
Smith, James L., to RTC, Ft. Ord, Calif.
Smoleroff, Eugene J., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Soltow, Edward A., to Arty Sch, Ft. Sill, Okla.
Spencer, Thomas K., to 4th Inf. Div., Ft. Ord, Calif.
Stalin, Gustaf S., to Fifth Army, 5025 ASU, Ft. Leavenworth, Kans.
Stovall, Jim P., to Fourth Army, 4203d Rctg Dist, Okla. City, Okla.
Suydam, John H., to asgd to CDC Shipment (60 days delay enroute).
Touart, Anthony J., Jr., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Van Auken, Wendell G., to ROTC, Ohio State Univ., Columbus, Ohio.
Walker, Robert M., to N. Mex. NG Instr Gp, w/sta Deming, N. Mex.
Wheatley, William M., to The Ground Gen. Sch. Cen., Ft. Riley, Kans.
White, Grady O. to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Williams, Norman O., to Fifth Army Rctg Dist, w/sta Milwaukee, Wis.
Woodward, Joseph G., to Far East Command, Korea.
Young, William A., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.

First Lieutenants

Anderson, Richard C., to 384th AAA Gun Bn., Ft. Bliss, Texas.
Aquillina, Raymond F., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Arnold, Ernest J., to AA & GM Br, TAS, Ft. Bliss, Texas.
Bacon, Averill W., to 83rd AAA S/L Btry., Ft. Bliss, Texas.
Bjugstad, Wilmer G., to European Comd, Bremerhaven, Germany.
Blackwood, Joe R., to detailed in QMC.
Bussey, Robert O., to AGO, Washington, D. C., for dy w/Administrative Services.
Casey, Lloyd B., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Collis, Everett F., to 3rd Armd Div., Ft. Knox, Ky.
Clark, Julian D., to Panama Canal Department.
Conn, Archie E., Jr., to detailed in Special Services.
Dall'acqua, Mario R., to Panama Canal Department.
Dunlap, Brady, to AA & GM Br, TAS, Ft. Bliss, Texas.
Dunning, Henry Nicholas, to relieved from active dy.
Gale, Don S., to Stu Det, Hq First Army, Governors Island, N. Y. w/sta Naval War College, Newport, R. I.
Hogan, James H., to Stu Det, TAS, Ft. Sill, Okla.
Hohmann, Benjamin W., to the Abn Sec, TIS, Ft. Benning, Ga.
Hoseman, Joseph F., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Jager, Roland V., to Hq. Camp Stoneman, Pittsburg, Calif.
Johnson, Robert S., to AA & GM Br, TAS, Ft. Bliss, Texas.
Kline, Martin L., to AA & GM Br, TAS, Ft. Bliss, Texas.
Kressin, Harold R., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Kubachko, Andrew, Jr., to European Comd, Bremerhaven, Germany.
Lake, Earl W., to Btry A, 87th Rocket FA Bn, Ft. Sill, Okla.
Lines, Clarence P. to European Comd, Bremerhaven, Germany.
McFeters, Glen A., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Morrisroe, William J., to Hq. Ft. Monmouth, New Jersey.
Morrison, Robert W., to relieved from active duty.
O'Day, Thomas H., to Second Army Rctg Dist, w/sta Cincinnati, Ohio.
Ost, Lincoln E., to Panama Canal Department.
Padgett, Raymond B., to 4th Inf. Div., Ft. Ord, Calif.
Perry, Donald E., to AA & GM Br, TAS, Ft. Bliss, Texas.
Pont, Walter F., to Panama Canal Department.
Radford, Duane E., to Panama Canal Department.
Reid, Raymond T., to Panama Canal Department.
Schmidt, Max W., to 5th Army Rctg Dist, w/sta Detroit, Mich.
Shay, Frank, J., Jr., to 3rd Armd Div., Ft. Knox, Ky.
Short, Norman V., to Stu Det, AA & GM Br, TAS, Ft. Bliss, Texas.
Smith, Harry F., to AA & GM Br, TAS, Ft. Bliss, Texas.
Terry, Milton O., to Stu Det, Hq. Fifth Army, ROTC, Ft. Ord, Calif.
Wasson, Earl D., to 5th Army Rctg Dist, w/sta Detroit, Mich.
Walston, Dayton F., to Panama Canal Department.
Weatherford, Gerald F., to Panama Canal Department.
Willson, Clayton R., to AA & GM Br, TAS, Ft. Bliss, Texas.

