COAST ARTILLERY JOURNAL

JANUARY-FEBRUARY, 1947

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90th AAA BRIGADE

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RUSSIA'S FOREIGN POLICY

THE STRANGE ALLIANCE

The Story of Our Efforts at Wartime Cooperation with Russia

by

JOHN R. DEANE

Major General, U. S. Army (Retired)

Head of the U. S. Military Mission to Moscow, 1943-45

Except for our wartime Ambassador, no American was as close as General Deane to those events in Moscow which shaped our present world. Here—in his record of secret happenings from 1943 to 1945—is vital documentation on the problems of Soviet-American relations, and hitherto unpublished evidence of Russia's aims and motives.

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ACTIVITIES of th

THE BRONZE ARROWHEAD

The first wave of Infantry hit the Leyte beach at 1000 hours after 2½ hours of naval bombardment. At 1045 hours the 32d AAA Brigade headquarters approached Palo Beach aboard LST No. 171, one of four ships in the loading echelon of LST's. Palo Beach was one of four beaches that extended from Tacloban, the provincial capital, to Dulag, 20 miles to the south.

As the leading LST came within 400 yards of the beach, enemy artillery fire from a well camouflaged position about fifty yards inland, was received from the left flank. After perhaps a dozen shots, the fire was shifted to the adjacent LST. As LST No. 171 sailed into the firing sector, the first shot struck an ammunition ready box at the bow. The fragments killed the redheaded naval gunnery officer and three of his 40mm gun crew and in addition wounded th others. The second shot which hit the gun tub of the antiaircraft gun, killed one man and wounded three m on the deck below. Subsequent shots penetrated the of the craft just when the ladders and passageways w filled with troops preparing to disembark. After the s passed through the firing sector, there were 19 dead 35 wounded aboard. The total casualties on the four LS as the result of the firing were approximately 40 killed 75 wounded.

It was the misfortune of the Brigade Headquarters to aboard one of the few vessels ever penetrated by direct J anese artillery fire during a landing in the Southwest cific and the good fortune of the members thereof th none was a casualty. This landing under fire within

HISTORICAL BRIEF

Headquarters and Headquarters Battery, 32d AAA Brigade, was activated at Fort Bliss, Texas, on 20 November, 1942 with Brigadier General Hobart Hewett in command. In an exchange of commands, Brigadier General Homer Case joined on 1 March, 1943 and remained in command until 20 July 1945, except for the period, 27 November, 1943-4 April, 1944, while he was hospitalized following an airplane accident. During this period, Colonel Kenneth McCatty commanded. Brigadier General F. C. McConnell has been in command from 4 August, 1945 up to the present time. Colonel Chas. T. Pulham served as Executive from activation on through most of the Brigade's time in combat.

The Headquarters sailed for overseas on 7 September, 1943 and landed at Milne Bay, New Guinea, on 14 October. The command post was moved to Goodenough Island on 3 November, to Finschhafen on 24 February 1944, to Hollandia, Dutch New Guinea on 7 July and to Leyte, P. I., on 20 October. As recited in previous issues, the Headquarters remained in Leyte after V-J Day in charge of demobilization of the Southern Islands. In 1946, it moved to Luzon to train Filipino organizations.

32d AAA BRIGADE

minutes of H-hour on A-Day entitled the members of the brigade to wear the Bronze Arrowhead.

Three Tropical Islands

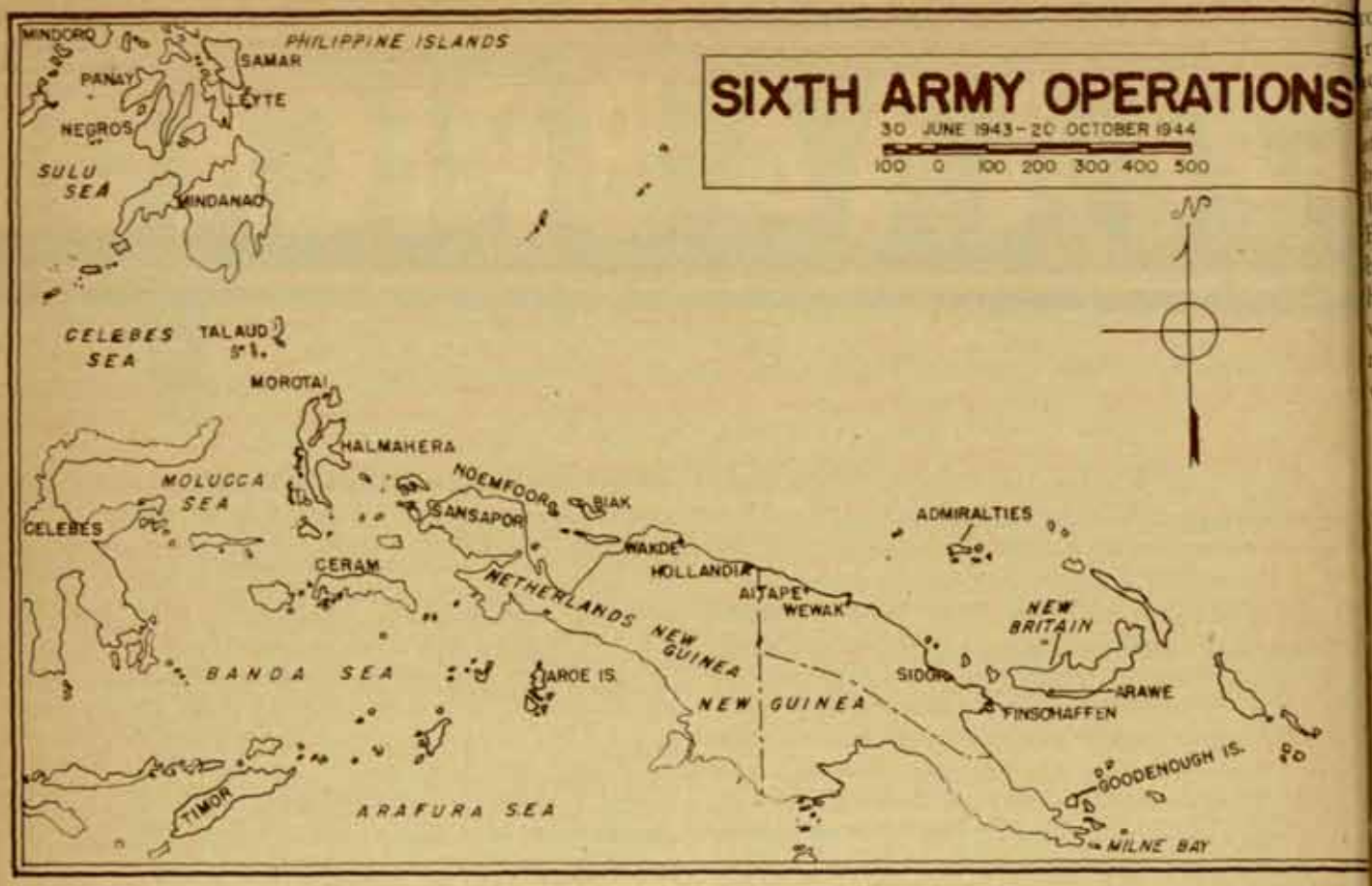
When the Brigade joined the Sixth Army in October 1943, the Allied "front line" in the Pacific consisted of the three "Dorothy Lamour" islands, between New Guinea and New Britain: Woodlark, Kiriwina and Goodenough which were held by the Americans and Finschaffen, on New Guinea which was held by the Australians. The 94th AAA Group, Colonel Kenneth McCatty commanding, defended Goodenough and Kiriwina Islands while a Marine Defense Battalion defended Woodlark.

The only AAA targets were occasional "reccos" that sometimes dropped a few small bombs at night. At this time the only demonstrated effectiveness of unseen firing using the SCR 268 was a hit on an Australian Beaufort as it approached one night without its IFF. The pilot complimented the gunners on their skill, but this did little to alleviate the misgivings all felt regarding this unfortunate experience.

The first Sixth Army landing on a hostile shore was made at Arawe, New Britain, on 15 December 1943. The landing was made by the 112th Cavalry Combat team, reinforced, Brigadier General J. W. Cunningham, commanding. Because of limited shipping space, this operation was supported by only two automatic weapons batteries and one searchlight section. Arawe was less than 200 miles from Rabaul, from which Japanese bombers were still operating. The Japanese soon discovered the lack of AAA guns and raided the small beachhead almost every night. They impudently flew at about 4000 feet which was above effective AW fire, and inflicted light but regular casualties. AAA guns were given a high shipping priority and after their arrival and subsequent employment, the Japanese bombers never came back.

Signal Corps

Landing craft unload supplies while a 40mm gun crew remain at their gun relaxed but ready to swing into action on a split seconds' notice.



The landing at Arawe was followed on 26 December by the landing of the 1st Marine Division at Cape Gloucester on New Britain. The AAA support for this operation was provided by the 12th Marine Defense Battalion.

The 1944 Campaign

The march of the Sixth Army up the north shore of New Guinea in 1944 began on 2 January when the 32d Division landed at Saidor against nominal opposition. A small supporting AAA force executed some terrestrial firing but engaged no aerial targets.

Plans were then in preparation for the 1st Cavalry Division (dismounted) to make a strong landing on the Admiralty Islands late in March 1944. Intelligence sources made it appear that the enemy forces there were weak. As the result, a reinforced squadron under command of Brigadier General William C. Chase made a surprise landing on the island of Los Negros on 29 February, nearly a month early. The story of this operation is told in the War Department Historical Document, "The Admiralties." Instead of a weak force, our troops, numbering less than one thousand, were met by over four thousand Japanese. The initial landing was supported by the 674th AAA Airborne Battery.

Although the gunners had no aerial targets, their heavy .50 caliber machine guns were used in the perimeter defense and provided staunch support against nightly Japanese ground attacks. The Battery First Sergeant was awarded the DSC for his bravery in breaking up a Japanese attack with his machine guns. The Admiralties later became one of the most important naval bases in the Southwest Pacific, and was defended by the 15th Group, commanded by Colonel O. D. McNeely.

On 22 April the I Corps, Lieutenant General Robert L. Eichelberger, commanding, landed at Hollandia, Dutch New Guinea. The AAA support for this operation consisted of a Provisional Groupment, commanded by Colonel Kenneth McCatty. The Groupment consisted of the 116th AAA Group, Colonel Robert T. Chaplin, commanding, and the 94th AAA Group, Lieutenant Colonel Lindner, commanding. Each group supported a division in the landing and the subsequent 20-25 mile advance to the three airfields on Lake Sentani. By this time, the Fifth Air Force had inflicted such crushing blows upon the Japanese that their air effort was light. However the damage inflicted by enemy aircraft was greater than the light effort merited. Shortly after dusk the second day of the operation, a lightJapanese bomber flew over the narrow Hollandia Beach thickly covered with men and supplies. The Fighter Controller did not release fire, although many Bofors were trained on the plane and it dropped three bombs. As General Eichelberger said later, "the one to a thousand shot came off." The bomb hit in a closely stacked ammunition dump which continued to explode for hours. The explosions kept the troops from other supplies stacked near by. Fire spread rapidly along the narrow beach, consuming rations, medical supplies and clothing. It was estimated that five million dollars worth of badly needed supplies were lost. The troops were on short rations for several days thereafter and the operation was slowed up considerably.

One gun battery landing at Tanahmerah Bay conducted the first ground support fire in the SWPA when it bombarded an air strip at a range of 21,000 yards, 1500 yards beyond the maximum firing table range.

As a subsidiary landing to the Hollandia operations,

troops landed at Aitape on the same day. A provisional AAA group under Lieutenant Colonel Kahl, Commanding Officer of the 383rd AAA AW Battalion, defended this landing. On 17 May, a landing was made at Wadke Island and at Toem on the adjacent New Guinea mainland supported by a Provisional Group under Lieutenant Colonel James T. Darrah, Commanding Officer of the 166th AAA Gun Battalion. After each landing, our troops held but a narrow beachhead entirely surrounded by Japanese. At Toem, the beachhead was extended approximately four miles long and varied in depth from 50 to 350 yards and the defense against night attacks by air was a problem. However such attacks were sporadic and there was but little AAA firing.

The Japanese First Team at Biak

For the first time since the days of Buna, American troops met the Japanese first line troops at Biak. In the operations that followed the landing of the 41st Division on that large Dutch New Guinea island on 27 May 1944, AAA protection was provided by the 208th AAA Group, Colonel James Mozeley, commanding. General Homer Case was the AA officer and was initially in general command of AAA troops. The Biak landing was not difficult after a heavy preparation by naval gun fire, rockets and 2000-pound bombs. But Japanese ground and air reaction began at once. An Infantry battalion was isolated in its advance down the beach and the capture of the air strip, seven miles away, took ten days rather than 48 hours as planned.

The beachhead, two miles long and nowhere over 200 yards deep, was subjected to constant sniping and infiltration. The air attacks began about 1700 hours, six hours after the initial landing. Five Japanese fighters and light bombers made a low level attack on the beach. The guns of the 476th AAA AW Battalion, Lieutenant Colonel Frank T. Ostenberg, commanding, shot down the entire five without a single casualty to our troops. These attacks, mostly low flying, continued for five days, and a total of 19 aircraft were definitely destroyed. The 165th AAA Gun Battalion, Major Cavallo, commanding, conducted the first combat firing in the SWPA with the SCR 584. Major Cavallo was killed when his jeep ran over a land mine on 20 June. The 476th was later given the Presidential Unit Citation for its skill in destroying Japanese aircraft and for its heroic work in repelling Japanese night attacks against isolated gun positions. The satisfaction of the AAA arising from these successes was greatly moderated by the bitter fact that our own AAA shot down a friendly B-25 on a dropping mission. Although a later detailed investigation placed the responsibility on other than AAA personnel, the incident was none the less tragic.

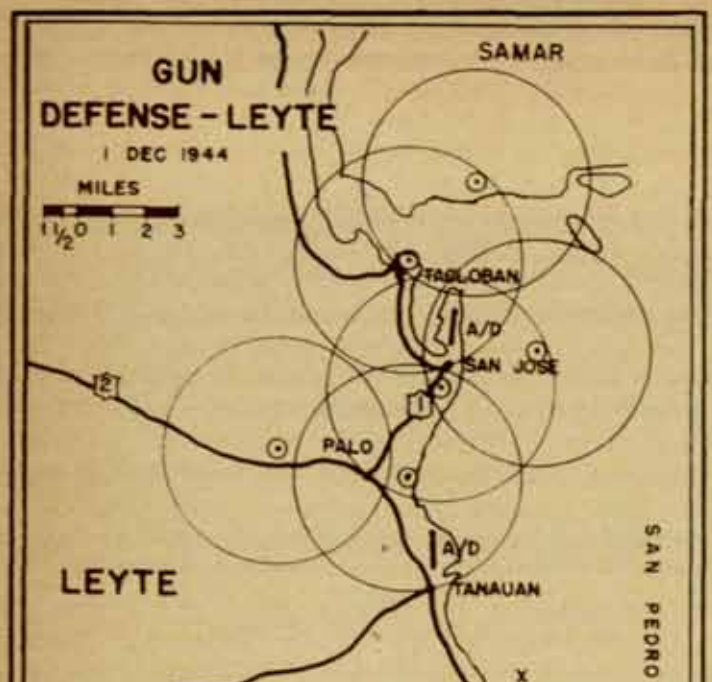
For the night that followed the landing, the Fighter Controller Center and AAA Operations Room was set up temporarily in a tent near—too near, the western flank of the beachhead. During the night, a Japanese infiltration attack penetrated the outer defense line and delivered a sustained attack on the Air Corps bivouac that surrounded the operations tent. This paralyzed operations for the night. American losses were five dead; two Japanese were killed.

Noemfoor, Sansapor and Morotai

The step by step march to the west continued. The 116th AAA Group, Colonel Chaplin, commanding, supported the

Signal Corps

A 40mm gun protects a beach on Dutch New Guinea while troops waiting to load on LCVs, refresh themselves.



attack on the island of Noemfoor on 2 July. The 33rd Group, Colonel John H. Featherston, commanding, supported the landing on Cape Sansapor on 30 July. Both small beachheads were within range of Japanese aircraft based on the Halmaheras to the west and although there was no violent air reaction, for months Biak, Sansapor and Noemfoor were subjected to scattered attacks, mostly at night. The favorite Japanese tactic was to approach our air strips at night with the landing lights on. Even if our troops suspected that the craft was enemy, no one could be sure since our own aircraft did not always turn on the IFF. As a result, too often a Japanese plane was able to fly in low, as if to land, and drop fragmentation bombs among the closely packed aircraft, and fly away with only a few scattered shots following him. As late as November 1944 such an attack at Biak destroyed a C-54 and three B-17s and damaged several other planes.

Morotai Island, the northernmost of the Halmahera Group, was to be the anchor to the westward for the attack on the Philippines. The XI Corps, Lieutenant General Charles P. Hall, commanding, made the landing with two divisions on 15 September 1944. The 214th Group, Colonel Chandler, commanding, provided AAA support. This Group was eventually composed of five battalion General Homer Case served as Corps AA Officer. Japane ground resistance on the south end of the island where th landing took place was negligible and aerial activity w limited to "reccos." All in all, the operation was easy wi the heat, dust and flies providing the principal oppositio

Preparations for Leyte

General MacArthur's plans provided that after Moro there would be three steps leading up to a large-scale lan ing on Leyte on 20 December, 1944. The Talaud Islan 150 miles northwest of Morotai, would be attacked on 2 October; airfields on the south tip of Mindanao wou be seized on 15 November and on 7 December an airbor operation would occupy airfields in northern Mindana From these positions, Air Force support for the Leyte lan ing would be provided. But during August and Septemb naval task forces made heavy air strikes against airfields an shipping on Luzon with such success that on Admir Halsey's recommendation, General MacArthur cancelle the three planned operations and advanced the Leyte oper tion by two months. This acceleration increased the g gantic logistical task of assembling and transporting troo and supplies. To the Sixth Army was assigned the XXI Corps, then loading in Hawaii for a landing on Yap Islan early in October. The 97th AAA Group was attached this Corps.

Prior to this time, the 32d AAA Brigade, assigned to th 14th AA Command and attached to the Sixth Army, wa responsible for the training and technical inspection an limited administrative control of all AAA units attached the army. When serving with a task force, the AAA uni were under the task force commander for tactical purpos with the Brigade providing staff assistance for the variou operations. Leyte was to be the first operation in which th Brigade was to exercise full command. For this landing, the Brigade was attached one operations detachment, tw groups and nine battalions, with three additional AW ba talions to arrive with divisions after the initial landing. O 20 September, when the changed plans were revealed, th 97th Group and attached battalions were in Hawaii, th AAA units in the SWPA were scattered over a distance o 1500 miles and the Brigade command post was at Ho landia. The operations detachment was at Bougainvill The 25th AAA Group, Colonel O. D. McNeely, com manding, was staging at Finschhafen, but was to embar for the operation from the Admiralties, 300 miles to th northwest of Finschhafen. Two battalions attached to th 25th AAA Group were in the Admiralties and two were i Hollandia. Although the group commander had inspecte these battalions, none had ever served under the grou headquarters.

The 97th AAA Group, Colonel L. L. Clayton, com manding, with five battalions, was soon en route to the nava rendezvous in the Admiralties. These units had been loade for an initial landing on Yap's wide coral reef and for fina unloading within a harbor. Lack of time prevented an change in loading after the objective was changed. Troop and equipment were widely scattered within the convo and one battalion was actually loaded onto 13 differen vessels. Upon arrival in the Admiralties, the ... up com

mander proceeded by air to [illegible] to receive his instructions. On his return he [illegible] at an un[illegible] difficulty in assembling his battalion commanders who in turn found it almost impossible to transmit all necessary instructions to battery commanders who were so widely scattered.

Colonel McNeely visited the Brigade headquarters for a few days late in September to receive orders and to inspect his two battalions in Hollandia. Captain Talbot, commanding the 146th Operations Detachment, arrived from Bougainville about the same time. His detachment was to be flown from that station in time to embark at Finschhafen about 5 October. (This air transport was delayed and the detachment was 18 days late in arriving at Leyte.) On 1 October, Colonel McNeely and Captain Talbot boarded a C-47 transport plane at Hollandia to return to Finschhafen. This plane was never seen or heard from after its departure. In the inevitable confusion of war, ten days elapsed before word of the loss of these two officers was received. The Leyte convoy was sailing the next day. By good fortune Colonel Richard A. Ericson, then commanding the 40th AAA Brigade, was in Hollandia on an official visit, and Major General William F. Marquat, commanding the 14th AA Command, assigned him to command the 25th AAA Group. He sailed with the Brigade headquarters and when he joined his new command on A plus 1 he had never seen any member of his staff or any of his battalion commanders. Colonel McNeely and Captain Talbot were naturally carrying copies of field orders and special instructions for the group so these were never received by their organizations. In the loss of Colonel McNeely, the AAA lost one of its most brilliant officers and undoubtedly its leading automatic weapons expert while Captain Talbot was an outstanding junior officer.