Second Lieutenants

Hogan, Robert L., to The Ground Gen. Sch. Center, Ft. Riley, Kansas.

BOOK REVIEWS

Where the Trouble Lies

THE BALKANS, FRONTIER OF TWO WORLDS. By William B. King and Frank O'Brien. Alfred A. Knopf, Inc., New York. 282 Pages; Index; $3.50.

Not so many years ago, west-Europeans, secure in the politically and economically stable order of their respective country, could look upon Balkan politics as the strange and somewhat improbable antics of semi-civilized, childishly querulous peoples. Today, the process of Balkanization, i.e., the progressive anarchy once believed to be a condition peculiar to the "backward" nations of southeastern Europe, operates in virtually all of Europe. The analogy is a simple one: The disintegration of the Ottoman Empire created a power vacuum which the Balkan states were not strong enough to fill. The Balkan Peninsula was the scene upon which the Great Powers of Europe maneuvered for position, and the Balkan peoples were the pawns in a game which they did not control.

The factionalism, deviousness and pettiness of Balkan politics were the logical consequences of persistent foreign interference, manipulation and exploitation, not of the racial or historical characteristics of the Balkan peoples. Similarly, it is the power vacuum of present-day Europe which is giving rise to the same pathological traits, collective schizophrenia, which, a generation ago, were thought to be typical of the writhing Balkans. The Balkans can thus be viewed, from the historian's point of view, as a laboratory experiment yielding many important and tragic lessons for the entire Continent.

Messrs. King and O'Brien, two old Balkan hands versed in the most recent intricacies of local politics, are well aware of the implications of their subject, which transcend the locale and assume crucial, world political importance.

The United States, no less than Great Britain and Russia, is deeply involved in Balkan politics, and it will probably be the course of U. S. foreign policy in this critical area which will affect the fortunes of people in, let us say, Kansas more decisively than U. S. foreign policy towards, let us say, Latin America or China. The authors have succeeded admirably in summarizing the strategic geography of the region and of the individual states, Yugoslavia, Rumania, Albania, Bulgaria, Turkey and Greece. They have pieced together, from their rich personal experience, the picture—in each instance a complicated and colorful one—of the politics of each country, an animated and acid Who-is-Who of incredible careers surpassing the imagination of our most lurid writers of fictionalized biographies. Thus, for example, the essence of the tragicomedy which is Rumania, is contained in the word portraits of the indomitable Maniu, the peasant leader who defied the Soviet, the evasive King Mihai and the venal Tatarescu, ex-fascist and ex-collaborationist who made the grade as foreign minister of the communist Grosza Government; the stark tragedy that is Yugoslavia is conveyed to the reader by inclusive character studies of the enigmatic, Goeringesque Tito and the ambiguous, feckless Mikhailovich.

The dominant theme of the book is the story of the systematic, carefully rehearsed procedure by which numerically negligible groups of Soviet agents perverted historical political parties, terrorized and divided their opponents, rigged elections, usurped power and sabotaged the solemn pledges given by Russia at Yalta. While the presence or proximity of Soviet military power undoubtedly eased the ascent to power of these small, perfectly trained and superbly led shock troops of the Comintern (which appears remarkably alive despite its officially announced demise), the methods they applied to the business of capturing the governments and nations of the Balkans are of universal significance. They are, except for small deviations, identical with those employed by communist groups in western Europe and Asia.

The authors, strongly critical of Russian policy, do not hesitate to give the Balkan leftists credit when credit is due. The book is not just an anti-Soviet tract; it is an even-handed account of Soviet methods—and of Anglo-American blunders and feeble compromises without which those methods could not have succeeded as spectacularly as they have succeeded at the expense of the United States, Great Britain and the one hundred million people inhabiting the debated ground between East and West. It is a political book and touches only briefly upon the cultural life and spiritual aspirations of the Balkan peoples. But it is permeated by a genuine sympathy for the common people, the docile peasant masses, who are made to bear the burden of power politics. *The Balkans* is essential reading for the student of international politics; it is also an expertly made and highly entertaining product of topnotch journalism.—Robert Strausz-Hupé.

The Best of Its Kind

AMERICAN COMMUNISM. A Critical Analysis of its Origins, Development and Programs. By James Oneal and G. A. Werner, Ph.D. E. P. Dutton & Co., Inc. 416 Pages; Appendices; Index; $5.00.

Although this is unquestionably the best available book on American Communism, it is better suited to the scholar or specialist than to the general reader. The authors are a veteran Socialist editor (of a conservative bent of mind) and a college professor. Their personalities make it possible for the book to be exhaustive and informed, but also cause the introduction of details in which the ordinary reader would not be interested. The historical parts are better than the contemporary; comprising the greater part of the book, these trace the background of ultra-radical socialism, World War I developments, the various Communist sects of the 1920s, the Communist "third party" movements (which may reappear in 1948), the financing of Communism, Trotskyism, youth groups,

the Comintern, Russian allegiance of the American Communists, World War II developments, and the *front* technique. The last chapters summarize the Communist organization and present a somewhat unnecessary defense of democracy against Communism—unnecessary in the light the book as a whole throws upon the Reds. Appendices include some of the basic Communist documents as well as an instructive table of Communist-Nazi parallels. Since the authors write from a pro-labor, pro-Socialist point of view, they attack the Communists on grounds which are morally sound and intellectually respectable, but nevertheless unfamiliar to the American public as a whole. There is, in this volume, no summary of the Communist penetration of the American Left, little appraisal of the debacle of American "liberalism," and only rare references to the rôle of pro-Communist sympathizers outside the obvious transmission-belts of the fronts. It is to be hoped that the authors or publisher digest their own book into a simpler, less scholarly presentation. Until a better book appears, this volume should be read and understood by every person concerned with security, political intelligence, counter-intelligence and counter-subversive activities. *American Communism* portrays the only fifth column which is *already here;* with this book, we are warned.—Paul M. A. Linebarger.

One World—2300 Years Ago

ALEXANDER THE GREAT. The Meeting of East and West in World Government and Brotherhood. By Charles A. Robinson, Jr. E. P. Dutton & Co., Inc. 252 Pages; Index; $3.75.

Twenty-three hundred years ago, the world's military power was concentrated in the hands of two nations. Macedonia with its Greek satellites in Europe faced Persia across the Bosphorus. Once again, for it had happened already a number of times, East and West were destined to meet on the battlefield. In military and economic potential the Asiatic power was immensely superior. Nevertheless, under Alexander the Great, the far smaller Greek army completely destroyed that of the Persians.

Conquest was by no means the most enduring or significant result of Alexander's invasion. Professor Robinson has no difficulty pointing out the Macedonian's better strategy, tactics, technology and logistics that achieved the victory. His succinct but most significant biography of Alexander is not primarily concerned with military affairs, although the comments on the various battles and on the course of the campaigns are sound and illuminating. Professor Robinson's rare scholarship and facile pen, however, find a more congenial field of study in Alexander the statesman than in the soldier. It is the aftermath of battle that fills these fascinating pages rather than the battles themselves.

According to the author, Alexander's greatest victory was the Hellenization of the East whereby many different races were united by means of the Greek language, Greek customs and Greek law. His purpose was one world. "Alexander's idea of cooperation between peoples included all races and was not limited to Macedonians and Iranians, the conquerors and the conquered." He sought to establish a world government and the fusion of races.

Professor Robinson's new characterization of Alexander is based on careful research and argument. It is noteworthy for its skilfull use of the sources available and for the lucid charm of its style.—Brigadier General Donald Armstrong.

Excellent Study of Shintoism

MODERN JAPAN AND SHINTO NATIONALISM. By D. C. Holtom. The University of Chicago Press. 226 Pages; Index; $2.75.