From this recital it would appear that a chaotic condition would have resulted. The hastiness in planning, the scattered units, and the loss of two key officers caused many subsequent difficulties. But it speaks highly of the basic training and indoctrination of our officers and troops that the general absence of specific orders for the operation did not materially hamper the combat effectiveness of the units.

The scattered elements destined for Leyte sailed between the 5th and the 13th of October. By the 17th, the separate convoys had joined into a huge flotilla of over 400 vessels, the largest in the Pacific up to that time. The convoy was unmolested by the Japanese until the early morning hours of A-Day, 20 October when one enemy plane attacked a flanking destroyer. The plane escaped but did no damage.

Early Leyte Days

By this time, the Japanese had stopped defending at the beaches, and at Leyte they retired into the hills overlooking the landing beaches. The two 75mm field guns that fired on the four LSTs from the Palo Beach were exceptions to the general rule. Our Infantry assault elements

Signal Corps

At times the going was pretty tough as witnessed by this picture showing a 90mm gun after a direct hit by a Jap bomb. This gun was also hit again the same day and the entire crew killed.

Signal Corps

A crew of Battery A, 211th AAA AW Battalion check their 40mm gun during a trip in convoy to the Philippines.

pushed rapidly forward from the beaches and extended the flanks. By nightfall, the Brigade, one group, three battalion headquarters, five AW, and one gun firing batteries were ashore. The first enemy air attack was launched early on the morning of A plus 1 and the primary effort was directed against our shipping. In what was probably the first of the *Kamikaze* attacks, a Japanese plane dived into the bridge of the Royal Australian Navy cruiser, *Shropshire*, killing the captain and an admiral. Attacks on our beachhead continued, until the 24th and during this time, five planes were destroyed by gun and ten by AW fire. A total of 21 additional planes were either damaged or probably destroyed. By the 24th, all AAA assigned to the operation, except three AW batteries, were ashore and in position.

The battle for Leyte Gulf started on the 25th. This was one of our greatest naval battles and brought a most important victory. This naval engagement had a definite effect upon the AAA mission. Every air attack against our airstrips and the shipping in the gulf was stepped up.

On the 25th, the Sixth Army troops ashore were still depending on naval aviation for air cover. The three separate naval actions drew our carriers away. Although P-38s began to arrive the next two days, the air strips were incompleted and the numbers of planes available were so few that no real cover was provided. It was left to the AAA, scattered over a 20-mile front, to protect our beachhead from the Japanese Air Force operating from the numerous fields in Luzon.

During the four days, October 25-28, the AAA engaged 73 separate attacks, ranging from single fighters to formations of heavy bombers. These attacks came almost continuously throughout the day and during the moonlit hours of the night. The heaviest attacks came on the 25th, when the Fighter Controller announced 17 separate alerts and the gun crews w... eventually Alert for 14 hours and 29 mi utes. The guns defin... served royed 16 planes and the A... destroyed 30 during these four days; 29 enemy planes v... th probably destroyed, and 27 were damaged.

The Brigade Takes Command

Until the beachheads of the X Corps to north and th XXIV Corps to the south were joined, the AAA grou commanded their own battalions. The Brigade was r sponsible only for running the operations room and pla ning for the consolidated defenses. The Operations D tachment attached to the Brigade was still at Finschhafe nearly 2000 miles away. Fortunately Lieutenant Colon K. C. French, S-3, had trained officers and men of th Brigade staff to man an operations room and for 18 days the heaviest operations, this group, using improvised equi ment brought for the purpose, did this work. General Ma quat, present in his other capacity as GHQ AA Office stated that he had never heard of better AAA comman discipline.

The brigade assumed command of all AAA units on 2 October and shortly afterwards GHQ named the Brigad Commander as Coordinator of Antiaircraft Defenses fo the Leyte Area to operate under the Sixth Army. By th time, the defenses of the air strips and installations aroun Tacloban and Dulag were consolidated and AW fire uni had been dispatched up the Leyte Valley to defend th Corps and division installations.

The November Full Moon

A short, severe typhoon grounded all planes during 2 30 October, but the full moon came the night of the 31 and the clear skies of the following nights gave the Jap nese an open invitation to attack. During the night of 3 November there was a continuous state of alert from 230 hours until two hours after daylight. Almost all attacks wer made by high flying bombers. There were 38 separate AA engagements that night and a total of 118 battery engag ments. The next night, nearly all planes came in low; the apparently learned the preceding night that high flying a tacks were not successful. During that night there were 2 separate engagements and a total of 164 battery engag ments (mostly by AW). While the attacking plane dropped a considerable number of bombs, damage to th beachhead was not great.

For the six-day period following 31 October there were total of 199 separate attacks. Several planes participated i most of these attacks. Fatigue from the long alerts and heav firing became a matter of serious concern for AAA perso nel. In spite of this, the guns were credited with the d struction of 21 planes and the AWs with 40. In additio 38 planes were probably destroyed and 30 were damage

Most of the low flying night attacks were directed at th air strips, which by this time were crowded with P-38s an B-25s. The Tacloban strip, on a narrow peninsula an easily located by night, took the brunt of these attacks, an it was here that the 211th AAA AW Battalion did suc heroic work. During this period the system of "sound ba rage," proposed by Colonel McNeely prior to his loss, w successfully developed. The gunners had by this time b come rather skillful in sound ranging. When a ... nm so

tion commander considered that an unseen plane was about 2000 yards away, he would open up at its estimated future position on full automatic. As soon as possible all other guns and machine guns in that sector would open up with converging fire. The result was almost as brilliant pyrotechnically as the Navy "porcupine barrages." Many planes were shot down by this system, and in no known case did any plane continue to attack in the face of this fire.

The Next Month

A four-day typhoon starting on 6 November gave some of the exhausted crews much needed rest. This was possible for the troops in the high ground in the Tacloban area, but the situation was different in the Dulag-Burauen area. It is only a mild exaggeration to say that the broad Leyte Valley was nothing but one big rice paddy. Expecting the dry season on Yap, the troops of the 97th Group had brought no tentage except shelter tents. The unceasing air attacks had forced the men to pitch these tents over their fox holes. During the month of November, 30 inches, twice the normal amount of rain, fell. The mucky loam was filled with water and the foxholes were filled to the top. There was no escape from the mud. Many roads became absolutely impassable. The Dulag-Burauen road disappeared; no vehicle could pass over it. Many AAA positions were almost isolated. The 97th Group had brought a number of amphibious "weasels." They were invaluable in the mud, but the heavy wear deadlined one after another. One gun battery was supplied for a period of two months by a train of carabao. Getting these guns back to a hard road was a major engineering task.

The intensity of air attacks from Luzon decreased although sporadic attacks continued. During the month ending 5 December there were a total of 192 attacks, mostly by single planes. 64 planes were shot down, 17 probably destroyed and 46 were damaged.

During this period the 94th AAA Group, Colonel Dean Luce, commanding (that was to do such skillful shooting with very little ammunition in Mindoro the next month) staged in Leyte. Two batteries each from the 166th Gun and the 202d AW Battalions occupied temporary positions and conducted target practices at live Japanese targets. These units received credit for destruction of three enemy planes during this practice period.

A Parachute Attack

By 6 December 1944, the Japanese situation in Leyte was serious. The enemy troops had been fighting in the mountains for over a month, and almost all their supplies and reinforcements sent in by sea had been sunk by our aircraft. Their air losses from Army and Navy air strikes, from air combat and from AAA fire had been very heavy. Nevertheless they contrived their death stand in the Philippines.

During the afternoon of 6 December one or two battalions from the Japanese 16th Division infiltrated down from the mountains west of Burauen and attacked the airfields. Since this was well behind the "front line," the AAA troops were the only combat elements there and the AW positions took the brunt of the attack. Three sections in succession resisted stubbornly in their pits, but the positions, being in heavy brush, were not mutually supporting and

Signal Corps

A searchlight is well camouflaged with palms and the radar in background is barely discernible.

were overrun. The commander withdrew then to a defensive perimeter. The crews retrieved their machine guns and rendered their 40mm guns inoperative before withdrawal. Here they held out for 48 hours against the enemy opposition.

About 1730 hours on 6 December, the Air Corps radars picked up large flights of aircraft approaching Leyte from the south and southwest, but for some reason neither fighters nor AAA were alerted. About 1830 hours, as darkness approached, three main flights appeared. The first, at high altitude, which was composed of twin engined bombers, dropped smoke and small anti-personnel bombs. These were followed by two low level flights of transports and bombers carrying paratroopers. The AAA was on a "HOLD FIRE" status and unfortunately did not engage the first flight until bombs had been dropped. However the AWs were ready for the troop carriers. These came in and discharged their paratroopers in a poor drop, scattering them over a large area. (One landed erect in a soft mud pile up to his waist and was dispatched with a carbine by a clerk from a fighter wing headquarters.) For the next quarter of an hour the covering fighters and the troop carriers that had not yet dropped their men continued to fly over the area in an aimless manner.

One and Two-thirds Planes A Minute

The best estimate is that 150-175 planes participated in this attack. Within the period of not over one half hour, the AAA was credited with the destruction of 49 planes, with about half this number probably shot down or damaged. With these it is estimated that between 500 and 600 pilots, crew members and paratroopers were killed. Since most flights were low level, the AW got most of the "kills." Two transports carrying demolition squads were shot down over the Tacloban strip and two were destroyed at Ormoc, over the mountains to the west.

Signal Corps

Manning a .50 cal. machine gun post atop Observation Hill overlooking Morabe Harbor, New Guinea.

On A-Day a regimental combat team landed on the small Panaon Island on the southern tip of Leyte to guard the straits by the same name. The four M-51 multiple MGs that accompanied them spent 46 days without seeing an enemy plane. Then the Japanese transport planes from Mindanao apparently had an assembly point just to the north of Panaon Island and, flying low to escape our radar, they flew right over the M-51s. Eight singles were shot down before the enemy realized what was happening. And at Tarragona, about ten miles to the south of Dulag, a number of fire units of the 102d AW Battalion, staging along the beach, were set up in position with the mission of protecting some troop bivouacs. Still flying low to avoid the radar, more transports flew over these positions and four were shot down and ten were either probably destroyed or were damaged.

The night was anything but pleasant in the Barauen area. It is estimated that 200-250 paratroopers landed in the airfield area and joined the troops from the hills. In marked contrast to the ragged Japanese Infantrymen with their rusty rifles, the paratroopers were fine soldiers with fine equipment. Headquarters of the Fifth Air Force and the 11th Airborne Division were surrounded by Japanese troops and there was little rest. Three days were required by the 11th Airborne to clean out the air strip area. The AW troops suffered casualties of one officer and eight men killed, one man missing and eight men wounded. In addition to the unknown number of Japanese killed in the planes, ground action by antiaircraft artillery troops resulted in an estimated 175 enemy casualties. Strangely enough the Japanese while in control of the area made no attempt to destroy the aircraft or the antiaircraft artillery equipment. There were a few stray bullet holes through the directors, but otherwise there was no damage to antiaircraft matériel.

The paratroop attack was the dying gasp of enemy a action. The campaign was declared closed on 25 Decembe after the Japanese staged a six-plane attack on Christma Eve.

A Few Facts

During the Leyte campaign, the AAA battalions a tached to the Brigade destroyed a total of 249 enemy ai craft, probably destroyed 111 and damaged 129. The hig est score was made by the 211th AAA AW Battalion, whic defended the Tacloban air strip. This air strip was a ver table "hot corner" because of its importance and because could be easily located. The 211th was officially credite with 40¾ planes destroyed, 26 probably destroyed and 2 damaged. The 502d AAA Gun Battalion came next wit credits of 36½, 26 and 14. The 866th AW, the 485th AW the 210th AW and the 168th Gun Battalions each receive credit for the destruction of more than 25 planes.

Gun batteries were credited with only 61 planes again a total of 188 for the AWs. Ninety-three per cent of th gun engagements were by radar control so unless the gu target fell in flames, and few of them did, proof that target was destroyed was sometimes difficult. Actual destru tion under these circumstances is undoubtedly greater tha those credited. The gun batteries operated under othe difficulties. Most of the batteries had drawn their ne radars, SCR 545s and 584s, just before the operation an had never fired a target practice with them. And finally, a inventory disclosed that there was a total of 256 differen lots of 90mm ammunition in the brigade.

Exclusive of those killed in ground action, and this num ber was considerable, it is estimated that AAA fire in th Leyte operation caused the loss to Japan of over 300 pilots about 600 crew members and 425 paratroopers. All bu three or four were killed. There is an interesting sideligh concerning the capture of one of these pilots. On 29 Oc tober, a gun commander of Battery D, 504th AAA Gu Battalion, saw a Japanese fighter approach his position a about 500 feet which was of course too low for gunfire. H quickly had his gun loaded with a precut round, took good lead for the crossing shot at 500 yards range, and le go. The shell, without exploding, tore off the tail of th plane, the pilot parachuted out, was wounded by a rifleman as he floated down, and was captured alive.

Conclusion

It was at Leyte that the Japanese Air Force "stood an fought." This article has been a history of the AAA in tha operation. It has not told of the destruction wrought b Army and Navy fighters and bombers. This has been th story of the beachhead and the air strips of Leyte, where th AAA alone stood between the troops and the planes on th ground and the Japanese bombers. The AAA mission wa successfully completed by battalions gathered from all part of the Pacific in such an exemplary manner that Genera MacArthur wrote them a letter personally thanking them for the protection they gave.

What Every Officer Should Know Today About The Atomic Bomb

By Lieutenant Colonel David B. Parker, Corps of Engineers

Introduction

At this time when almost all service talk and thought seem to be concentrated on future developments in warfare, it is well for the Army officer to appraise the art of war as it is right at this moment. We are all so conscious of the dominant role science now plays in our profession that we naturally succumb to the lurid appeal of guided missiles, biological warfare, rockets that will encircle the globe, and push-button tactics. We know that although the essential character of warfare has never changed through the ages, despite all the revolutionary weapons that have been introduced, it now seems quite possible—probable, even—that a complete change may well occur during our lifetimes. We may all be destroyed in a final hellish culmination of man's scientific genius. But it is just as possible that we may again be confronted with the task of fighting a war that follows—however more rapidly—the pattern of its predecessors. We may have to fight it largely with the tools we already have at hand. So, while we should indeed be prepared to defend our country in the future, it is more important that we know how we should defend it in 1947.

Chief among all developments connected with war today is the atomic bomb. There are rumors of the existence of even more potent weapons, but there is no concrete evidence—at least to the average professional soldier—that there is any real challenge to the unique position of the bomb as the dominant weapon of all time. We should accept the fact that the atomic bomb is the decisive, the definitive weapon. No nation in the future will ever wage war against any other nation whose atomic bomb stock pile is known to be superior. Any nation which possesses at least as many bombs as any other should be safe from attack.

It is natural, therefore, that soldiers should be more curious about the bomb than about any other weapon; and it behooves all of them to inquire what the bomb means to them in the Army today. The existence of the bomb as the definitive weapon does not yet mean that normal soldier roles can be neglected, and every soldier should satisfy himself on that point. Not that the bomb is "just another weapon"—it is far from that—but the bomb does not do all things, and we still need our airborne striking forces, our occupation troops, and our other principal Army components. It is important that every officer know as much about the bomb as he needs to know in his profession, especially since it seems most likely that the bomb's influence will become greater and greater in the future; and it is also important that he be satisfied that he does not need to know anything else.

On countless occasions, the Manhattan Project has been queried by persons desiring to know more about the bomb than can be told them; the queries almost always stem, not from mere curiosity, but from a genuine concern that vital plans or details will be neglected if more information about the bomb is not available. Probably almost every officer, although recognizing the exigencies of security, feels that his professional knowledge and education will not be completely rounded out until he has been acquainted with the details of the bomb.

00 tons. This series of three pictures shows the evolution of the atomic fireball in the New Mexico test.

A view of the explosion as record

It is advisable, therefore, to summarize the information which every well-informed soldier should have on the atomic bomb, and to explain why further details need not be sought except by those whose duties are directly concerned with the bomb itself.

Here is a list of things that every interested officer *should* know:

1. Capabilities of the bomb, in general terms
   A. Destructive power
   B. Unique characteristics of atomic explosions
   C. Effect on matériel
   D. Effect on personnel
2. Atomic bomb targets
3. Means of carrying the bomb to its target
4. Defense against the bomb
5. Effect of the bomb on tactics and strategy
6. Effect of the bomb on design of structures and equi ment
7. Effect on Army organization.

Here are the things which every officer does *not need* know:

1. Details of the design and functioning of the bomb
2. Number of bombs on hand
3. Rate of production of bombs
4. Details of bomb research and promise of improvemen or change

tically operated camera on Bikini.

5. Details of how the bomb will be employed in event of attack on our country.

Capabilities of the Bomb

The capabilities of the bomb are staggering, but it is not yet a weapon which can destroy the world, or even a country, at one stroke. The first announcement of the existence of the bomb, made by the President sixteen hours after the first bomb had been dropped on Hiroshima, told that the bomb had the power of 20,000 tons of TNT. There has been no official statement since that time to change this estimate of the bomb's power. One can assume that each bomb is not exactly the equivalent of 20,000 tons of TNT, but that each explosion has the power of "the order of" 20,000 tons. (This TNT equivalent, the most common means of measuring the bomb's capacity, refers to blast energy alone. The total energy release of an atomic explosion includes in addition to the blast energy, the energy of the various types of radiations. Therefore, the total energy release may be in excess of 20,000 tons of TNT. The figure for blast energy is used because blast energy is fairly well understood generally; nearly every person, and certainly every soldier, is familiar with the effects of the detonation of ordinary high explosive.)

The tremendous power of the bombs is clearly shown by the following figures:

In Hiroshima, 4 square miles of the city were almost completely devastated; 66,000 persons were killed, and 69,000 injured.

In Nagasaki, 1½ square miles of the city were destroyed.

An aerial view of the Baker Day explosion of the atomic Bomb at Bikini.

39,000 persons were killed, and 25,000 were injured.

The lower figures for Nagasaki were in no way due to the use of a less powerful bomb; the hills and ridges in the city confined the blast, and the built-up area was not uniformly exposed to the blast as in Hiroshima.

The British Mission to Japan has summed up the destructive effects of the bomb more concisely than any other reporting agency. They estimate that a bomb similar to that used in Nagasaki, if exploded at the same height over a British city, such as London, would:

a. cause complete collapse of normal houses to a distance of 3,000 feet from the center of damage
b. damage all houses beyond repair out to 1 mile
c. render houses unhabitable without extensive repair to a distance of 1½ miles
d. render houses unhabitable without first-aid repairs out to 2 or 2½ miles

Over London, the bomb would have completely wrecked 30,000 houses, badly damaged 35,000, and damaged 50-100,000 more. Thus a total of 400,000 persons would be rendered homeless, one-half of whom could return after repairs had been carried out. They point out that not all of the remaining 200,000 persons would need homes, for about 50,000 of them would be dead or would die within 8 weeks, and a comparable number would be wounded.

The British have also calculated an excellent way of showing the killing power of the bomb at a glance. They use the so-called Standard Killed Rate, which is the number of persons that would be killed by a single explosion in a city area whose population density is 1 person per 1,00 square feet. Here are exemplary SKR's:

500-pound bomb:	6
1-ton bomb:	30
Atomic Bomb:	75,000

The British estimate that the number who would be kille in a typical large British city would be 50,000 per bom the comparable figure for the German V-2 rocket is 15.

The unique power and other characteristics of an atom explosion are due to the fact that in the explosion th *identity* of the atoms is changed. In an ordinary explosio only the *arrangement* of the atoms, not their identity, changed. In the transmutation of the atoms, a considerab portion of the explosive material (alias fissionable materi and active material) is transformed into energy. Here is standard comparison: the energy released when a pou of TNT explodes would, if converted entirely into he raise the temperature of 36 lbs. of water from freezi temperature (32° F.) to boiling temperature (212° F. but the nuclear fission of a pound of uranium 235 wou produce an equal temperature rise in over 200 milli pounds of water.

In an ordinary TNT explosion, the solid TNT is co verted almost instantaneously into a gas, which occupi initially the same volume as the solid material. (This chan is entirely a chemical change: the molecules of TNT a converted into molecules of other substances while th elements themselves are unchanged—the unchanged ato merely collect together in a new series of combinations, molecules.) The gas which has been formed by the e plosion is at a very high temperature and it exerts inten pressure on the surrounding air and expands rapidly to volume many times larger than the initial volume. A wa of high pressure thus moves rapidly out from the center the explosion and this wave is the major cause of damag There is only a minor amount of heat radiation associat with a TNT explosion—for example, recall how close o must be to a gun muzzle to suffer any burning effect—an there is nothing at all of the other types of radiation whic account for a large part of the lethal effect of an atom bomb.

An atomic bomb also generates a wave of high pressur which is of much higher pressure than any caused by ord nary explosions. This wave is again the major cause of dam age to buildings and other structures (but not necessarily persons or animals). The atomic high pressure wave di fers from a TNT wave not only in intensity and size of th area over which it is spread, but also in the duration of th pressure pulse at any given point: the initial positive pre sure from, say, a block-buster lasts for a few milliseconds millisecond is one thousandth of a second) only, while th from an atomic bomb lasts *nearly a second*—observers both Japan and New Mexico described the pressure wa as seeming like a very strong gust of wind, rather than sharp shock.

But the atomic bomb also gives off immense amounts radiation. Most of this radiation may be classed general as "light" of some wave length, ranging from the so-calle heat radiations of very long wave length to the so-calle gamma rays which have wave lengths even shorter than th

rays used in medicine. All of these radiations travel at the me speed, viz., the speed of light, which is 186,000 miles er second. The radiations are intense enough to kill per- ns within an appreciable distance from the explosions, and e in fact the major cause of deaths and injuries, apart om the mechanical injuries caused by falling buildings nd flying debris.

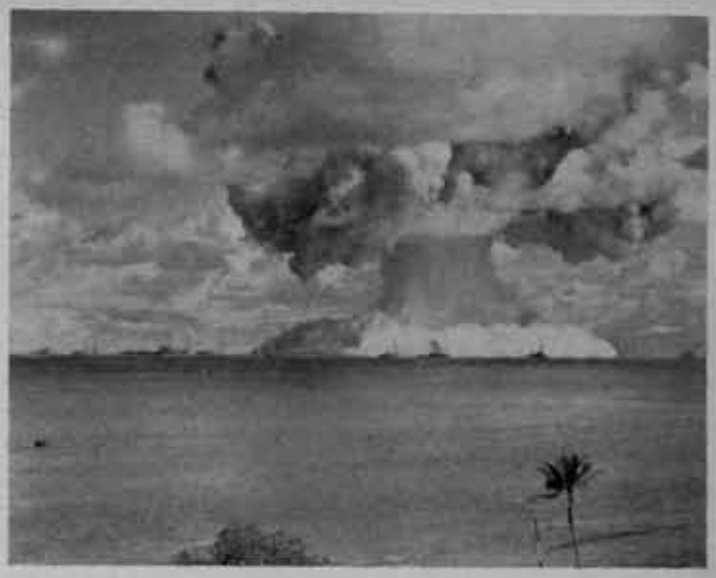
The atomic bomb causes its damage to buildings and ructures in two principal ways: first, by the great pressure om the blast, and, second, by fires either started directly heat radiation or indirectly through the collapse of build- gs, wirings, etc. The blast pressure is very close to that hich would result from the explosion of 20,000 tons of NT *in one spot;* it is thus easy to see that an actual 20,000 ns of TNT, if judiciously distributed over a city area (as an ideal bombing raid) would cause greater damage by reading the high pressure over a greater area. (The pres- re would not be so great at any one point as at the center the single explosion, but the area over which it would ex- t more damage would be greater.) The great power of the omic blast results in a unique destruction feature termed ass distortion" of buildings; an ordinary explosion can mage only part of a large building, but the atomic blast so large that it can engulf whole buildings, no matter w great their size, pushing them over as though by a ant hand.

In all explosions the initial positive pressure wave is im- ediately followed by a negative pressure, or suction, wave considerably less intensity but much longer duration. The ng duration of the positive pressure pulse in an atomic plosion adds another distinguishing feature: nearly all ructural failures occur during this phase, and very few the succeeding negative phase. TNT explosions cause a rge fraction of the total damage in the suction phase, be- use many structures simply do not have time to fail under e short positive pulse (the suction phase is always of nger duration than the positive).

The injuries to persons caused by the atomic bomb are as llows:

A. Burns, from
   1. Ultraviolet rays
   2. Fires started by the explosions.
B. Radiation injuries from the instantaneous emission of gamma rays and beta rays.
C. Radiation injuries from secondary sources:
   1. Fission products (particles of the fissionable material which are scattered by the explosion), which emit radioactivity.
   2. Induced radioactivity. An atomic explosion can cause certain near-by substances, which are not normally radioactive (e.g., salt) to become radioactive; this phenomenon is comparable to the way an electric current can be induced in a conductor by another near-by current.
D. Mechanical injuries from the collapse of buildings, flying debris, etc.
E. Direct effects of the high blast pressure, i.e., straight compression.

The order of importance depends upon whether the mb is detonated in air or in water, and, if the former, at hat height.



Another view of the Baker Day explosion as recorded by an automatically operated camera on a near-by island. Characteristic clouds form, altered by steam from subsurface detonation.

Just how radiation causes injury to animal life is a complicated biological subject which is still not thoroughly understood. The injury comes from ionization; i.e., the rays cause atoms of the living cells to gain or lose electrons, and thus change chemically so the effect is similar to a form of chemical poisoning. Some of the rays, particularly gamma rays, are very penetrating; they do little or no damage to the skin, but penetrate to the bone marrow where they kill the white blood cells.

In discussing the characteristics of flash burns and other radiation injuries, it is well first to summarize some general facts concerning the radiation. The radiation comes in two bursts (not to be confused with positive and negative pressure waves): an extremely intense one lasting only about 3 milliseconds and a less intense one of much longer duration, lasting up to several seconds. The second burst contains by far the larger fraction of total light energy, more than 90 per cent. But the first flash is especially potent in ultraviolet radiation which is biologically most effective in causing burns. Also, because this heat flash comes in such a short time, there is no time for any cooling to take place, and the temperature of a person's skin can be raised 50 degrees Centigrade by the flash of visible and ultraviolet rays in the first millisecond at a distance of 4000 yards. Persons may be injured by these flash burns at much greater distances. Gamma radiation does not extend nearly so far.

In Japan, the most significant features of the flash burns were their severity and their sharp limitation to areas of skin which were directly exposed to rays in a straight line from the explosion. Patients who were walking at right angles to the line between them and the center of explosion, and whose arms were swinging, often had burns only on the outside of the arm nearest the center and on the inside of the other arm. This "shadow" effect was equally marked on buildings, trees, and structures, and led to an exact determination of the location of the center of the explosion.

The radiations which are the principal causes of radiation injury, may be summarized as follows (The term "radiation injury is usually used to denote any injury from

gamma rays, beta rays or alpha rays but is used here as a general classification):

Ultraviolet rays probably cause the greatest number of radiation injuries. They have a wave length slightly shorter than visible light and cause instantaneous flash burns comparable to severe sunburn.

Gamma rays are a form of light, very similar in action to X-rays, but much more penetrating. The best absorbers (shields) are the most dense materials, e.g., iron and lead.

Beta rays are high speed electrons, and are readily absorbed by most solids. Even clothing affords considerable protection.

Neutrons are atomic particles emitted in nuclear fission. Their range is less than gamma or beta rays, but they are very potent within their range.

In Japan, the gamma, beta and neutron radiations which caused injury were primarily those experienced in the first second after the explosion; a few may have occurred later, but all occurred in the first minute. There were no injuries from lingering radioactivity (fission products or induced radioactivity); but Test B at Bikini proved what was already known: that many of the lethal rays may last for hours, days, or months after the explosion and may be of prime importance if the bomb is not detonated high in the air. In uranium or plutonium fission, the atoms split into two parts producing two lighter highly radioactive atoms. After the explosion is all over, these lighter atoms or fission products remain on the scene. They are widely dispersed by the explosion but they are still very harmful biologically. (Fission product action on inanimate things is negligible.) In Japan, no injuries were caused by the radiations from so-called "fission products," or particles of the explosive material itself spread by the explosion, nor from induced radioactivity. This lack was due to the fact that the bombs were exploded high in the air, expressly to avoid all radiation injuries other than those due to instantaneous radiation at the moment of explosion. However, when a bomb is detonated close to the ground, or under the water, the injuries from fission products and induced radioactivity may assume major proportions. Test B at Bikini illustrated this fact most graphically; it is well known that radioactivity from fission products which were spread over the ships by the contaminated water and induced radioactivity prevented our occupying the ships for many days, and if any personnel had been aboard at the time the bomb went off, they would have been killed or injured in large numbers.

The greatest single factor affecting the occurrence of casualties in Japan was the distance of the victim from the center of explosion. Next to distance, the most important factor was the amount and type of shielding that intervened between the victim and the center of the explosion. This varied from a single layer of clothing to many feet of concrete and afforded a great variation in degree of protection.

The blast pressure generated by an atomic explosion is, as above stated, more intense than any previously known. The fact that comparatively few persons were injured by

Crew members of one of the target ships scrub down the d to wash possible radioactive material overboard.

straight compression alone in Japan was due entirely to fact that the bombs were detonated hundreds of feet in air. The height of detonation was carefully selected to the maximum ground area of destruction, and to a danger of induced radioactivity so that our troops and sc tists would be able to enter the area after the occupatio Japan, to study the bomb effects; the peak pressures on ground were still high enough to flatten all buildings ex for a few reinforced concrete frames (built to withst earthquakes) which were badly damaged and gutted fire. It has been calculated that it takes at least 220 pou per square inch of direct compression to injure a hu being's lungs; and even more pressure is required to in intestines or other internal organs. The pressure requ to completely flatten a building, however, is very much because the governing factor is total force (pressure ti area on which it acts). In Japan, although buildings w almost uniformly obliterated, very few persons suffered jury from compression alone as evidenced by the fact even ruptured eardrums were comparatively rare.

The mechanical injuries suffered in Japan were no ferent in quality from common ones. It was their quan which was different. The tremendous force of wind, as far as one mile from the center of the explosion, have resulted in many deaths and injuries. Some large pi of concrete wall were lifted 30 feet high and thrown feet; so it is easy to imagine what must have befallen i viduals who were exposed to the same force.

A good deal of data have been collected on the amo of radiation required to produce injury. Radiation ca measured quite readily, and therefore it is possible to termine the maximum dosages which can be toler without harm. The maximum safe dosage must be defin two ways: (a) the amount which can be taken cont ously, and (b) the amount which can be taken in quick dose, without repeated exposure—this amoun much the larger. The best available figures on safe dos cannot be released, but the following table shows progress of radiation disease of varying degrees of seve

Summary of Radiation Injury
Clinical Symptoms and Findings

Day after Explosion	*Most Severe*	*Moderately Severe*	*Mild*
1.	Nausea and vomiting after 1–2 hours	Nausea and vomiting after 1–2 hours	NO DEFINITE SYMPTOMS
2.	NO DEFINITE SYMPTOMS	NO DEFINITE SYMPTOMS	"
3.	"	"	"
4.	"	"	"
5.	Diarrhea	"	"
6.	Vomiting	"	"
7.	Inflammation of the mouth and throat	"	"
8.	Fever	"	"
9.	Rapid emaciation	"	"
10.	Death	Beginning epilation (loss of hair)	"
11.	(Mortality probably 100%)		"
12.			"
13.			"
14.			"
15.			"
16.			"
17.			"
18.		Loss of appetite and general malaise	
19.			Epilation
20.		Fever	Loss of appetite and malaise
21.		Severe inflammation of the mouth and throat	
22.			Sore throat
23.			Pallor
24.			Petechiae
25.			Diarrhea
26.			Moderate emaciation
27.		Pallor	
28.		Petechiae (bleeding into the skin), diarrhea and nosebleeds	
29.			(Recovery unless complicated by previous poor health or superimposed injuries or infections)
30.			
31.		Rapid emaciation Death (Mortality probably 50%)	

At this point, a word should be added about the future development of the atomic bomb. It is to be expected that some improvements will result from continued research in the field. The efficiency of the bomb has been and will be stepped up; this efficiency depends upon the rate at which energy is released from the fissionable material as opposed to the rate at which the bomb blows itself apart. Much greater efficiencies in the utilization of available energy can be expected.

Atomic Bomb Targets

In considering what type of targets are suitable for atomic bombs, one must keep in mind that the bombs may always be comparatively scarce in number, and their use probably will be dictated in the case of *each single bomb* by the very highest level of command, e.g., the President or the Joint Chiefs of Staff, not the theater commander. This fact will be true even in cases where several bombs are used against one target, to insure success. It will be imperative therefore, until one has plenty of bombs to spare, to choose the target with the utmost care.

The best target is likely always to be a large city or industrial concentration. Hiroshima and Nagasaki were superb targets from a strategic standpoint—witness how quickly after the bombings the Japanese sued for surrender—and the results in every way confirmed the wisdom of those

Surrounded by the target ships in the lagoon of Bikini, the USS *Saratoga* slowly settles to a watery grave. The *Sara* was too "hot" to be boarded by salvage men in order to prevent her from sinking.

who selected the targets, the aiming points and the heights of detonation. In the selection of the Japanese targets a number of special considerations were involved, some of which may not apply in future attacks; these were:

A. The range of the aircraft which would carry the bomb. When other means of carrying the bomb are developed, the range may become unlimited, as the proponents of guided missiles hope to prove.

B. The desirability of visual bombing in order to insure maximum effectiveness. Radio-controlled missiles may eliminate this consideration in the future, so that weather will have no effect on the operation.

C. Importance of having alternate targets in event the primary target could not be reached.

D. The morale effect upon the enemy.

E. The strategic value of the area to be destroyed.

F. Need for densely built-up area to insure maximum damage from both blast and fires.

G. Desirability of using a target untouched by previous attacks, so the effect of a single atomic bomb could be determined.

While the best target is the densely populated and built-up area, there are other targets of great importance to the strategist. The foremost is perhaps the large naval concentration. It is easy to conjecture what would have happened if the Germans had been able to drop even one atomic bomb on the fleets which crossed the channel to invade Normandy in June of 1944. The past war in the Pacific consisted mainly of one landing operation after another, and it is difficult to think of a single such operation that would not have been completely disrupted by an atomic bomb. The same reasoning of course applies to mass land concentrations, although these are not as common as naval concentrations. No commander will in the future ever gather large forces together for any sort of mass attack without having to consider the possibility of an atomic bomb ruining the bulk of his dispositions.

The capital ship may also on occasion be a worthwhile target. Cost of bomb vs. cost of ship will probably govern; but both tests at Bikini proved that the bomb will destroy *any* ship at which it is successfully directed—i.e., within a reasonable radius distance, and not by any means necessarily a direct hit—whether detonated high in the air, on the surface, or under the surface. It is fairly safe to predict, there-

fore, that the capital ship's place as the dominant naval fixture is in jeopardy. Smaller and faster vessels, including submarines, will probably be more important than ever.

Consideration of bomb targets includes also the height at which the bomb should be detonated. This height can be varied to suit any desired effect of the explosion. In Japan, the explosion heights involved the following factors:

a. Maximum blast effect (minimum shielding effect from building to building).

b. Maximum casualty effect from blast, flash burn, and instantaneous radiation.

c. Minimum casualty effect from *delayed* radiations (either from fission products or induced radioactivity).

Lowering the burst will of course increase the scale of the effects on the ground, but may reduce the area over which the effects are spread. Lingering radioactivity in general will always be increased as the height is decreased. The proper height will be varied in every case, therefore, to suit the target and the effect which is desired on that target.

Means of Carrying the Bomb to the Target

The future of the atomic bomb depends in large measure on the means which will be developed to carry it to the target. Without inquiring into the exact weight, size, or shape of the bomb, one can infer much from the five bombs that have already been detonated. The first bomb, in New Mexico, was suspended from a steel tower; the second, third, and fourth were dropped from airplanes (B-29's in each case); and the fifth was suspended under water from a small landing craft. This last method shows that in future war, bombs could be carried and launched from submarines; the corollary is that fleets will have more to fear from a single small underseas craft than they did from a full-scale attack by a complete battle force in the past.

But it is safe to say, first, that the most important method of delivering the bomb at the present time is by aircraft, and, second, that the guided missile of long range with atomic warhead looms as the most potent probable weapon of the future. Very little has been divulged about the type of plane required to carry the bomb; in each case so far the plane has been a B-29, but no statement has been issued which explains whether the size of the bomb or some other consideration, such as range or special equipment, dictated the use of the Army's largest bomber. It is obvious that the development of new, larger bombers will soon result in the feasibility of attacking any point on the globe, from any other point, with one or more bombs in a new superbomber.

The first step toward a guided missile is the robot bomber, which is simply a conventional aircraft controlled by radio. The use of "drone" planes at Bikini points the way to this development. Both B-17s and Navy planes were very successfully launched, flown, and landed completely by radio control. At the present time, the controlling, or mother, plane must be fairly close to the robot, but the future will undoubtedly see robots controlled from extreme distances. And eventually they will be controlled from the launching point throughout their flight to the target. The means of propulsion is of secondary importance, but it is presumed that great ranges and great speeds—making defense almost impossible—will depend on rocket development.

Defense Against the Bomb

The problem of defense against the bomb is the m awesome of all. Those who have worked intimately with t bomb do not see any positive defense as possible. The o idea that for every weapon there is a defense has, at le for the time being, been exploded, literally and figurative Some persons may have enough confidence in scientists believe that they will find an antidote for the bomb ev more effective than antiaircraft fire has been against a craft. But, as pointed out by Mr. Bradley Dewey, Preside of the American Chemical Society, for centuries man h tried to square the circle and to invent a perpetual moti machine—yet the evidence all points to his never succeedi in either effort. And whether we shall succeed in devisi an active defense against the atomic bomb is most prob matical.

It is important that soldiers should not misinterpret t Bikini results. Some news accounts have conveyed the i pression that the results proved the bomb much less leth than it is. But the "box score" at Bikini was intentional kept fairly low in order to obtain more evaluation da rather than a maximum number of ship casualties. Son slight changes in the target array would have easily r sulted in a very impressive list of ships sent to the botto Also, it should be kept in mind that a battleship, more tha any building, is specially designed to withstand gre shock.

The impossibility of designing an effective defen against the bomb is emphasized by consideration of the d fenses which were developed against ordinary bomb rai in the past war. In that war, any bomb raid which suffere up to 25 per cent casualties was almost prohibitive in co and a raid on which 90 per cent of the planes were inte cepted would have been termed a total failure. But in a atomic raid, *only one plane* would have to get through t cause a catastrophe for the defenders. If the raid was mad by 100 bombers, each with a bomb, then 99 per cent coul be intercepted and the defenders would still lose a city. A most anyone will agree that the prospect of developing a antiaircraft defense which is always 100 per cent effecti is nil. And the rocket makes the picture even worse. Re member that no V2 rocket sent over England by the Hun was ever intercepted. The rocket speed of well over 3,00 miles per hour made our most improved antiaircraft weap ons virtually helpless.

Dispersion and protective shelter offer a certain amoun of passive defense. We would be much less vulnerable t atomic attack if all our great cities were dispersed over th country, so that a nearly even concentration of populatio would be achieved; but it is obvious that we cannot under take such dispersal. It is *possible* to design a structure tha could withstand a direct hit, or at least a near-miss, by a atomic bomb; but the cost will always be prohibitive. Th War Department has carefully considered both dispersa and protective construction, and has decided to what length these measures should go. It is possible to define what in stallations should be given protection, and how much pro tection they should have without exceeding economic limits For example, one could say that message centers shoul

be protected by x-feet of reinforced concrete, in order to protect against an atomic explosion at y-miles distance; and that the cost of any additional protection would not be warranted.

Structures can be protected against blast by (1) strengthening, (2) using blast resistant exterior shapes, and (3) employing a dynamic design which takes most advantage of mass and period of vibration. Shielding from blast is also afforded by terrain features, as well illustrated in Nagasaki.

Personnel may be shielded from flash burn quite readily. It was found in Japan that even one layer of clothing often gave complete protection. Almost any object or substance which intervened between the area concerned and the center of explosion gave some measure of protection. Shielding from other radiations can also be effected by various substances. Exact figures on the thicknesses of materials such as concrete, lead, or water which provide complete or partial protection from radiation effects cannot be released; the collection of data is still under way. It can be stated, however, that at a reasonable distance, say ½ mile from the center of the explosion, protection to persons from radiation injury can be afforded by a layer of concrete or other material whose thickness does not preclude construction. In general, it is possible to design air raid shelters to give the maximum protection, and this protection will be quite appreciable.

Effects of the Bomb on Tactics and Strategy

As to the effect of the bomb on tactics and strategy, much has already been said above in connection with atomic bomb targets. The bomb has made it dangerous to possess any large concentration of strength, whether it be in the form of factories, harbors, troop concentrations, or naval formations.

Preparedness is the main requisite of an army in the atomic age. Atomic attacks may come so rapidly, with no warning, that whatever forces we have must be ready to fight on the instant; there will be no months or years in which to prepare. This fact makes any future conflicts entirely different from any past one, from the American point of view. We are all familiar with the many difficulties attendant on keeping our Army ready for instant action; we may never achieve the goal of preparedness—if we ever do, it most likely will be only in respect to our counterattacking atomic units alone, and not the whole army. All necessary war materials should be in the hands of the troops before the war breaks out, and the troops must be thoroughly trained in their jobs. The great disruption of control and communication which accompanies an atomic attack means that we need extraordinarily thorough training in comparison to that we have been able to tolerate in the past.

Effect on Design

It is well known that Test A at Bikini was especially disastrous to ship superstructures, and the Navy will no doubt consider how these structures can be made more bomb-resistant. It is particularly important that radar and fire control equipment be protected from air blast. Very extensive tests were carried out on all types of equipment and supplies, from food to airplanes, and from radio equipment to vehicles, and the results are now being evaluated. Among common items of supply, however, it does not appear that many changes can profitably be made merely to lessen possible atomic bomb damage. Some steps will be taken to make paints and surfaces less susceptible to flash heat, and all items will be made as rugged as is consistent with good design and economy.