This is more than a book—it is the fruit of a life's work. Professor Holtom has studied Shinto for more than thirty years. He taught religious history in Japan while studying the Japanese themselves assiduously and sympathetically. Over twenty years ago, he began publishing the scholarly materials of which this volume is the final rendition. Throughout these years, he has maintained the calm, friendly fairness which characterized the very best in Christian scholarship. In the years before the war, Dr. Holtom risked severe Japanese censure by his courage in describing Shinto as an inflated, abused, nationalist cult; now, in the postwar period, he risks abuse from self-styled liberals because he reaffirms the basic spiritual values of Shinto. He agrees with our wartime jingoes who shouted that Shinto—the special Japanese religion—was the key to Japanese character, but he pulls the carpet out from under these latter-day iconoclasts by pointing out that Shinto, as a private religion, is a moral, religious and esthetic heritage of which we have no right to deprive the Japanese. His additional, new chapters on postwar Shinto are thus an authoritative vindication of the American policy, wisely made in Washington and admirably administered by General MacArthur, of reducing Shinto from war cult to peacetime faith.

Perhaps never before in the world's history has a religious disestablishment proceeded so smoothly for all concerned. Japan today is still "Shinto" just as the U.S. is "Christian"—though the Federal government is neither Methodist nor Catholic, it closes its offices on the "religious" holiday of Christmas; similarly the postwar Japanese government can honor and respect Shinto without making it an obligatory state faith. This book, in its earlier forms, is already known to all Far Eastern experts. The present, perhaps final edition is worth careful, sympathetic reading by anyone concerned with Japan.—Paul M. A. Linebarger.

Fruit of an AGO Form

ANOTHER DAY, ANOTHER DOLLAR. By John T. Winterich. J. B. Lippincott Company. 204 Pages; Illustrated; $2.50.

The questions the Adjutant General's Office dreams up for its innumerable blank forms never produced a more surprising or pleasing answer than this book of essays on one person's experiences as a child laborer. As an enlisted man in World War I, Colonel Winterich was one of the editors of the original *Stars and Stripes*, and probably decided then that if another war came he would join the ranks of those "who never had it so good" and get a commission. That's how when World War II came he got enmeshed in WD AGO Form 0857, which among other things told him to list the complete record of his civilian employment. It's difficult to believe any ex-*Stars and Stripes* man could be so attentive to detail but Mr. Winterich faithfully, so he tells us, listed for the AGO all the jobs he had held in manhood, youth and boyhood.

He must have done it in good order too because he got his commission and went on duty in the Pentagon Building. Those were hectic, crucial days and, despite the jokes, people in the Pentagon worked hard. But Colonel Winterich couldn't get Form 0857 out of his mind and so for relaxation he began to write an autobiographical account of his boyhood experiences as a wage earner in his home town, Providence, Rhode Island. The result is a good-humored autobiography (without vital statistics) that's sharpened with an unpredictable sense of the incongruous.

One thing must be added: The book contains a most splendid tribute to West Point and its products.—Tee Four.

RIDING AND SCHOOLING HORSES. By Brigadier General Harry D. Chamberlin. Washington: The Armored Cavalry Journal Press. 200 Pages; Illustrated; $4.00.

Lovers of horseflesh—and their name is still legion—will welcome this limited reissue of General Chamberlin's famous handbook for horsemen. It contains the principles of equitation and tells the reader how to become a better horseman and horsemaster. General Chamberlin's vast experience as a horseman and as an instructor in horsemastership, plus his successful participation in many of the Olympic Equestrian Games made him a natural candidate for the authorship of this book. All horsemen—military and civilian—will be glad that the Armored Cavalry Journal Press has seen fit to reissue it.—Tee Four.

Emporia Editor

WILLIAM ALLEN WHITE'S AMERICA. By Walter Johnson. Henry Holt and Company. 621 Pages; Illustrated; Index; $5.00.

Mr. Johnson, the editor of William Allen White's letters, has written a definitive account of the Emporia editor's life and times. It's neither a biography of White nor a history of the U.S. from 1890 to 1944 but it's certainly a splendid account of the effect White had on America and the effect America had on White. As such it is more rewarding than either biography or history.—Tee Four.

Clear, Authoritative Discussion

THE UNITED STATES IN WORLD AFFAIRS 1945-1947. John C. Campbell with an introduction by John Foster Dulles. Harper & Brothers. 585 Pages; Index; $5.00.