Effect on Army Organization

The agencies of the Army which are today concerned directly with the production, handling, and use of the bomb are strictly limited in number. This limitation does not in any way need to imply that any part of bomb development is being overlooked; those agencies which can contribute to the program are already integrated into it. At the present, the only components of the Army directly involved are the Manhattan Project and the Army Air Forces. By the time this article goes to press, the civilian Atomic Energy Commission will have taken over the bulk of the functions and installations of the Manhattan Project, and it is not yet clear what War Department agency will succeed Manhattan. The Air Forces are the principal "using agency" at this time, and they are of course involved in the many special problems of atomic bomb handling and delivery. The bomb is not, of course, either an Ordnance or Chemical Corps item of equipment, though one cannot predict at the present time what change might occur if, for example, future use of the bomb is confined to guided rocket missiles. Most of the officers in the Project at this time are from the Corps of Engineers, but other branches are represented by picked specialists. Unquestionably, the Project or its successor will be a branch-immaterial organization; it is possible that some sort of "atomic warfare command," to handle all problems concerned with the military use of atomic energy, may be set up, analogous to the Armored Forces, which will be manned by men from all branches and will in effect constitute a separate service component.

The atomic bomb has dictated the need for new types of units in the Army, in addition to those whose sole duty is to deliver the bomb to the target. One example is the special anti-radioactivity unit which will probably be needed to (1) examine bombed areas to determine the amount of residual radioactivity, (2) effect decontamination of areas and objects made dangerously radioactive by atomic explosions, and (3) instruct troops in these matters. Specially trained crews are needed to handle the bomb from the time it is first assembled (with the fissionable material in a subcritical mass) until it is dropped on the target; these crews must supervise bomb storage, assembly of the final bomb, transport bombs to the point of take-off, test the bombs while en route to the target, and the final dropping on the target.

When other types of atomic weapons—principally guided missiles—are developed, other new types of units may be needed, which cannot be foreseen at this time.

Justice For The Bumblebee*

Nature's bumblebee has been flying around for a long time, but without being backed up by the formulas to prove that it could. Navy's "Bumblebee," the ram-jet, has had formulas for several decades showing that it could fly; but none ever flew successfully until last year. Below is given the proof that Nature's bumblebee can fly and on the page opposite, there is the explanation of how the Navy's "Bumblebee" flies.—ED.

"According to the laws of aerodynamics, the bumblebee is so constructed that it is scientifically impossible for it to fly. But the bumblebee does not know this, so it goes ahead and flies anyway."

This wisecrack, concocted by someone with only a dim idea of aerodynamics, has been printed millions of times in various places, and is still in circulation as an inspirational piece. Just what it is supposed to inspire, no one knows.

The fact is, however, that the bumblebee IS constructed according to the laws of aerodynamics. It is true the bumblebee does not know this but it probably wouldn't give a damn, anyway.

The general assumption of the anti-bee crowd is that the insect's wingspread isn't large enough to support its fuselage. In all human-made flying machines you have to follow formulas, and when some insect that has been around for several eras longer than humanity doesn't follow these formulas, the upstarts go around saying it can't fly because it doesn't follow their rules. But nobody ever heard of a bee crashing and killing all aboard.

At the Northrop plant in Hawthorne, California, where they build Black Widows, the personnel usually eat in an open-air dining room. Bumblebees often hang around the place, waiting for crumbs: one day a visitor from the East told a couple of aeronautical engineers it must be a mirage: Bees couldn't fly; it was scientifically impossible.

This got under the hide of the engineers, and when the visitor had gone, they got out their slide rules and caught a bee and measured its wingspread and fuselage. They studied it.

"It's an ornithopter," said one, "or else I'm no aerodynamicist."

"Too bad Rimsky-Korsakov didn't know that; he could have written the Flight of the Ornithopter," said the other.

Then they found a book which said that the Germans, some years ago, had built an oscillating machine that measured INSEKTENFLUGELS and such things, and had proved that bees could really fly.

So the Northrop experts built their own INSEKTENFLUGELS machine and covered many old blueprints with calculations—all during the lunch hours, so as not to interfere with production and have "Hap" Arnold raising hell. The result was two formulas:

$$1.\ A = \frac{R}{2} F\,(0.20\ S^2M^2N^2 + 0.36\ SMVN)$$

$$2.\ \frac{A}{W} = \frac{R}{2}\,\frac{1}{AW}\,(0.20\,S^2M^2N^2 + 0.36\,SMVN)$$

For the benefit of the skeptics, A represents lift, R is air density (over which the bumblebee, naturally, has no control), F is wing area, S length of wing, M the amplitude of motion, V speed of flight, and N the number of flapping motions per second. W is the focal point of the whole controversy—the weight of the bee.

The first formula proves that the bee has lift at zero speed, meaning that it can take off. The rest is easy, because any bumblebee with a reasonable I.Q. is intelligent enough to flap its wings at the proper angle and speed to keep going.

But Formula 2 will squelch any further doubts. A schoolboy can see that if $\frac{A}{W}$ equals + 1, then the bumblebee can fly, and that if the insect flaps its wings fast enough, it can go places in a hurry.

So next time you see a bumblebee in flight, don't swear off or tell someone it's scientifically impossible.

Ol' bumblebee, he done got formulas back of him now.

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*By Jim Marshall, *Collier's* July 7, 1945.

The Flying Stovepipe — How It Works

By Major J. P. D'Arezzo, CAC and Major W. B. Sigley, CAC

Introduction

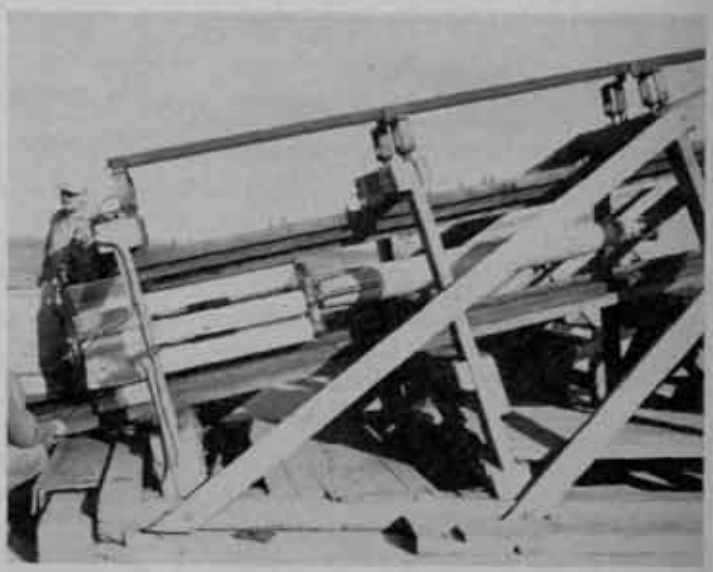
The requirement for speed in both the aircraft and guided missiles envisioned for the future has turned the attention of military research and development to the four general types of jet propulsion engines. (The solid propellant and liquid propellant rockets are considered as one type.) Much has been written of the three types already put to practical use, namely, the rocket motor used in the V-2 missile, the intermittent jet which powered the V-1 bomb, and the turbo-jet which is employed in the P-80 airplane. On the other hand, relatively little mention has been made of the fourth type of jet propulsion engine, the ram-jet motor.

On June 8, 1946, the Navy announced that under the cognizance of the Bureau of Ordnance, development of a ram-jet motor was in progress under direction of the Applied Physics Laboratory, The Johns Hopkins University, Silver Spring, Maryland, the organization made famous by its development of the VT fuze and the Navy Mark 57 Fire Control System. Ram-jet development was started as the "Bumblebee" Project at the laboratory in January 1945 under the leadership of the eminent physicist, Dr. Merle Tuve, and is presently being carried on by his able successor, Dr. L. R. Hafstad.

In its announcement, the Navy revealed that successful ram-jet flights had been obtained. Mention was made of one unit which after being accelerated to 1900 feet per second by booster rockets, then accelerated under ram-jet power to 2200 feet per second—about 1500 miles per hour or twice the speed of sound. In this case, the total horsepower developed by the ram-jet was comparable to that developed by the engine of the P-47 aircraft, but in the ram-jet one horsepower was developed for each half ounce of the motor's total weight of 70 pounds. This is a remarkable achievement in view of the fact that the best performance attainable with reciprocating aircraft engines is about one horsepower per pound of engine. The fuel used in the flight reported was gasoline. One gallon of fuel was burned during the flight, and a range of five miles was obtained.

The concept of the ram-jet is not new. Rene Lorin, a French engineer, is credited with having first proposed and patented the idea of such a propulsive device in 1913. A similar engine was patented in Hungary in 1928 by Fono and again in France in 1933 by Leduc. The latter also entered a ram-jet aircraft model in the Paris Aviation Exhibition of 1933. That the principle of the ram-jet should have been known as early as 1913 is not surprising since the ram-jet is a logical application of the principles of aerothermodynamics which were known at that time. It is significant that 32 years elapsed between the time the idea of the ram-jet was first proposed and the time that the first successful free flight of a supersonic ram-jet was made by the Applied Physics Laboratory in June 1945. Calculations made in the intervening years showed that fuel consumption of a ram-jet is excessive as compared with that of conventional aircraft engines. Therefore, there was little impetus for development. However, these calculations assumed speeds of the order of 300 miles per hour which are low in comparison with those anticipated for the guided missiles of the future. It is at these higher speeds that relative ram-jet performance appears especially attractive, and for this reason development of the ram-jet is desirable.

In common with the other types of jet propulsion motors, the ram-jet is a reaction device. That is, the forward push given the motor is the reaction to the rearward push given the working gases of the motor as a result of combustion. The basic principle involved is Newton's third law of motion which states that to every action there is an equal and opposite reaction. Unlike a rocket which must carry a separate oxidizing agent in addition to the fuel or as part of the fuel, the ram-jet takes the oxygen required for the combustion of its fuel from the atmosphere. The function of combustion in the ram-jet is to heat the air that flows through the motor thus imparting additional energy to it. Relative to the mass of air flowing through the motor, the mass of fuel added is very small. Using atmospheric oxygen for combustion is an advantage because the oxidizing agent need not be carried, but a disadvantage in that the ceiling of operation is limited by the atmosphere. These characteristics of the ram-jet are also applicable to the intermittent jet and the



Bumblebee Test Missile showing Booster Rockets and Launcher.

turbo-jet which likewise utilize atmospheric oxygen for operation. Unlike the other jet motors, and as will be explained later, the ram-jet cannot develop thrust when at a standstill; therefore, the ram-jet must be boosted to an efficient operating speed by some auxiliary propulsive system such as booster rockets which drop off when all burnt. The ram-jet is of simple construction and light weight compared to the other jet engines. The use of moving parts and, therefore, close tolerances of manufacture can be eliminated in the motor thereby facilitating mass production.

The ram-jet is also referred to as an athodyd, a name derived from an earlier descriptive term given it, *aerothermodynamic-duct*. Perhaps because the exhaust pipe of a P-47 was used for the initial ram-jet experiments, or because the ram-jet motor consists essentially of a tube or pipe open at both ends, the device has been appropriately dubbed the "flying stovepipe."

The simplest ram-jet motor to understand is one which travels at a speed less than that at which sound waves travel in the air, i.e., subsonic speed. This is true because certain aerodynamic and air flow phenomena accompany the motion of objects in air at speeds greater than that of sound waves, i.e., supersonic speed. These phenomena tend to complicate the operation of the supersonic motor even though the basic principles of operation of the subsonic and supersonic ram-jets are the same. Therefore, an explanation of the subsonic motor will be presented first. This will be followed by a discussion of certain aerodynamic phenomena and finally consideration of the supersonic ram-jet.

The Subsonic Ram-Jet

Figure 1 is a cross section of a ram-jet motor showing the essential internal elements.

Assume that the motor has been launched or projected into the atmosphere in a given direction by auxiliary booster rockets to a subsonic velocity of, say, 600 feet per second. For purposes of analysis the same results will be obtained if the motor is considered stationary with the air moving past the motor at 600 feet per second in the opposite direction. Then it can be said that air will enter the forward opening or throat of the motor and will continue to flow throughout its length.

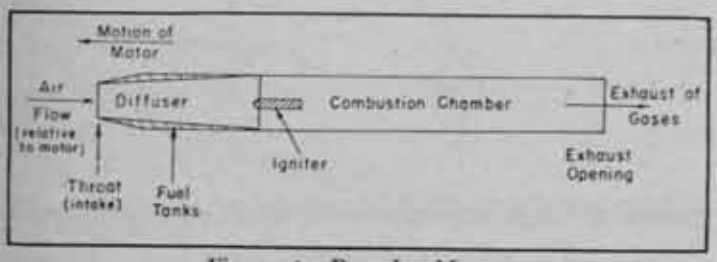


Figure 1—Ram-Jet Motor.

The air entering the motor has a certain momentum where momentum is commonly thought of as the quantity of motion possessed by a body. Mathematically it is equal to the product of the mass and velocity of the body. If the motor imparts additional momentum to the air in the direction of air flow, by Newton's laws of motion the air will impart an equal amount of momentum to the motor in the opposite direction—which is forward for the motor. The same principle applies when a rifle is fired. The momentum imparted to the bullet forward equals the m mentum of the rifle in recoil.

Without combustion, the momentum of the air leav the motor at the exhaust is essentially the same as the m mentum of the air entering the throat so that no net fo will be exerted on the motor to push it forward. Howev fuel is injected into the airstream flowing through the d fuser, and the resultant mixture of air and fuel is igni by an igniter (Figure 1). Combustion of the fuel results the liberation of heat energy *which raises the temperat of the air in the combustion chamber. Therefore, the pr sure in the combustion chamber is also greatly increas* Under this increased pressure the heated air tends to e pand in all directions. However, the only available ope ings through which it can expand to the lower outside mospheric pressure are to the rear and to the front of t motor. The hot gases are prevented from escaping throu the front for as soon as the incoming airstream encount this back pressure from the combustion chamber, i.e. t pressure acting towards the front of the motor, addition pressure is produced by further slowing of the air whi is rammed into the diffuser. Hence, the static pressure the diffuser is increased enough to balance the back pr sure resulting from combustion. Not being able to expa to the front, the hot gases expand through the only oth opening available, the exhaust opening. In expandi through the exhaust, the mass of hot gases accelerates whi means that the air leaves the rear of the motor at increas velocity and increased momentum. The increased ener given the air evidenced by increased temperature and i creased velocity is derived from the combustion of fu The direction of increase of momentum, i.e., through th exhaust, is caused by air under ram pressure "pluggin the diffuser.

Since the air is given an increase in momentum to th rear of the motor, an equal momentum must be impart to the motor in its forward direction. This forward m mentum is imparted to the motor by the increased pressu in the diffuser acting on the sloping walls of the diffuse This pressure acts perpendicular to the walls of the d fuser, but since these walls are conical and, therefore, i clined to the longitudinal axis of the motor, a componen of pressure exists in the forward direction (Figure 2 These forward pressure components summed over the e tire internal area of the diffuser constitute a forward forc This forward force is called thrust and imparts to th motor an increase in momentum equal to the momentu increase of the air accelerated to the rear. However, retar ing forces also act on the motor. These retarding forces co sist of the static pressure on the nose of the motor and aer dynamic drag, the latter being the retarding force cause by the motion of the motor through the air. Aerodynam drag is due to: (1) surface friction, (2) impact of the a on the motor, (3) the creation of partial vacua along th outside surface of the motor depending on the attitude the body to the air flow. These quantities vary with th shape of the body. When net thrust is zero, i.e., when thru is equal to all retarding forces, constant speed is maintaine If the net thrust is greater than zero, the motor w accelerate.

As combustion continues, a condition of equilibrium

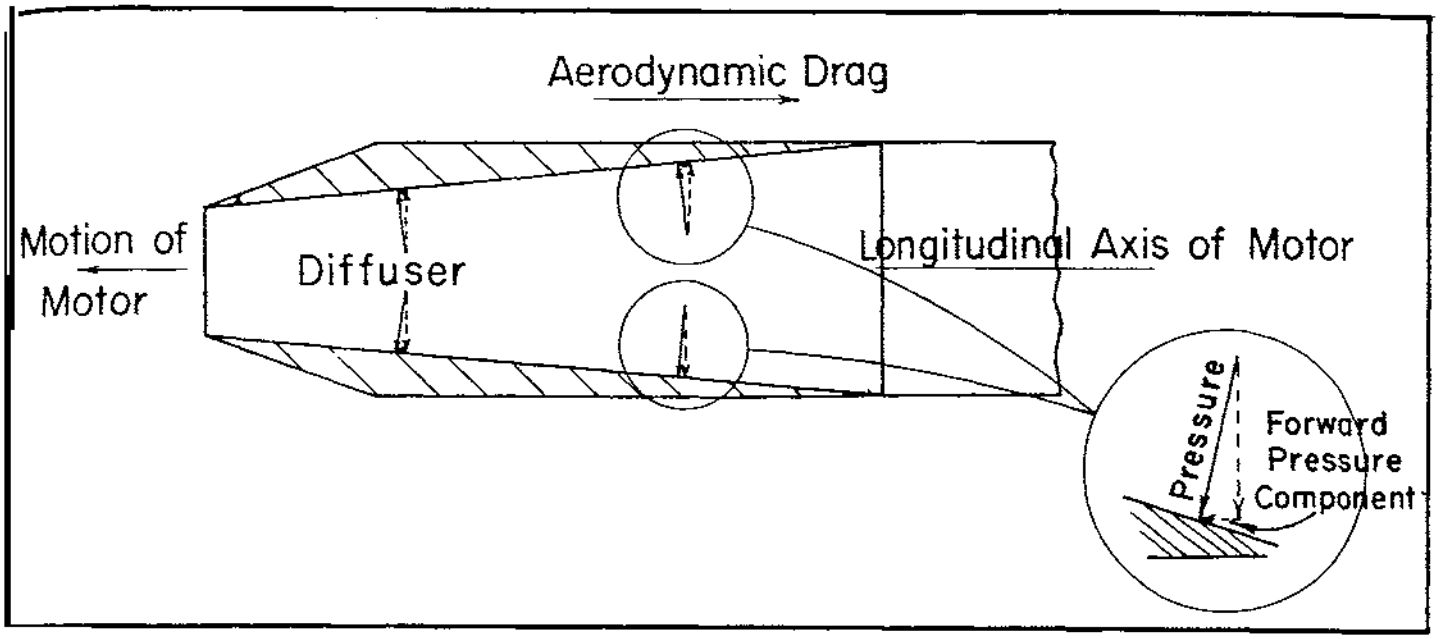


Figure 2—Ram-Jet Thrust.

reached at which the back pressure from combustion acting towards the front of the motor is opposed by an equal pressure in the diffuser acting toward the rear of the motor. Then so long as combustion results in the desired high pressures in the combustion chamber, thrust will be maintained.

The formation of thrust can also be explained in another way. The thrust exerted on the motor is actually the reaction to the force accelerating the hot gases. It is stated above that under the increased pressure resulting from combustion, the hot gases are accelerated to the rear of the motor. This mass of gases is accelerated to the rear because a force is pushing it to the rear. This force pushing to the rear is dependent upon the difference between the pressure built up at the rear of the diffuser by air ram pressure (equal to combustion back pressure) and the pressure outside the exhaust opening. The pressure acting to accelerate the hot gases is exerted by the incoming air on the inside walls of the diffuser as well as on the hot gases. Hence, since the diffuser withstands this pressure on its walls it can be said to exert the force on the hot gases, the air in the diffuser merely being used to transfer the force to the hot gases. Then, by Newton's third law, the working gases exert an equal and opposite force on the diffuser, the air in the diffuser again being used to transfer the force to the diffuser. This opposite force on the diffuser is thrust, and the inclined walls of the diffuser provide the "toehold" on which the force is exerted forward. When steady burning conditions are reached, a steady thrust force is exerted.

Formation and Characteristics of Shock Waves

A particle moving through the air causes small pressure disturbances or pressure waves in the air. These waves are sound waves and move at the speed of sound. The speed of the waves is independent of the speed of the particle which causes them, and is dependent only upon the local temperature of the air. It is convenient to define a particle's speed as subsonic (less than the speed of sound), sonic (equal to the speed of sound), or supersonic (greater than the speed of sound); for at each of these speeds, the pressure waves from the particle form a particular pattern. Another term used to define an object's speed is Mach number (symbol M) where the Mach number is the ratio of the object's speed to the speed at which sound waves would travel in the air under the same physical conditions. If an object is moving at a Mach number less than 1, its speed is subsonic; if at a Mach number equal to 1, it is sonic; and if at a Mach number greater than 1, it is supersonic.

Consider a particle moving at subsonic speed. Each of the pressure waves formed by the particle radiates outward in all directions from the point of origin and remains ahead of all pressure waves subsequently formed.

With the particle moving at sonic speed, the portions of the waves directly ahead of the particle "bunch up." As a result, there is built up immediately in front of the particle a single wave of much greater magnitude than the individual waves from which it is formed. This is to be expected since the particle moves at the same speed as the pressure waves formed by it, and, in its particular direction of travel, is continually adding new pressure waves to the pressure waves previously formed. The increased pressure disturbance explained above as existing in the path of the particle is called a *shock wave*. As the particle moves the shock wave moves with it.

In the supersonic case, the waves "bunch up" or are added to each other not only in the path of the particle as in the sonic case, but also on the sides. The result is that a conically shaped shock wave surrounds the particle. This shock wave is most pronounced directly in front of the particle and grows weaker towards its trailing ends. The sharpness of the apex of the shock wave is dependent upon the Mach number, becoming sharper as the Mach number increases.

Although the discussion so far has restricted the formation of shock waves to a moving particle, shock waves are also generally formed in the same way by moving bodies of appreciable size. Figure 3 shows the shock wave formed by a body with a flat front surface. Note that the

shock wave tends to align itself with the front surface of the body, and that it is nearly perpendicular or normal to the

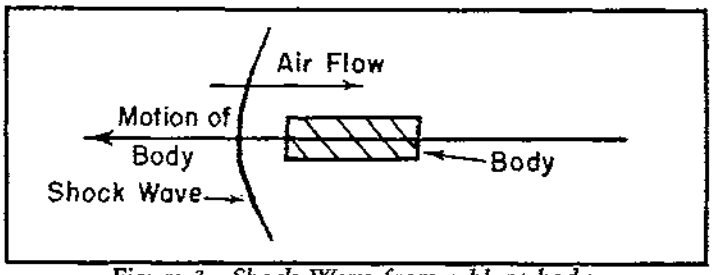


Figure 3—Shock Wave from a blunt body.

direction of air flow. Such a shock wave which is approximately perpendicular to the direction of air flow is called a *normal* shock wave. A shock wave does not cause a change in the direction of air flow which remains essentially parallel to the surface of the moving body. Figure 4 shows the shock wave formed by a conical body or wedge. In this case, the sharpness of the apex depends not only upon the Mach number but also upon the sharpness of the cone or wedge

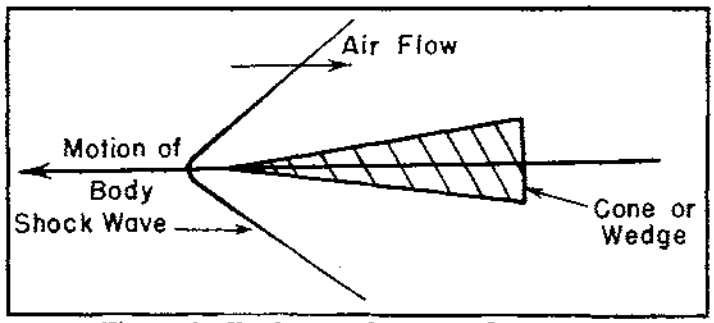


Figure 4—Shock wave from a wedge or cone.

itself. For large cone or wedge angles, or for relatively low speeds, the shock wave is blunt and detached from the front of the body. For small cone or wedge angles, or high speeds, the shock wave becomes attached to the front of the body and is bent backwards at a sharper angle.

The Supersonic Ram-Jet

Theoretically, and as verified by practical experiments, the ram-jet operates most efficiently at supersonic speeds. The basic principles of operation as outlined for the subsonic ram-jet remain the same for the supersonic ram-jet. However, at supersonic speeds the presence of shock waves makes the operation of the motor critical. A discussion of ram-jet shock waves and a more detailed explanation of the action of the diffuser in obtaining higher ram pressures than given for the subsonic ramjet is represented below.

At Mach numbers equal to or greater than one, a shock wave forms in front of or inside the diffuser, its position being dependent upon the back pressure resulting from combustion. When this pressure is of the proper value based on the particular design of the missile, a shock wave similar to that shown in Figure 5 forms across the throat. The portion across the throat is a normal shock wave and rests on the rim. If the pressure resulting from combustion is below the designed value, a normal shock wave is formed inside the diffuser while if the pressure is too high, a detached shock wave is formed in front of the nose. These undesirable shock waves are shown in Figures 6 and 7.

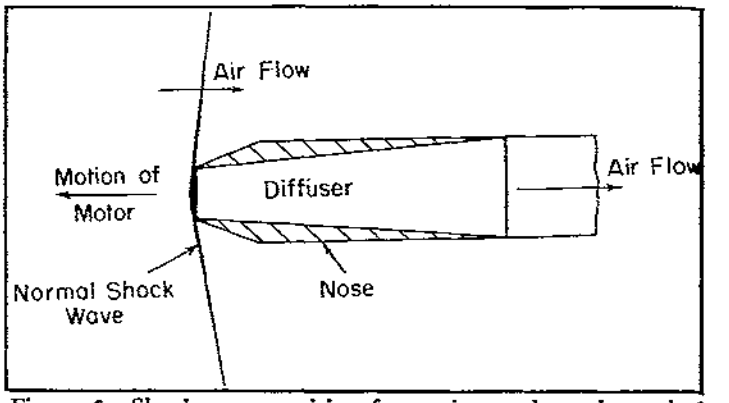


Figure 5—Shock wave position for optimum thrust in conical diffuser.

It is emphasized that one of the objectives to be attained in a ram-jet using a simple conical diffuser is the maintenance of a normal shock wave on the nose as shown in Figure 5. This condition is maintained by the proper combustion for the conditions under which the missile is designed to operate, i.e. for a definite pay load and speed. As one may surmise from the previous discussion of the formation of shock waves by an accumulation of pressure waves in front of a particle moving at sonic or supersonic speeds, instantaneous and marked changes in velocity, pressure, temperature, and density occur across a shock wave. This is related to the compressibility of air and must be accepted even though it appears to contradict some of the basic laws governing the behavior of gases. If the shock wave is normal and on the nose, the speed of airflow behind it is subsonic whereas in front of it, the speed is supersonic. In addition

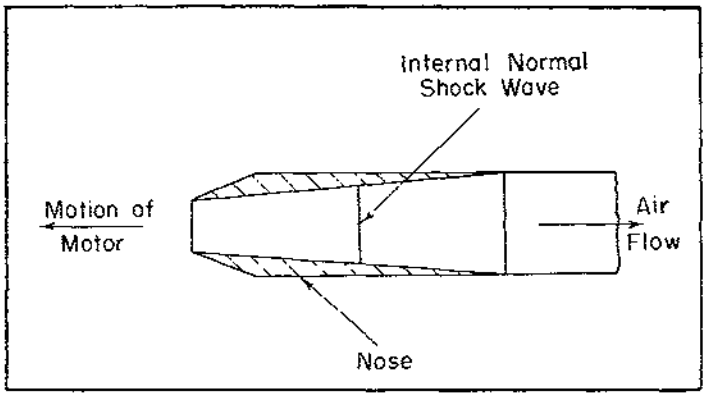


Figure 6—Undesirable shock wave for Ram-Jet (combustion back pressure too low).

there is an abrupt and high increase in static pressure on the subsonic side of the shock wave. If the shock wave is normal and inside the diffuser, the same results of subsonic flow and increased pressure are obtained behind the shock wave as for the optimum shock wave, but supersonic flow will exist from the throat to that point of the diffuser where the shock wave is located. In the case of the detached shock wave also, subsonic flow and increased pressure are obtained behind the shock wave, but air "spillover" occurs. "Spillover" is the name given to the action in which part of the air which should enter the throat is deflected off to the sides and therefore cannot perform its desired functions in the diffuser. See Figure 7. To obtain the maximum static pressure in the diffuser and therefore to realize maxi-

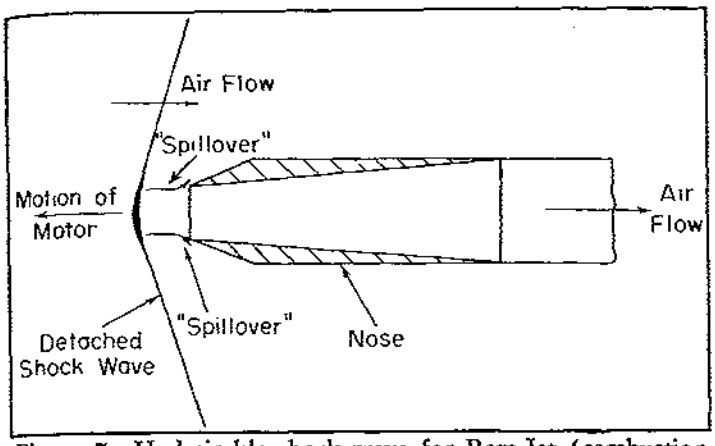


Figure 7—Undesirable shock wave for Ram-Jet (combustion back pressure too high).

mum thrust, it is necessary to have the maximum amount of air flowing at subsonic speed throughout the whole length of the diffuser. It is shown below that the optimum shock wave alone satisfies these conditions.

By virtue of its diverging shape in the direction of air flow, the diffuser acts to decrease the speed of the air flow and to increase its static pressure. It is obvious that decreased speed and increased static pressure would be obtained in the diffuser if air were incompressible. For under this assumption, a fixed volume of air would have to pass each point along the diffuser every unit of time. As the cross sectional area through which the air passes increases, the air's speed decreases. Since the air slows down in the diffuser, it now has less kinetic energy or energy of motion than it had in the forward part of the diffuser. It is fundamental that energy can neither be created nor destroyed, and from Bernouilli's application of this law to fluid flow, it can be shown that the lost kinetic energy reappears in the diffuser as increased potential or "pressure" energy. Even accepting the compressibility of air, the same general results are obtained in the diffuser, i.e., a decrease in speed and an increase in static pressure, provided the air flow in the diffuser is subsonic. Therefore, in the case of the optimum shock wave of Figure 5, the static pressure is increasing throughout the length of the diffuser in addition to the increase obtained after the shock wave. In the undesired case of shock wave inside the diffuser, that portion of the diffuser in front of the shock wave causes a decrease in the static pressure since the flow there is supersonic. As a result the diffuser is able to add less pressure to that already obtained across the shock wave than in the optimum case where the whole length of the diffuser is effective in increasing the static pressure. Hence, a lower pressure results at the rear of the diffuser. In the undesired case of the detached shock wave, due to "spillover" a smaller mass of air enters the diffuser, less kinetic energy is available for conversion to "pressure" energy, and again a lower pressure results at the rear of the diffuser. Summarizing, the optimum shock wave is the one which allows the maximum static pressure to be derived in the diffuser from air ramming at supersonic speeds.

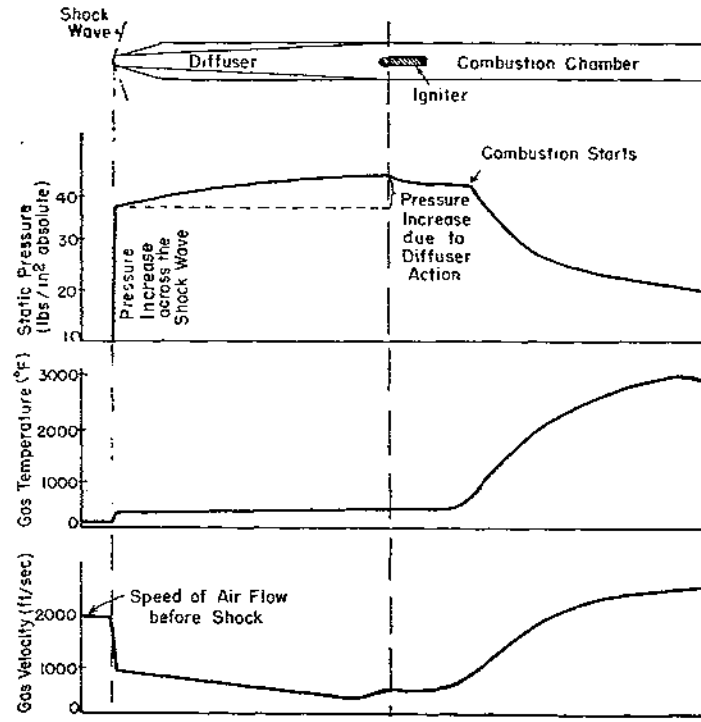


Figure 8—Pressure, temperature and velocity variations in a Ram-Jet.

Figure 8 presents graphs of the variations in static pressure, gas temperature, and gas velocity along the length of a ram-jet motor flying at 2000 feet per second at an altitude of 10,000 feet. Steady and optimum burning is assumed. As shown in the static pressure curve, advantage is taken in the diffuser of the great increase in pressure realized across the normal shock wave. In this case the increase is about 30 pounds per square inch. Compression in the diffuser causes an additional increase of 7 to 8 pounds per square inch. A slight pressure drop is experienced across the igniter due to restriction of the path across the tube. At the downstream end of the igniter where combustion is initiated, the pressure created by combustion is opposed by an equal pressure formed in the diffuser. Because of additional pressure increase obtained across the shock wave, greater combustion back pressures can be restrained by the diffuser at supersonic speeds than at subsonic speeds. Hence at these higher speeds, greater thrust is obtained. From the point of initiation of combustion to the exhaust opening, the static pressure drops steadily due to the expansion of the hot gases. The velocity of the hot gases increases throughout burning. The resulting increase in momentum of the hot gases is imparted to the motor in the forward direction just as in the case of the subsonic ram-jet.

The authors disclaim any originality for the ideas and explanations presented in this article, and gratefully acknowledge the assistance of members of the staff of the Applied Physics Laboratory and Associated Contractors.

COUNTER-MORTAR RADAR

By Lieutenant Colonel Leonard M. Orman, Coast Artillery Corps

One more task of major importance has been added to the numerous ones which radar already performs—that of counter-mortar. Mortars are deceptive things. They have been more than a nuisance since their invention. Both Germans and Japs demonstrated complete awareness of the mortar's inherent capabilities and thoroughly exploited its combination of mobility and firepower.

The small amount of flash and noise that accompany firing make ordinary methods of sound and flash detection impractical. Its characteristically high trajectory means that shells can be lobbed over hills or other obstructions which preclude the use of other field weapons. Because a mortar is so easily defiladed, direct location of it by either visual or radar means is usually impossible. In addition, it is light, small, easy to handle, easy to move and conceal. In combat the location of mortars posed a tough problem. Reports like the following testify to that fact:

"The extensive use of mortars has caused a tremendous number of casualties in this theater. The problem of locating enemy mortars is a difficult one—no satisfactory solution has been found for our troops."—Chief Signal Officer Com Z, ETO.

"Fifty per cent or more of all casualties in the various theaters are the result of mortar fire."—Surgeon General's ASF Survey.

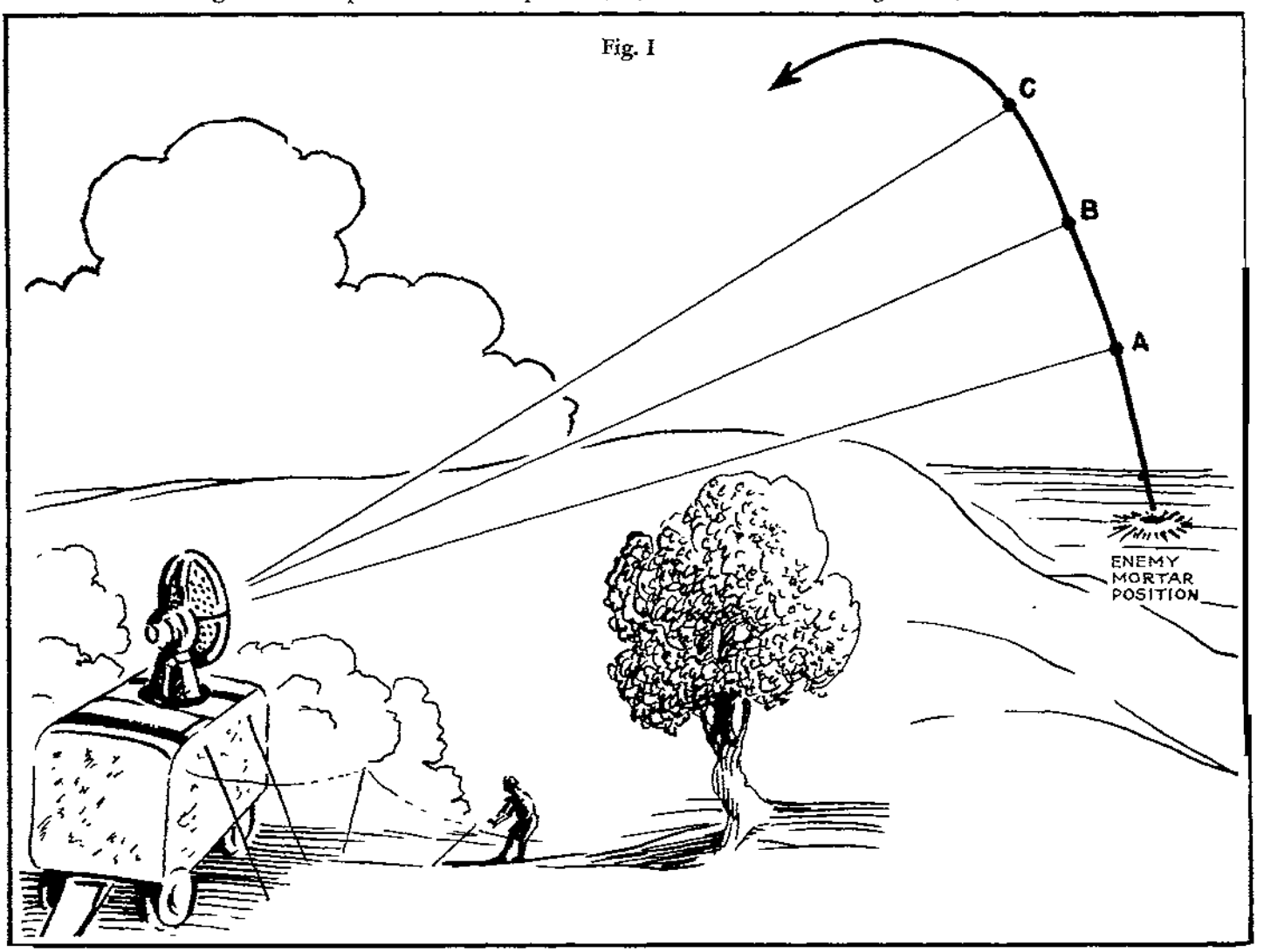
"Japanese mortar fire caused us more casualties than the rest of their weapons combined."—Platoon Leader, Leyte.

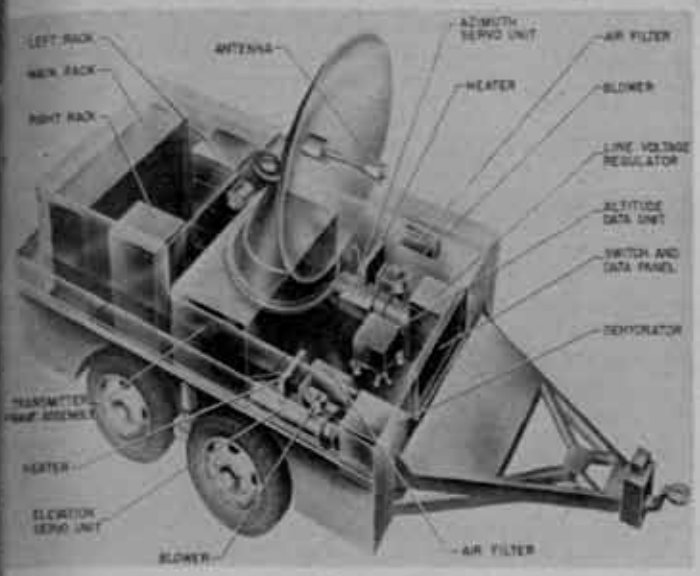
"There is an urgent need of any sort of equipment which can be put into the field now to combat enemy mortars."—US Military Attache, London.

Radar To The Rescue

Although the mortar itself can be successfully hidden from a radar, any set having the necessary power and resolution to pick up a target as small as a mortar shell can observe the trajectory. As early as 1937, tests at Fort Monroe

Radar Set SCR-584 in action. Set tracks mortar projectile automatically, providing range, azimuth and elevation at each five second reading. Point A represents the lock position; B, the five second reading and C, the ten second one.





Radar Set SCR-784 with operating personnel has been proposed for the T/O and E of a FA observation Battalion.

showed that antiaircraft shell bursts were recorded on radar scopes. In 1939, during tests of the first U. S. radar, the SCR-268, it was noted that 12-inch coast artillery shells could be followed across the scope but the signals received by the sets were weak. Since there was no apparent requirement for development of the phenomenon at that time, it remained just that—an interesting phenomenon.

Radar had been suggested by several sources as a possible answer to the mortar menace and had been given some tests which didn't pan out too well. However, when casualties in some outfits on the Anzio beachhead reached 73% and for the first time antiaircraft radar sets were close enough to the front lines to notice projectile "pips" on the scope, the need was so urgent that it was decided to try radar in spite of the earlier negative reports.

Much of the early experimentation with radar against the mortar was carried on right at the battle front, starting at Anzio. Almost concurrently, the British were carrying on their independent program in Normandy.