Dr. Campbell has had the assistance of the research staff of the Council on Foreign Relations, publishers of the authoritative quarterly *Foreign Affairs*, in the preparation of this inclusive survey of a difficult subject. Long without being lengthy, the volume summarizes American political and military problems for the critical end-of-war and postwar years. Separate chapters take up such problems as the United Nations, Latin America, Central Europe, the Far East, UNRRA, and disarmament. The author has been unusually successful in digesting an immense range of information in a readable, graceful style. It is as though the New York *Times* editorial page were expanded to almost six hundred pages while maintaining its clarity, authority, and straightforwardness of discussion. This book should be in even the smallest libraries.—Paul M. A. Linebarger.

BREAD AND RICE. By Doris Rubens. Thurston Macauley Associates. 234 Pages; $3.00.

By accident, certainly not by design, this account by a young psychologist-journalist of the year and a half she and her husband spent in the hills of Luzon as fugitives and of their later confinement in Japanese prisons may describe certain aspects of the Japanese occupation of Luzon more accurately than many better books. Its style generally inclines to the horror-story hysterical ("tore my eyes away," "my eyes were glued," "Jap-talk," "slanting eyes," "cruel, sinister Jap eyes," "I cried out hysterically"), which doubtless correctly reflects the mental condition of many Americans in the Philippines. It reveals an amazing helplessness in these two heirs of the American pioneer spirit, who apparently could not even try to build huts, store firewood, secure food, and who were completely dependent on brave, tireless Filipinos such as Fabian. The book was interesting to me because of its naïvely candid revelation of the character of a kind of contemporary romantic, agnostic, missionary. It is even more of a tribute to the Filipino people than the author set out to write.—Lt. Col. Walter L. Woodfill.

THE HISTORY OF JAPAN. By Kenneth Scott Latourette. The Macmillan Company. 290 Pages; Index; Illustrated; $4.00.

History, being such an explosive subject, is open to much whim and opinion; however, *The History of Japan* by Latourette is admirably organized and written with a style that makes reading easy. In this book the author has condensed the history of a nation that stretches from before the time of Christ to the present year. The work is a summary and the many whys and wherefores of actions throughout the centuries are not interrupted often nor at any great length. The author deals chiefly with what has happened in Japan and not with why it happened, nor of the many ways events might have gone if certain variables had not been present. The history is the result of other books on Japan by the same author and of more recent research.—G. T. T.

THE MYSTERIOUS SEA. By Ferdinand C. Lane. Doubleday & Company. 345 Pages; Index; $3.00.

If you were lucky enough to get a copy of *What To Do Aboard A Transport* before going overseas, and if you enjoyed it, this excellent book is emphatically your meat. It is an expertly written narrative of everything concerning the sea—the water itself, the tides, sea life, ocean boundaries, ships, lighthouses, piracy, trade routes, charts and anything else you want to know about the sea. It is a wonderfully engrossing book, but why, oh why, didn't the publishers put some maps in it?—Richard Gordon McCloskey.

New Books

THE SOLUTION OF THE GERMAN PROBLEM. By Wilhelm Ropke. G. P. Putnam's Sons. 282 Pages; Index; $3.00. The author is professor at the Institut Universitaire de Hautes Etudes Internationales, Geneva.

THE GREAT TIDE. By Rubylea Hall. Duell, Sloan & Pearce, Inc. 535 Pages; $3.50. Novel of plantation life on Florida's west coast in the 1830s and 40s.

ADMINISTRATIVE BEHAVIOR. By Herbert A. Simon. The Macmillan Company. 259 Pages; Index; $4.00. A study of decision-making processes in an organization.

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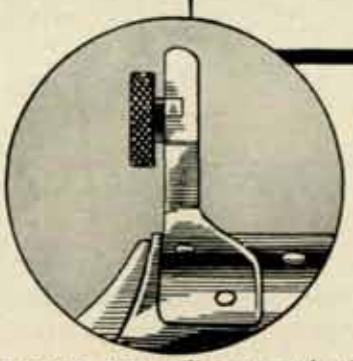

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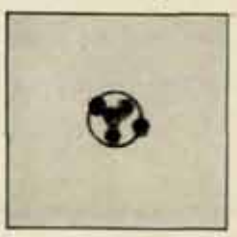

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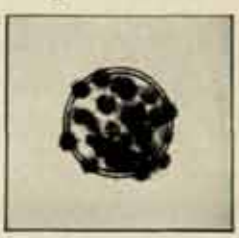

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