When tried in Italy, the first sets were moderately successful even though hampered by two factors: the mountainous terrain and the inability to make ground checks of results because of the static state of the front. However, the first battery of two sets that went into action in the MTO recorded 226 targets in its first three weeks of operation.

Methods Used

Depending on the type of radar and the plotting facilities, the parabolic path of the shell can be determined either by plotting one or more points on the curve or by continuously tracking and, in both cases, computing the mortar's location by backward extrapolation.

The methods differ slightly in the two most successful sets used to date, Radio Set SCR-584 and Radar Set AN/TPQ-3.

The 584

A basic antiaircraft SCR-584 is converted to mortar work by the following modifications:

1. The N^2 Gate, which was first developed primarily as an anti-jamming measure, was also very useful for those sets used in buzz bomb defense and generally speaking, it's a big help in tracking small targets through cluttered areas.

2. Provision for a 10,000-yard time base on the PPI scope.

3. The sector-scan kit, which was developed for buzz bomb work, is particularly adaptable to counter mortar work since the general area to be searched is known beforehand.

The sector scan limits antenna search to a sector covering a unit front and is variable from 300 to 2,500 mils, eliminates the necessity for manually throwing a switch twice per second and provides a uniform sweep over the sector being scanned. The 10,000-yard time base and the N^2 gate provide greater accuracy at workable ranges. The ability to track a target automatically, a standard feature of the 584, improves the accuracy of data obtained and helps prevent tracking an interfering target. With these modifications, the 584 can locate a mortar site within 50 yards at a 5,000-yard range with an azimuth error ranging between 5 and 15 mils. While this is not an exact positioning of the mortar, sufficient data are given so that the area defined by the set is a worth-while target for saturation fire, and the mortar will be neutralized if not destroyed.

Care in siting the set and in its orientation will pay dividends. The range from the set to the enemy front line should be no greater than 6,000 yards as the signals returned from mortar projectiles are very weak beyond that range. Since enemy radio direction finding facilities are capable of locating the radar, its use too close to the front lines is impractical. The 584 gives better performance when it is emplaced on the flank of hostile fire. Whenever possible the radar site should be chosen to allow the beam to make the largest angle possible with the plane of hostile fire. Higher command will usually designate a general area in which the radar section may select a position and may assign a definite area to search for mortars.

Important considerations in the selection of a site:

1. The set must be sited so that echoes from land masses will not cause clutter in the scope which would prevent the detection of targets in the sector of search.

2. Accessibility, defilade, camouflage, proximity of survey control and communication facilities are other factors entering into the choice of a site.

Proper orientation is essential and its direct effect on results cannot be overemphasized. Constant rechecking of survey and orientation is invaluable in obtaining accurate locations of enemy mortars. This orientation may be accomplished by several methods just as a gun can be laid for indirect fire: survey of the position area with computed azimuths to known points both near and far; "radar registration" using friendly mortars or bazookas fired vertically from a known point; and friendly fire adjusted on surveyed targets.

When the 584 is operating in sector scan, its antenna beam is swept across a sector at a constant elevation. Any reflecting object such as a projectile passing through the beam will appear on the PPI scope as a bright spot, and will diminish in intensity as the beam passes beyond the direction to the object. In the case of mortars, the beam may

Radar Set AN/TPQ-3 set up for mortar detection. Reading from left to right; power plant, modulator unit (small box with top up), antenna and console with control unit on top.

flick a projectile three times on successive sweeps before the projectile passes above the beam. The same is true for the descending branch of mortar trajectory. The momentary appearance (two or three flicks) and disappearance of a small signal on the PPI scope at approximately constant range is a typical indication of mortar fire. Planes will return a much stronger signal than will mortar projectiles. Echoes returned from artillery projectiles in flight are generally weaker than those from mortar shells. This is due to a phenomenon known as aspect.*

Operation

Once the set is put into operation, tuned, adjusted, and clutter diagram taken and studied, the spinner motor is stopped and the PPI turned off while the dipole is positioned either vertically or horizontally. (The vertical position gives more exact azimuths while the horizontal position gives more exact elevation and makes target pick-up easier.)

Several plotting methods with variations have been tried with the 584. One method is graphical plotting by hand. The assigned sector is searched until a mortar projectile is detected. As soon as the pip from the mortar shell appears on the scope, the azimuth operator will throw the sector scan switch and move the antenna manually until the trace is over the point where the mortar round appeared. The range operator will at the same time move the range trace over the same point. When this has been done properly, the next round fired by the mortar should appear as a hump on the illuminated trace on the 2,000 yard scope. As soon as he sees the round, the range operator will place the tracking gate on the leading edge of the target and will then throw the automatic switches. The radar will then track the projectile automatically throughout its trajectory.

Three 5-second readings on slant range, azimuth, and elevation dials are taken after locking on. (Fig I.) These data provide discrete points on the trajectory which are projected to the ground. The line of fire is then drawn. The height of each point is computed, the trajectory drawn and extrapolated backward, freehand in most cases. The position of the mortar is the intersection of the extrapolated trajectory and ground mortar level—the latter checked closely against maps and aerial photos. Both the British and the Americans have experimented with various types of automatic plotters.

Disadvantages of the 584 are its great weight—14 tons—and the resultant difficulty of moving into position and getting into operation, which greatly limits its use in a fluid situation. These difficulties have been overcome to a certain extent by the development of the SCR-784 which is the same set electronically but weighs only half as much and presents a much lower silhouette. It has the additional advantage of automatic tracking in range as well as in elevation and azimuth. The 784 has been proposed as the organic FA Observation Battalion radar set.

AN/TPQ-3

Since the size of the 584 made its use in and near the front lines impractical, the Army looked for a lighter set and found it in the AN/TPS-3, a lightweight search radar which could be transported easily by troops to a front-line position.

The choice of the TPS-3 is rather a surprising one since it is not a micro-wave set and a mortar shell is such a small target. Although there is quite a gap between the TPS-3 and the 584 in general performance as radar equipments they become comparable as mortar location sets.

Certain modifications were necessary to suit the TPS-3 to its counter-mortar role. These were:

1. Change in polarization from horizontal to vertical.
2. Separation of radar console from antenna by about 100 feet. This makes it possible to protect and conceal the

*Theory of aspect.

When a projectile in flight passes through the antenna beam it becomes energized by the radio waves, and reradiates them. In effect, the shell becomes a transmitter.

The direction of the radio waves emitted from the projectile is dependent upon—

Angle at which the projectile is energized.

Contour of the projectile.

operators and, at the same time, to locate the antenna in a relatively exposed position, a fact greatly appreciated by the operators.

3. Installation of a range and azimuth marker unit; off-center PPI; sector-scan switch (400, 700 or 1000 mils).

4. Change of maximum range from 120 miles to 10,000 yards. With these modifications the name was changed to Radar Set AN/TPQ-3.

Knowing the approximate direction from which the mortar fire is coming, the operator scans a sector of about 60° until a shell signal appears, then continues the scan over a narrower sector centered on the shell echo. The range-azimuth marker, which is merely a movable spotlight on the PPI, is centered directly on the first point (ascent), then on the last point observed (descent). Range and azimuth to each point are recorded. The origin of the parabolic path of the shell passing through these two points is then determined by a Farad slide rule.

The TPQ-3 has two big advantages over the 584. It weighs a great deal less, which means a lot in mortar work, and being lower frequency, it is much less susceptible to rain echoes. Heavy rain will almost blanket the 584 scope when the set is used to track small targets at short ranges. The 584, on the other hand, has the edge on accuracy. The accuracy of any set depends upon a number of factors, principally the state of training of the operators. The artillery counter-mortar section works very closely with the counter-mortar agencies of the infantry through artillery liaison channels. The range of radar allows the most efficient operation from the general position area of the field artillery battalion. The counter-fire potentialities are readily available there, as are the communication and survey facilities.

However, the usefulness of the radar does not end with the location of mortars. Fire adjustment can be accomplished with radar by tracking the projectile of the adjusting pieces. Then too, radar has been successfully used for road watching, and can locate personnel, patrols, vehicles and other ground targets of opportunity as has been brought out in July-August and November-December issues of the JOURNAL.

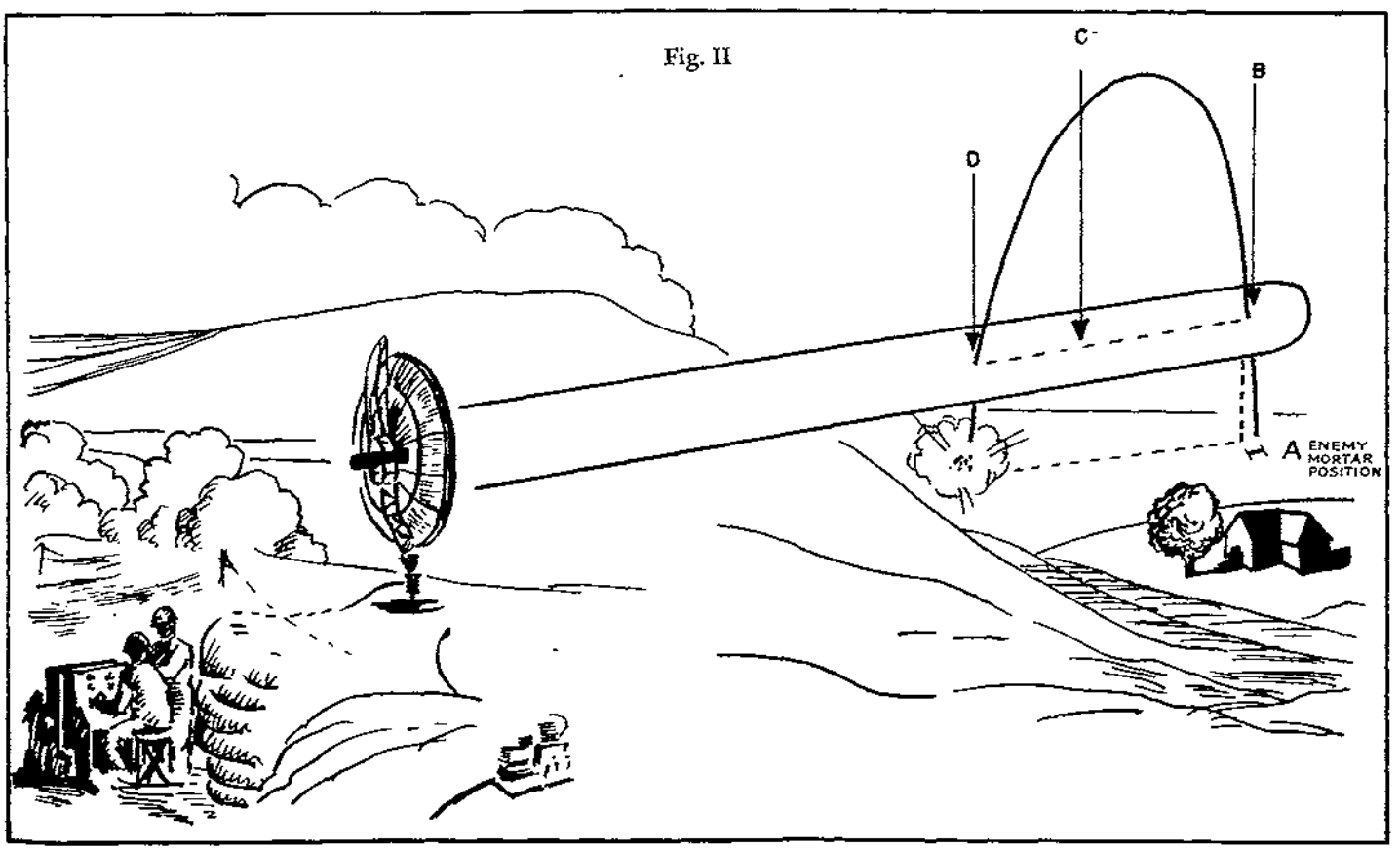
SUMMARY

With present location methods and equipment, an enemy mortar position can be neutralized. But there are several prerequisites—well chosen sites, experienced operators, and of course, a knowledge of mortar employment. Under some field conditions, it is difficult to obtain a site that will give optimum radar performance but even under unfavorable conditions it should be possible to direct counter-fire close enough to a position to make it untenable.

General Somervell remarked near the end of the war, "Use of radar to locate enemy mortars is a device which, even in its infancy, is saving many American lives. Perfected, it can save many more. . . ."

So, remember this. Neither of these sets was designed for this job, but rather they were converted from existing sets which were doing entirely different jobs. Perhaps when sets are designed to fulfill the military characteristics of a counter-mortar set, radar will be even more the nemesis of mortars than it is today.

Mortar location with Radar Set AN/TPQ-3. This set does not track automatically but uses another method of scanning at a constant elevation, picking up the mortar shell as it goes up through the beam and again when it comes down. A represents the location of the mortar; B the ascending range-azimuth; C the mortar line of fire, and D the descending range-azimuth.



Pacific Flak Intelligence Versus Japanese AAA

By Lieutenant Colonel Harlan B. Ferrill, Coast Artillery Corps

Japanese Antiaircraft Artillery, although it was never a critical threat to the U.S. air offensive against Japan, nevertheless emerged as the principal enemy obstacle to our air operations in the Pacific War. As our Air Forces attained air superiority, the threat from Jap fighters continually declined, leaving flak as the major opponent and the final Japanese defensive measure to be countered. This article gives the story of how Jap flak was dealt with in the Pacific.

Since the writer served in the Pacific Ocean Areas, it will pertain mostly to information concerning that theater in contrast to the Southwest Pacific, the other theater in the Pacific. At this time it may be well to explain, in general terms, the theater organization in the Pacific. As stated above, there were two theaters—(1) the Pacific Ocean Areas (POA) with Admiral Nimitz as Commander and (2) the Southwest Pacific (SWPA) under the command of General MacArthur. It goes without saying that the internal organization in both POA and SWPA varied as the war progressed. But for sake of brevity the organization as it pertains to the Air Forces will be explained as it was on V-J Day. In the geographical area of POA there were two principal air organizations: the Navy Air Arm including both carrier and shore-based aircraft, and the 8th and 20th Army Air Forces with B-29's and supporting aviation. The top level of Army air command in POA was the U.S. Strategic Air Forces (USASTAF) which operated directly under the Joint Chiefs of Staff. In SWPA, the top air headquarters was Far East Air Forces, controlling the 5th, 7th, and 13th Army Air Forces and armed with heavy and medium bombers and supporting fighter and reconnaissance aircraft. That the air commanders of both theaters, POA and SWPA, were seriously concerned with countering Jap flak is evidenced by the establishment of an extensive flak intelligence program in each theater.

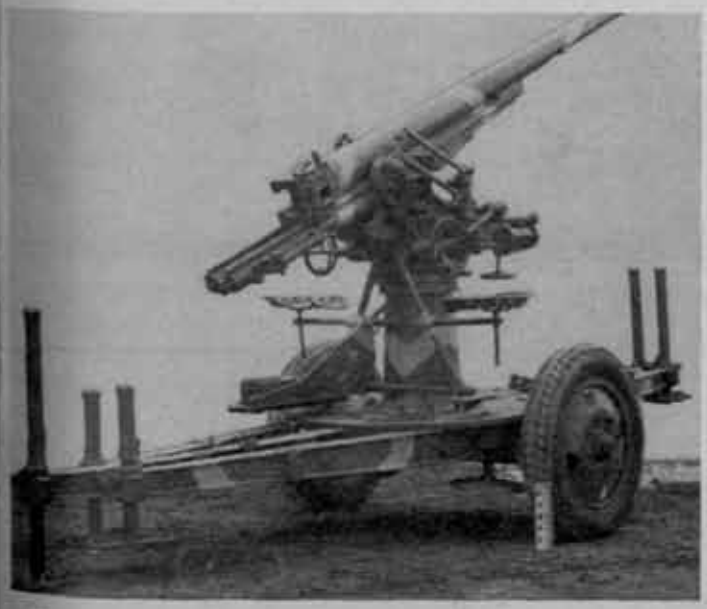
Before investigating the flak intelligence activities as such, a few words about our "obstacle"—Jap flak—will serve to add a basis for further exposition. That Japanese antiaircraft artillery was inferior to that of other major powers in World War II is a well established fact. This may be attributed to two prime factors. First, the Japanese High Command erroneously concluded that they were secure from air attack due to their geographical isolation and consequently deemed antiaircraft artillery as a minor arm. Secondly, the Japanese military leaders authorized no development of antiaircraft artillery until 1939. However, by the time Pearl Harbor had arrived, the Japanese had been able to organize and equip a fairly extensive antiaircraft arm by copying models of foreign matériel. As the war progressed, the Jap realized the vital necessity for adequate antiaircraft artillery defense and by 1945, 190,000 officers and men were in Jap antiaircraft artillery; this was an expansion of 1500%. Through improvisation, they were able to develop both guns and automatic weapons which ballistically approached those of other Major Powers. However, directors and gun laying radar developed by the Japs were notably inferior in performance.

Taking the fall of 1944 as a period of average Japanese antiaircraft artillery capabilities, what matériel was in the field? The 75mm and 120mm guns were the principal defense against high level bombing. Both guns were equipped with directors capable of handling radar data; batteries equipped with radar had become fairly common, even though it was in no way comparable to our excellent SCR-584. The 75mm, found in two different models, had been developed by the Japanese Army while the Japanese Navy had developed the 120mm gun which had been adapted to Army needs. The best director in use at this time had been originally developed by the Jap Navy and later standardized by the Army. Both services had attempted to forge to the front in radar development with the Navy actually being more successful. In the line of automatic weapons, we find

A B-29 is hit by flak near Nagoya. The wing which has been blown off may be seen in the upper right hand corner of the picture.

the 25mm and 20mm in use both by the Army and Navy, with the 25mm predominating. This weapon, the 25mm, is generally considered to be a modern gun, comparing favorably with automatic weapons of other major powers. It was found in single, dual, triple, and quadruple mounts, all utilizing on-carriage cartwheel sights. This weapon was particularly effective against glide and dive-bombing—to which any Navy pilot will testify. However, it lacked mobility. That the Japs realized this error is shown by the fact that many crude attempts at mobility were made, including sled and truck mountings. With regard to machine guns, the Japs employed 12.7 and 13.2mm primarily. These were found in fairly large concentrations in support of 25mm guns in airfield defenses and contributed effectively to those defenses in combatting very low altitude attacks.

In addition to the matériel just described as Japanese standard, several innovations or oddities in equipment were in existence. To mention a few, the 100mm, 65-caliber gun, had been removed from outmoded cruisers and converted to land use. Its muzzle velocity was in the neighborhood of 3300 feet per second and it was equipped to receive director data. However, loading the gun must have presented some difficulty since the breech was some eight feet above the ground. Loading alone actually required three men; one on the ground, one on a platform attached to the gun about three feet above the ground and a third on the level with the breech. The series of relays and struggles that must have been existent in loading need no explanation when one remembers that the round (fixed ammunition incidentally) weighed 62.2 pounds. In Tokyo, a 105mm AA gun was found. This weapon had been designed specifically to counter B-29 high altitude attacks. Only two had been built and just a few test rounds had been fired from one mounted in concrete in a tactical position for experimental purposes. It had most modern features of heavy guns, including a muzzle velocity of 3000 feet per second. During interview, the Japs seemed somewhat frustrated by the fact that by the time this gun was emplaced, B-29's had ceased bombing from very high altitudes.



The Japanese 75mm antiaircraft gun in traveling position.

There were peculiarities in Japanese tactics too. The number of guns in a battery varied from three to six; the pattern of the battery varied widely too. The top priority target for defense in Japan was the Emperor's Palace in Tokyo. Here the Japs saved face, because the Palace was practically untouched by American bombs. (It was never a designated target.) There was no coordination between the Japanese Army and Navy in establishing defenses. If a Navy installation happened to be within an Army defense, the Navy would frequently superimpose its defense with no regard to near-by Army units. And, additionally, there was a complete lack of coordination between the Army and Navy in the field of research and development. Within Army commands lack of coordination prevailed; one example of this deficiency is given by the fact that fighter aircraft and AA were not in Jap Army Air Defense Commands.

The reasons for many of the weaknesses were difficult to comprehend even after interrogation of Japanese antiaircraft artillery officers of ranks from Lieutenant General to Lieutenant. When queried about a weakness, they would smile meekly and reply, "These are the reasons we lost the war." That thought was a stock answer to questions put to Japanese officers immediately after the surrender and it was repeated so frequently that it became almost logical. To carry the discussion further, Japanese Army officers of the General Staff were sometimes asked general questions about Navy AAA equipment in use ashore. It was an exception, a great exception, when any knowledge of the equipment was displayed.

As a matter of clarity it may be well to point out that the Japanese Army and Navy both maintained AAA defenses ashore. Consequently both had developed equipment and tactical doctrine for shore-based AAA. Which type was used was dependent on whether the area in question was a Navy or Army responsibility. As you have previously seen, often both Services had defenses ashore.

From this very uncomplimentary picture of Jap flak, you may wonder why the air commanders were even concerned about it. Admittedly it is hard to understand how the Japanese ever destroyed a plane. For that matter, looking at the entire Japanese Army in postwar retrospect it is difficult to believe that they overran the majority of China and the Pacific. But they did enjoy this success just as they enjoyed a surprising degree of success with antiaircraft artillery. Perhaps some can remember when a mission to Rabaul was certain to meet accurate and intense flak, or when the bombing of Truk in daylight was in disfavor, or when B-29 flying above 25,000 feet received accurate flak over Tokyo. Furthermore, any loss or major damage to an aircraft is always a vital consideration. The lower the flak loss and damage, the higher is the operating effectiveness of the air force. Decreasing flak loss and damage is manifestly a necessary function, regardless of the standards of the enemy causing the destruction. So in the Pacific as in Europe, the Air Forces instituted flak intelligence early in the war. The problems and procedures of those officers engaged in flak intelligence, the true theme of this article, and how they served to counter the Japanese AA will now be presented.

Flak intelligence first came into being in the Pacific with

The 120mm type 10 dual purpose gun.

the 5th Air Force in SWPA in early 1942. Both the AAA Commander and the Air Force Commander agreed it was essential to do something about Jap flak. As a result, antiaircraft artillery officers from units in the theater were assigned to Air Force units to analyze Jap defenses and to minimize our loss and damage. No scientific procedures had been developed and intelligence information was far from plentiful. It was a question of, "There is your job, see that you do it." Then as time went on and both information and procedures were improved, the 7th Air Force in late 1943 (then operating in POA) acquired flak intelligence officers for its units. When the 13th Air Force was placed in operation in the Pacific it included flak intelligence officers on its staffs and when the 20th Air Force arrived in the Marianas, it was staffed with flak officers. The Navy, too, acquired flak officers of its own. As a consequence when the final air effort against Japan got under way all major air commands had flak intelligence officers assigned to their staffs.

To meet these requirements for flak officers, the Antiaircraft Artillery School had organized a course in flak analysis and was training carefully selected officers in that subject. Furthermore, the School had improved the technique of analysis. Experience had developed the functional procedures and organization in the theater. So when an officer arrived in POA there was no difficulty encountered in fitting him into the flak intelligence program.

Stated briefly and at the risk of over-simplification, the mission of the flak officer obviously is, to minimize the effectiveness of hostile AA. To accomplish this mission, the flak officer must assemble and analyze all available data on the enemy antiaircraft artillery and present his study to the Air Commander and his staff in the form of recommendations concerning operational aspects to minimize flak effectiveness. It follows that the flak officer requires technical information on antiaircraft matériel, detailed dat on tactical doctrine, location of fire units, together with th accessories necessary to analyze these data and present a analysis in usable form. In POA a determined effort wa made to insure that both the fullest information on th Japs and the best equipment manned by trained personne were available.

In Theater Headquarters, a flak intelligence section wa established to coordinate all flak intelligence activities i POA. This section had access to all captured document and from them supplied the majority of the information o weapons characteristics and tactical doctrines to both Nav and Army Air Commands. Reports were issued periodicall and were disseminated through normal channels. Supple menting these reports was the information available fro flak intelligence reports in Far East Air Force Headquarte in SWPA and the Air Commands in the China-Burma-Ind Theater. From these reports, the flak officers with tactic air units were able to determine what weapons the Japane had, how he would employ them, and what their capabil ties and limitations were. Post hostility investigations hav shown that the assessment of this information was sur prisingly accurate.

The intelligence from captured documents was aug mented by on-the-spot examination of captured equipmen and by testing of captured equipment both within PO and by the Ordnance Department at Aberdeen Provin Grounds. Often they revealed limitations of the equipmen which, when exploited, allowed the flak officer to add muc toward carrying out his mission. For example, it was learne that one model of a Japanese director could not compensat for even a slight dive. Consequently for some time, shallo dives were extensively used as evasive action for high leve bombardment aircraft.

An on-the-spot examination of equipment provided both interest and relief from routine intelligence work for som flak officers. When possible a flak officer would land on D Day with the Amphibious Forces in order to examine cap tured equipment before it was destroyed either of necessit or by souvenir hunters. This procedure allowed some o the officers a bit of unexpected excitement. One flak office landed on Luzon on D-Day and a few nights later was do ing guard duty in a captured town. Sitting comfortably o the porch of the OD's shack overlooking the ocean, h suddenly saw an armed Japanese soldier appear on th seawall. He calmly took aim, fired, saw the Jap fall motion less to the ground, and then yelled for the sergeant of th guard. Another officer was ambushed at Iwo Jima, bu escaped harm. These are but two of several incidents tha occurred during attempts to gain the best possible technica information on Japanese antiaircraft artillery.

Having technical information concerning the capabilitie of Jap weapons, the flak officer must then determine thei exact, pinpoint location in the defenses of all targets with which his air force is concerned. This requirement is prob ably the most difficult of all to fulfill. It requires timely adequate photo intelligence and suitable maps for plotting the information so obtained. If any one process is the back bone of flak intelligence, this is certainly it. Computation are no better than the data on which they are based; no matter how scientific flak analysis procedures may be

they are worthless unless supported by good photo intelligence and usable plotting maps. No little trouble was caused in POA by these requirements and it seems that such was the case in all theaters where flak intelligence was employed, so a detailed examination of these items as they existed in POA may well be worthwhile.

Photo intelligence consists of obtaining aerial photographs of given areas and interpreting the photographs for information. In POA, the great majority of useful photographs for flak intelligence purposes were taken by either F-13s (B-29s converted to photo aircraft) of the 20th Air Force or by a Navy photo squadron using primarily B-24 photo planes. The two reconnaissance organizations certainly acquitted themselves valiantly. However, certain obstacles served to make their job very difficult and, so far as flak photo intelligence is concerned, made the efforts often seem futile. The weather over the Japanese homeland frequently ruined an otherwise ideal photo mission. The great distances involved necessitated the use of large aircraft; these aircraft, being vulnerable to both flak and fighters, necessarily were forced to fly at very high altitudes. This, in turn, caused the scale of the photographs obtained to be so small that, in some cases, it was impossible to interpret them for antiaircraft artillery positions. In all cases, the scale of photograph was much too small to provide flak intelligence of the accuracy ideally required. However, 20th Air Force photo missions as well as the Navy's were flown for many purposes, flak locations being only one. Target damage assessments, target locations and natures, airfield facilities, port facilities, and many other types of information were in constant and high-priority of demand from aerial photos. Also mapping requirements for Ground Force elements were essential. So it goes without saying that the photo reconnaissance units in POA were overloaded and naturally could not devote detailed attention to flak requirements.

Strike photographs often provided useful information.

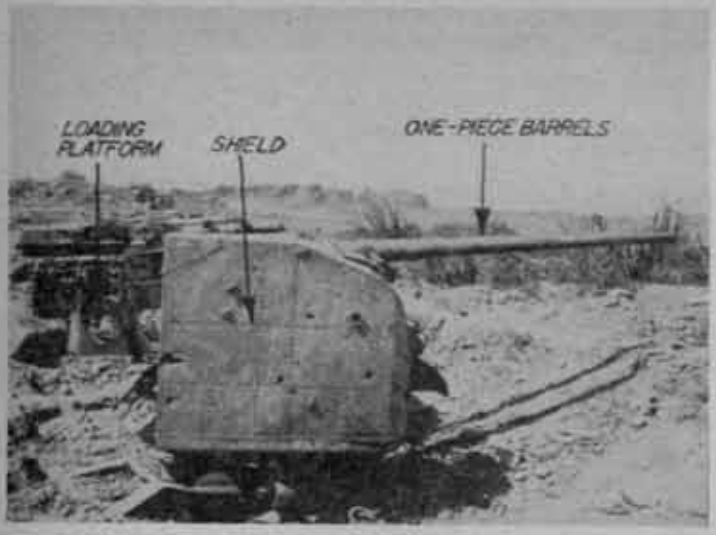
Japanese 25mm Pompom showing sights and sighting mechanism. These guns were manufactured with varying numbers of barrels.

Strike photos are taken by tactical units during a mission. Their chief purpose is to determine bomb impact. The B-29s, particularly after lower altitude operations were begun, provided some excellent strike photography. This, plus reconnaissance photography, gave coverage of all major target areas and consequently the interpreters were able to locate the great majority of Japanese antiaircraft artillery positions.

Someone should write a lengthy volume praising the photo interpreters for the job they did in the war. Though they and the flak officers were often in violent disagreement over interpretations, the "P.I.s" served flak well. Photo interpretation is a long, hard task requiring unlimited patience. In the case of flak interpreting it is extremely exacting because of the very great detail involved. Furthermore, most photo interpreters have little knowledge of antiaircraft artillery; they learn and improve from experience. Flak interpreting necessitates measuring of gun pits, "seeing through" camouflage, detecting dummy positions, and not a few other items sufficient to frustrate any but the most stable and determined person. Detecting changes in defenses alone was a major problem, e.g., flak defense in one airfield had 65 changes in 60 days. In retrospect, the "P.I." certainly did an excellent job. This is evidenced in U.S. Strategic Bombing Survey Report—"Evaluation of Photographic Intelligence in the Japanese Homeland" in which it is concluded through post-hostility surveys that photo intelligence was surprisingly accurate in its assessment of the AAA defense of the Japanese Homeland.

Perhaps a qualifying remark concerning "P.I." work is deserving at this point. In POA, it was generally impossible to determine the *exact* caliber of antiaircraft weapons. They were classified as heavy (75, 120, 127mm), medium (20-25mm) and light (12.7-13.2mm). In our terminology that means guns, automatic weapons, and machine guns and such a classification would give the true capabilities of our own equipment. Such was not the case in Japanese matériel. There was considerable difference in the capabilities of the Nip 75mm and 120mm and it would have been advantageous to differentiate between the two. This being impossible, all heavy guns were considered to be 120mm unless otherwise identified.

Photo intelligence problems seem inconsequential when compared to the map problem that flak intelligence experienced in POA. When the flak program initially was launched, flak defenses were plotted and disseminated to air commands on maps of widely varying scales, none of which was suitable to the flak officer's purpose. Intially the basic requirement for maps for flak intelligence was that they be of a scale of 1:100,000, this scale being suitable for analysis of gun defenses. Such a requirement may seem simple, but the catch was that 1:100,000 maps did not exist for Japan and surrounding islands. Hence, the maps had to be printed. Furthermore, Navy units were mostly concerned about automatic weapon defenses and a scale of 1:100,000 was not suitable for this purpose. Some alternative had to be adopted. The final solution resulted in flak maps being produced in three scales: 1:25,000, 1:100,000 and 1:500,000. These scales, as well as all other details of the maps, were agreed upon by both the Army and the Navy and both services combined in a coordinated effort to produce



The 100mm naval gun converted to land use. Note the height of the breech from the ground.

the maps. Standard grids and symbols were adopted to facilitate inter-service use and revisions were issued when necessary.

It might be well to explain that a flak map is not a special map. It is simply a tactical map on which is printed flak positions. There are three definite requirements for such a map—(1) a conventional grid system, (2) sufficient terrain detail to permit pinpointing by photo interpreters, (3) a scale suitable both to flak and photo intelligence. The three scales just mentioned were necessary because of the different uses to which they were put. The 1:25,000 was for automatic weapons defense; the 1:100,000 was for heavy gun and searchlight defenses; the 1:500,000 showed defended areas only and was primarily for planning of routes to avoid these.

These maps were printed with flak defenses on them and distributed to the using units. Changes and additions were forwarded to the units as they were discovered from new photography. The changes were sent out over the radio-teletype circuit from advanced theater headquarters to the proper units; they were expressed in grid coordinates and map sheet number. This system worked very well, but it was quite a task for flak officers in lower units to keep their maps up to date. Once each week a mimeographed list containing a recapitulation of the preceding week's changes was mailed out as a convenience and a check for all flak officers. It should be noted that theater headquarters was fortunately in close proximity to the two photo intelligence units (one 20th Air Force, one Navy) which supplied the great majority of information. Consequently there was little delay in disseminating this data and flak officers were kept abreast of all changes.

The flak officer of tactical air units in POA was furnished his intelligence by higher headquarters so that he could devote the majority of his time to operational considerations. At the planning level, where the flak officer is of maximum value, it was particularly desirable to have him free of documentary research.

Procedures followed by flak officers varied from headquarters to headquarters. However, generally speaking, their procedure followed common, basic approaches. They would participate in the planning conference where routes, altitudes, bomb run headings, the target, and counter measures were decided upon.

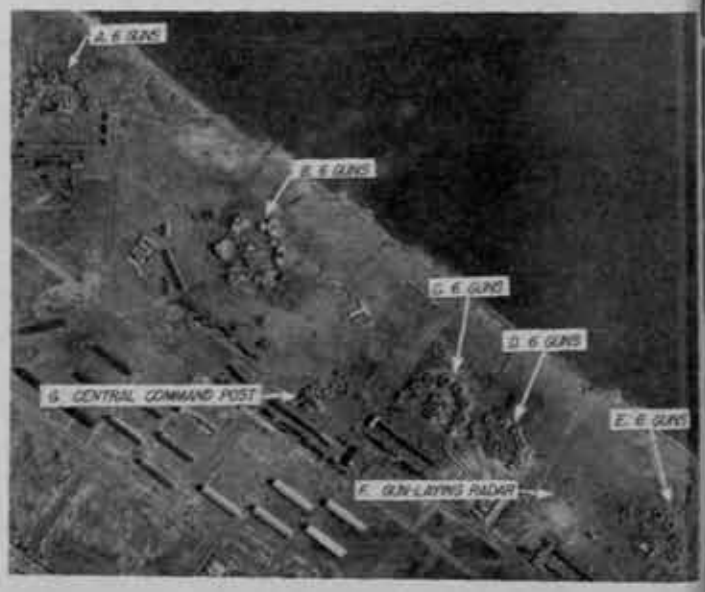
It was here that the hours of study of Nip antiaircraft artillery bore fruit. Radar jamming, evasive action, and innumerable other items were considered. It is obvious that prior to the planning conference, the various staff officers have much to discuss mutually. In these discussions general agreements were reached and the fine points were ironed out at the conference.

Briefing and reporting were very important functions of all flak officers, but due to the common familiarity of those subjects, they will not be discussed here.

In evaluating the flak intelligence activities in POA, it is best to refer to opinions of unbiased individuals. One group commander expressed a desire to make his flak officer the group operations officer. In a fighter command, the flak officer planned the timing, axis, and altitudes of airfield attacks. Navy carrier task force commanders have spoken very highly of flak intelligence. Japanese officers have testified that certain of our air tactics decreased the effectiveness of their gunnery and these tactics were the result of flak officer recommendations. These facts would indicate a job well done.

But there were shortcomings, many shortcomings. It often took some time for the flak officer to realize that he was only a member of the air intelligence team and that his work and opinions should not dominate all others. In many cases both information and materials for flak intelligence were produced too late. Sometimes flak officers were erroneous in their recommendations. But the budget of flak intelligence in POA seems to balance in a very definite black.

That this form of intelligence as well as all air intelligence contributed to the success of our air operations is one of many reasons for the maintenance of these services on a working basis in the future.



The difficulty of determining the caliber of the guns from aerial photographs and the variety of tactics used are both well illustrated in this picture.

Whither Russia's Economy?

By Colonel Carl F. Tischbein, GSC

"What do we require to outstrip the principal capitalistic countries economically? First of all, we require the earnest and indomitable desire to move ahead and the readiness to make sacrifices and invest very considerable amounts of capital for the utmost expansion of our Socialist industry. Further we require a high technique of production and a high rate of industrial development. Lastly, we require time. Yes, comrades, time. We must build new factories. We must train new cadres for industry. We cannot outstrip the principal capitalist countries in two or three years. It will require rather more than that. . . ."

This enlightening excerpt from a speech delivered by Marshal Stalin on a blustery March day in 1939 to the members of the Central Committee of the Eighteenth Congress of the Communist Party of the Soviet Union reiterates a theme which has appeared in speech and print since the earliest days of the Bolshevik revolution. Lenin in particular voiced the primary importance of economic supremacy on every suitable occasion, while spokesmen of lesser rank explained this goal in simplified form to the masses. To the peasant it meant more produce; to the factory worker it meant more end items; to the economic planners in the Kremlin and its precincts it meant more raw materials regardless of whether they were "animal, mineral, or vegetable."

An examination into Russia's natural resources from which we might reach a proper conclusion with reference to her present and potential industrial strength is a difficult venture. For generations past, the Russians have exhibited an almost oriental secretiveness about their everyday affairs that challenges perception. This characteristic is evident in all of their dealings whether such be amongst themselves or with foreigners, and has generally hobbled the world's efforts to gain information which other nations are often only too happy to divulge. In much the same manner as accumulated wealth on the part of an individual usually leads to some form of ostentation, such as the purchase of a high-powered automobile or a 20-room house, so among the nations natural wealth as a sign of affluence leads to some sort of self-advertising. But not the Russians!

The last official, comprehensive report concerning economic developments and containing information relating to natural resources was published by the Soviets in 1937. Since then the world has been forced to rely upon occasional pronouncements of policy by Stalin, well censored radio broadcasts, incidental government reports, and an odd lot of innocuous writings by Russian scholars for such crumbs of information as have been permitted to leak out of Moscow concerning the Soviet's natural wealth. How much of Russia's vast wealth was destroyed by the Nazi invaders? How much of it was sacrificed for war? How much is being utilized to rebuild the war's devastation? What new fields of natural resources have been discovered? These and many other related questions which bear directly on Russia's present and future industrial potential remain unanswered. Certainly the "Iron Curtain" was no recent device in these respects.

Until a quarter century ago, Russia's heavy industries were comparatively feeble. Such industries as she possessed were mainly centered about the Moscow-Leningrad complex in European Russia for which raw materials customarily came from either her own or some other European source. Coal and oil came from southern Russia as did iron ore and manganese. Peat for fuel purposes was immediately available in large quantities. Food for her urban population came from the south. The power of her majestic rivers was called upon to aid an enfeebled transportation system in bringing materials and food to her industrial centers. Her industrial requirements were not great, for Russia at that time was an agrarian state in which eight out of every ten people were engaged in providing food to ward off the cyclical famines which beset the Czar's empire from time to time. Her industrial development was therefore of secondary importance. The Court at St. Petersburg was more interested in providing bread for a politically restless populace than in considering the problems of a twentieth century industrial civilization then engaging the attention of her western contemporaries. In the meanwhile, the treasure-trove of natural wealth in the adjoining Siberian hinterland remained unexploited. In the future lay the days of wrestling with problems incident to distributing raw materials from widely separated sources; of coping with great distances between mine and factory; and of developing the necessary technique among countless thousands of workers—all in order to effect a modern industrial miracle.

The overthrow of the Romanoff regime was the signal for beginning the conversion of a semi-feudal, backward, agricultural state into a modern industrial giant. In 1920 Lenin decreed that the electrification of her industrial plant must be the medium by which Russia would emerge to a position of industrial leadership. And even while the country was being ravaged by internal difficulties incident to readjustment under the Soviet system, electrification was energetically pursued. Electric stations on the Volga and the Dnieper, in the Caucasus, and more lately in the Urals —to mention but a few—were constructed. In one area, for example, the Molotov Province on the thinly populated western slope of the Urals, construction is under way to utilize vast water power reserves. The Molotov Project is a part of a general hydroelectric project which proposes to build some 65 hydroelectric stations on twenty-four Ural rivers for a total capacity of 2.5 million kw and an average annual electric output of 9 billion kw hours.* Over 95 percent of these stations will be built in Molotov Province. A comparison of the capacity of this single project with the power developed in 1913 in all of Russia, which

*Herman, L. M. *Journal of International Economy*, pg. 7, Feb. 9, 1946.

amounted to a feeble 1.9 million kw hours, pictures the sensational strides being made to electrify Russia's industries. In Siberia, also, on the Yenisei and the Angara rivers electric power stations are under construction to meet the requirements of industrial centers which today are not much more than blueprints on the drawing boards of the Soviet central economic planning body—the Gosplan. It may take years to complete the present program under recurring Five Year Plans, but the presence of near-by coal and iron to many of these projects lends greater credence to Stalin's assertion on February 9, 1946, that Soviet industry will catch up with the American parade in the next twenty years.

There were good and sufficient reasons why the Russian industries of Czarist days depended upon raw materials from European Russia. Foremost among these was the matter of distance which still plagues Soviet planners. It is not enough that a state have within its frontier or easily accessible the materials needed for its industries. Those materials must in addition be sufficiently close to manufacturing centers to permit their use without exorbitant transportation charges being added to the cost of manufacture. Likewise, efficient transportation systems must be available to haul the materials to their destinations. Russia has been handicapped in both of these considerations. The vast distances within her borders, and the lack of a first-class highway system and an adequate rail net (except to the older industrial centers) have prevented her from exploiting her natural wealth. These factors coupled with a generally severe climate have compounded the difficulties of Soviet planners and have loomed large in considerations which apparently determine the reorientation of Russia's basic industries behind the Urals. Other considerations, to be sure, such as the necessity for locating her industrial base where it cannot again be easily overrun by a western foe, were contributing factors which determined the Soviets to erect new centers of industry in remote regions. Yet it cannot be denied that the desirability of locating manufacturing centers in close proximity to the sources of raw materials was a factor of primary economic consideration.

The development of a modern industrial state may be considered to rest on its ability to produce pig iron upon which the steel, rolled steel, and machine tool industries are predicated. Emphasis is therefore placed upon the availability of iron ore. Russia stands first among the nations of the world in this basic metal with sufficient reserves of all grades to meet her present and foreseeable future requirements. Her iron mines are conveniently located in both European and Asiatic Russia with many of her principal deposits located in the Urals where the famous industrial complex, with center at Magnitogorsk, has been erected. Before the war the Soviets obtained more than half of their iron ore from the Ukraine. The development of the Ural area and the mines in the Kuznetsk basin (close to the Karaganda coal fields), however, were sufficiently advanced to lessen the crippling effects which the subsequent seizure of the Tula, Voronezh, and Kerch mines by the Nazis imposed upon the Russian war effort.

Coal, the handmaiden of iron ore in the production of steel, is likewise available in superabundance. Russia possesses sufficient coal to meet her requirements for several centuries even though her reserves are not as large as those of the United States. Her European coal fields were largely overrun by the Nazis and eventually either fired or flooded during their final retreat. A fortuitous circumstance, however, has placed the major portion of her coal reserves deep in Siberia where, agreeably, iron ore deposits of a high grade have also been found. Her future industry thus will become less and less dependent upon the Ukrainian fields which have served Russia for so many decades.

The third basic industrial titan, oil, presents an interesting anomaly. The Seventeenth Geological Congress in 1937 estimated Soviet oil reserves to consist of approximately 6.4 billion metric tons. This astronomical figure includes about 3.8 billion metric tons carried as proven reserves. The remainder of 2.6 billion metric tons includes the "unproved" reserves. Russian claims, however, give her 55 percent of the world's oil. Others, on the contrary, present figures to show that Soviet oil reserves are much less and place her in the No. 2 position behind the United States in such resources. According to a report which appeared in World Petroleum in September, 1945, the Soviets can claim no more than 22 percent of the world's oil. Whatever the final casting up of accounts shows, there is still plenty of oil in Russia!

By far the largest and most significant Russian reserves of oil lie in European Russia on or near the shores of the Caspian Sea. Additional important fields are located near the Urals where the Second Baku provides fuel for industrial centers near by. It is interesting to note that the same Molotov Province which will provide so great a portion of the electrical energy required for the industrial centers to be located in the Urals also contains important oil reserves. It has been estimated that this Province will be capable of meeting all of the Ural industrial requirements for the next quarter century*—with an oil whose chemical and physical properties are rated as the finest in all of Russia! In the meanwhile exploration for oil continues apace with emphasis being placed upon searching the areas near the Arctic shore line of Siberia, the Maritime Provinces, and remote parts of Sakhalin Island to the north of Japan for future sources. Russia's Siberian territories are notoriously poor in oil reserves, a condition which will not assist in industrializing her farthest provinces or help to sustain a mechanized agriculture in that region.

Writing in the July, 1946, issue of Foreign Affairs under the title "How Much Oil Has Russia?", Solomon M Schwartz of the International Institute for Social History, Amsterdam, discusses the future of Russian oil.[1] He notes the singular goal set by the Fourth Five Year Plan (1946-1950) which calls for an output of oil and gas smaller than that set for the Third Five Year Plan (1943) and also for the Second (1937). This is the first instance in which a plan goal has been decreased. And, since the production of oil is of such paramount importance to Russia's industrialization, it naturally brings up the question "Is it a sign of the approaching exhaustion of the Russian oil deposits?" The author hastens to deny any such conclusion, but he points out that Russia's position may have deteriorated during the past decade. "Since that time (1937) gigantic

*Herman, L. M. *Journal of International Economy*, Feb. 9, 1946.
[1]Published by Council on Foreign Relations, Inc., New York, N. Y.

events have taken place in the world of oil. Immense new reserves have been 'proven' in the Near East and in the United States." On the other hand "the Russians have thoroughly explored for oil only in the Caucasus," and "great discoveries are still possible." He concludes that "the general tendency to expand the Soviet oil industry in new areas nearer the centers of oil consumption can be observed in the plan for drilling. . . . The oil problem of the Soviet Union is not a lack of deposits but the problem of industrial exploitation of reserves; and this is primarily a problem of geography."

Russia possesses other fuels which must not be overlooked. The largest peat bogs in the world are at the back door of her European industries. Industrial areas around Leningrad and Moscow are supplied with electricity and steam by central thermal electric plants which burn peat. Firewood also is used in industrial enterprises and in railways. A vast strip of dense forest stretching from the Finnish frontier to the Pacific and covering almost half the Soviet Union provides the Soviets with a quarter of the world's timber reserves. A large portion of this reserve, however, is found in Asiatic Russia where the lack of roads and other transportation facilities render its exploitation difficult. This is the future locale of important wood pulp, paper, and cellulose industries which are being developed. Another richly endowed forested area lies in the Caucasus where the forest reserves are believed sufficient to provide the world with an inexhaustable supply of timber.[2]

In addition to the basic essentials of iron ore, coal, oil, fuels, and electrical energy to implement a growing industrialization, the Soviets are well endowed with other raw materials. With the exception of tungsten and molybdenum, they possess all the metals such as manganese, chromium, etc. in abundance which are necessary for steel hardening.[3] Only in a few materials such as rubber, nickel, antimony, and tin are they wholly or almost wholly deficient. Soviet uranium sources are wrapped in secrecy and no formal declaration of the discovery of uranium deposits has issued from Moscow. It seems reasonable to presume, however, that a nation built on "continental proportions" and so richly endowed in other respects as the USSR will find ample uranium resources among its assets. All in all Russia occupies a most-favored-nation position among the people of the world in its reserves of natural resources.

In gauging the Soviet industrial potential due consideration must be shown her agricultural economy. A nation in which 80 percent of the population were engaged in agriculture had but a small portion of its people available for industrial pursuits. Small wonder, then, that Nicholas II presided over a feeble industry. With an indifferent transportation system the produce from the farms failed to reach the cities and industrial workers starved. Small wonder, then, that Nicholas and his predecessors were confronted with bread riots and worse, and that city life was no temptation for the country lad. The relationship between the farmer and the industrial worker must be maintained in balance. Other things being equal, a minimum of farm workers to feed a nation of industrial workers must be maintained on the farm if the greatest industrial effort is to be made.

Prewar Russia was one of the world's leading agricultural producers and was the principal European grain exporter. The rich black earth of the Ukraine provided the foodstuffs which fed the Russian populace. Here over 60 percent of the arable land is customarily under cultivation. It is to Russia what the midwest is to America.

The Ukraine, unfortunately, is vulnerable, as has been proved twice within a single generation. A safer granary is therefore highly desirable. In this respect, however, Nature has turned her back on the Russians. Although the climate is surprisingly uniform over vast sections of the USSR, millions of square miles are unsuited for agricultural purposes because the growing season is too short, or there is too little rainfall. Elsewhere occasional frosts appear in midsummer. Such factors as climate, desert and semi-desert lands, mountains, and arctic seasons present natural difficulties which science, skill, and Soviet enthusiasm are not likely to conquer.

The Russians have recognized the desirability of extending their agricultural activities to regions outside of European Russia. East of the Urals, for instance, lie great expanses of marsh lands which are reputed to occupy almost 20 percent of the entire areas. These lands are being drained and placed under cultivation. In addition, the Soviets are attempting to cultivate polar regions heretofore considered uncultivable. In other actions tending to promote their agricultural economy they have introduced new crops to determine the practicability of including them in their economy. Soya beans are sprouting in the Ukraine; Egyptian cotton is being grown in southern Siberia; and different types of the sagiz plant (a source of a fairly good quality of rubber) are being grown in the mountains of Tajikistan.

Most of Russia's agricultural processes are now accomplished by mechanical means. Even before the war there were almost 1.5 million persons engaged solely in the scientific mechanization of Soviet farms. Thirty-odd years ago (1910) there were only 1700 major farm implements in all of Russia of which no more than 600 were made of steel! Most of the remainder were of a very primitive type. Today Russia is reputed to have more mechanical equipment on her farms than the United States has.

The results of this mechanization have been startling. The best index to the result may perhaps be gained by considering the decline in the number of Russian farm workers. Since the Bolshevik revolution the number of farmers has steadily declined, and today less than 50 percent of the former farm workers are still on Russian farms. The surplus farm workers provide the pool from which Moscow recruits its workers for industry. And in the meantime the volume of food products has steadily risen. Currently 35 percent of the Russian people are engaged in agriculture. This figure does not compare favorably with like statistics from the United States where 15 percent of the people work the farms. Yet it does show a phenomenal growth in Soviet agricultural economy which is directly reflected in her industrial capabilities.

Food production does not of itself tell the entire story of Soviet agriculture. Of large importance to Russian industry are the industrial crops grown on her farms. Cotton, flax,

[2]The Statesman's Year Book, MacMillan Co., New York, N. Y., 1945.
[3]Goodall, Geo. "Soviet Russia in Maps." Denoyer-Geppert Co., Chicago, Ill., 1943.

sugar beets and oleaginous seeds are cultivated in great quantities. Between 1913 and 1938, cotton production increased over 360 percent. During the latter year more than 5 million acres were devoted to this crop. Cotton growing in former years was limited to certain parts of Middle Asia, but today cotton bolls are familiar sights along the Volga and even in the Trans-Caucasus. Flax is likewise an important crop which appears in the Leningrad-Moscow area. Between 1913 and 1938 flax production increased 165 percent. Before the war the Russians boasted that they supplied 86 percent of the world's flax. Sugar beets have long been grown in the Moscow area and in the Ukraine. Present developments show large sugar beet farms in the Caucasus, Middle Asia, and even in the Far East. Between 1913 and 1938 sugar beet production increased 153 percent. The Russians appear to lead the field in the production of rye, barley, oats, flax, and sugar beets.*

From this short exposition of Russia's natural wealth, what might be deduced concerning her future? We know that her European industries throughout South Russia to include Stalingrad were almost totally destroyed. Some 2 million tons of serviceable industrial equipment was saved from destruction and shipped to more remote areas where it was set up. Coal and iron mines were flooded or fired, and many of these have not been rehabilitated. Power plants along her principal rivers, especially the Dnieper, were wrecked but are again back in partial operation. Almost all of the Ukraine's tractors and mechanical farm equipment were lost. So were the manufacturing facilities which produced them. What is left of automotive equipment is in a bad state of repair with only a dim outlook for necessary spare parts. Even farm animals are not available. In addition, the scorched earth policy followed by both the Russians and the Nazis alike has affected the productivity temporarily of Europe's bread basket. The ravages of war present a grim picture!

After the war Soviet planners concluded that much of the equipment so laboriously moved from the path of the Nazi armies and transported principally to positions in the Urals was either obsolete or so worn as to render its transportation back to its place of origin uneconomical. In many instances it was cheaper to buy new equipment and begin from scratch. In some cases it was found that plant design and new production methods dictated the need for new and different equipment. And of course, in many, many instances all that was left of a former manufacturing plant was either a blackened wall or a pile of nondescript rubble.

Everywhere that the tide of war had touched, Soviet industry was sorely affected. The Russians were faced with the alternative of either buying or building. No doubt, by purchasing industrial plants the Soviets could have regained their industrial stability in a shorter time. To rebuild would be slower and compound their troubles, for in addition to rehabilitating a major segment of their industry they would be simultaneously broadening their industrial base—a policy to which they were already committed. This latter alternative was the decision of her economic planners. In Premier Stalin's election speech on February 9, 1946 he stated "The fundamental task of the new Five Year Plan consists in restoring the areas of the country which have suffered, restoring the prewar level of industry and agriculture, and then exceeding this level by more or less considerable amounts."

The program will be expensive in men, money, and materials, but the over-all effect upon this communist state will not cause too severe a dislocation of her economy. Manpower is a cheap commodity in Russia. Money as an incentive to labor is not a part of the Marxist doctrine. Materials are plentiful. Many industries will doubtless fail to return to their former addresses; new ones will take their places. The reorientation of industry to meet the requirements of the atomic age may well give the Soviets a head start in such matters over their present industrial competitors who will have to fuss along with their present plant. It may be concluded that rebuilding her shattered industries and devastated areas will not seriously retard Russia's industrialization program. In fact the benefits of experience and the increase in "know how" to be gained in this operation are difficult to evaluate.

It appears evident that from whatever angle we survey the Soviet's industrial position, the prospects of her possible future development are great. Whether we consider power, minerals, metals, fuels, or agriculture, it is observed that the natural resources of Russia have yet to be fully measured. With wide stretches of the country still to be explored by the scientist and the industrialist, the implications of the ultimate vastness of her natural wealth are just cause to ponder her future role as an industrial competitor in a shrinking world.

(The author wishes to acknowledge the use of the Foreign Commerce Weekly *as a source of information in the compilation of this article.)*

*Cressey, Geo. B.—*The Basis of Soviet Strength*, McGraw Hill Book Co., N. Y., 1945.

Crichlow Slide Rules

The Book Department of the Seacoast Branch, The Artillery School, Fort Scott, California, desires to dispose of 7,000 Crichlow Slide Rules. The reduced price of this rule is $1.10 postpaid, but on orders of five or more, a discount of 15% will be allowed.

The Antiaircraft Artillery

By Lieutenant Colonel Alvin T. Bowers, Coast Artillery Corps

EDITOR'S NOTE: *The following message by Major General Homer and article on the "Antiaircraft Artillery" by Lieutenant Colonel Bowers appeared in the "Other Branches" section of the January-February issue of the* Armored Cavalry Journal *and is reproduced here with permission.*

Prior to World War II many of the extremist proponents of heavy air power denied the feasibility of effectively defending against air attacks with Antiaircraft Artillery. Here are some of our own Air Corps statistics on the effectiveness of German flak. In the raid on the shipbuilding yards at Kiel, in June of 1943, 20% of all planes were damaged by antiaircraft artillery flak. The following month in an attack on the industrial plant at Kassel, 65.5% of our planes were damaged by antiaircraft artillery.

In a general study of the over-all figures, there was an indication that on our raids damage by enemy antiaircraft artillery accounted for 20 to 60 per cent of all damage, both major and minor, to our attacking force.

We believe that our Antiaircraft Artillery is superior to any in the world both in armament and fire control equipment Our 12th Army Group reported that from "D" Day to 20 December 1944, in 4,393 raids, by 9,700 enemy planes, 1,192 were destroyed and 781 probables. This is good shooting. The record of the 12th Army Group is matched by those of our other armies, including those in the Pacific.

The importance of Antiaircraft Artillery during World War II can be readily appreciated when study of any amphibious operation is undertaken. In almost all of these types of invasions, the Antiaircraft Artillery went in with an early wave to provide protection for the assault troops.

At Anzio, the position of our troops was extremely precarious. The line of supply came from ships in the harbor. The Germans threw every available plane at this shipping. In one instance a formation of 60 JU 88's, DO 217's, and HE 177's were picked up approaching the harbor. The 90's were able to open up while these planes were far at sea. This broke up their formation and the attacks by single planes—dive, low level, medium, and high level bombing, together with deck strafing had very limited success.

The Antiaircraft Artillery defenses are credited with saving our line of supply. In a short period of time the enemy lost over 102 planes, and they were forced to abandon large-scale air attacks on the Anzio harbor. Records show that forty per cent of all attacking planes were shot down.

A similar situation occurred when the Remagen Bridge was crossed. The Germans realized the importance of this bridge and immediately launched all available planes with a mission to destroy it. In the early morning of the crossing, three Stukas and one ME 109 dove at the bridge; all four were destroyed. Later that morning, eight Stukas dove at the bridge, and all eight were destroyed with the aid of searchlights. The Antiaircraft Artillery made a very definite

Major General J. L. Homer

"The war, so recently ended, has clearly illustrated the advantages of and the need for cooperative action and thorough, mutual understanding throughout all elements and echelons of the Army.

"This need was manifest to the Antiaircraft Artillery early in the war, when in addition to its primary mission of destroying enemy aircraft, it was called upon to serve as Infantry, as Field Artillery, and in the anti-mechanized role. Searchlights were also used to illuminate night battlefields for the Infantry.

"No one can tell at this time the part our new weapon, the Guided Missile, will play in the future development of the Army. But we do know it will be an important part, and that it will in some way affect every branch of the Service. It is therefore essential that everyone in the Army keep abreast of developments in this new weapon and it is equally important that those of us charged with the employment of the guided missile be informed of the activities and developments within other branches. Our peacetime training must be based on a constant exchange of ideas.

"In fostering this exchange of ideas, the Armored Cavalry Journal is taking a broad step toward achieving cooperative action and mutual understanding. The portrayal of the activities of 'Other Branches' to its readers is a definite service to the Army and to the nation.

"We of the Antiaircraft Artillery and Guided Missile Center at Fort Bliss, sincerely appreciate this opportunity to present the story of our activities, and I personally would like to congratulate the Journal on its farsighted policy in maintaining the 'Other Branches' section."

J. L. Homer

Major General, U. S. Army,
Commanding General, Antiaircraft Artillery and Guided Missile Center.

contribution toward keeping this bridge open until auxiliary bridges could be built.

Secondary missions of antiaircraft artillery frequently rival in importance its primary mission. Northwest of the City of Cebu, in 14 days of firing, a detachment of 90 millimeter guns knocked out seven tunnels, 17 dugouts, 77 pillboxes, seven trench systems, four supply dumps, three DP's, destroyed one CP, and silenced 29 machine guns. General Omar Bradley stated that without the help of the Antiaircraft Artillery, Omaha Beach could not have been held. There the units functioned in a ground role.

During the early phase of the Bulge attack practically no field artillery was available to stop the German armor. However, nine battalions of antiaircraft artillery were available, and their employment as artillery and antitank weapons caused the slow-down of the attack which was vital in the saving of Liege and Antwerp.

Let us participate in a typical antiaircraft artillery action.

The city air-raid sirens, with their mournful, ear-shattering howls, are signalling the approach of enemy bombers. Minutes later, when the last throbbing roar of the sirens dies, a deep silence falls on the port and city. People are scurrying into shelters. The lights in the ports go out by areas, leaving large patches of blackness.

After a short period of waiting and growing tension a thin curving stream of brilliant red dots rises into the night sky. Another stream of red rises beside it. Then another and another—nearer now. Seconds later a distant chattering of rapidly firing guns is borne in. Now the volume of sound grows as other antiaircraft guns spring into action. Soon the whole port area is jarred by fire of all types of antiaircraft, from the rapid staccato of machine guns and the beating cough of the 40s (40mm automatic cannon firing 120 rounds per minute) to the heavy thunder of the 90's (90mm guns firing 25 rounds per minute). A fantastic number of rounds from hundreds of hot gun barrels are hurtling toward enemy raiders. In the tracer-filled sky two flaming planes fall to earth. A terrific concussion signals the collision of a fully loaded bomber into a mountainside.

Now the surviving enemy planes are speeding out of range. The gunfire dies down, then stops. Silence settles once more, only to be broken again by the steady, unwavering howl of the city sirens signalling "all clear."

That was the Antiaircraft Artillery in action. That spectacular display of light, fire and sound was the punch of our antiaircraft artillery.

Now let's turn back the clock about a half hour, reset the battle stage, move our observation point to one of the 90mm antiaircraft gun batteries and observe how it joined in the fight.

This battery, we find, is located on a bluff overlooking the port. It is a good gun position affording excellent "visibility" for the radar and a clear field of fire for the guns of 360 degrees. The radar is concealed in a hole blasted out of the ground. Only its dish-shaped antenna is above ground level. About 15 yards away an optical tracker is located in its own small pit. These two instruments furnish to the electronic computer the "present position" of the enemy in the sky under all conditions of visibility, day or night. A revetted trailer near by carries the computer. This instrument accepts the "present position" data from the tracking instruments and applies automatically all ballistic corrections. It adds superelevation, drift, prediction. This combined data is automatically transmitted to the guns.

The guns, which are located about 250 yards from the radar, accept the data from the computer and automatically point themselves continuously at the predicted position of the target. There are four of these guns set in individual revetments, in a rough square measuring about 50 yards on a side. Each gun is dug in to a depth where its crew will be protected from flying shell fragments. Where it is impossible to dig a gun in, a revetment is built up to the height of the gun trunnions.

The sound of the 35 KVA power plant, generating only enough power now to keep the radar warmed, can be heard. Four turrets of multiple-mounted machine guns are dispersed around the area for local protection. In the near-by Battery CP the duty officer and his enlisted assistants form the stand-by crew. One of these assistants is just making his "half hour check" of the gun stand-by crews over the hot loop.

The duty officer is now answering the buzzing of the telephone marked AAOR (Antiaircraft Operations Room). He receives the long-ring warning of "Condition Yellow." One NCO alerts the stand-by crews over the hot loop and announces "Condition Yellow." Another NCO plots the location of "multiple hostile" targets on his plotting board. The duty officer notes that the targets, now about 100 miles away, appear to be headed for the ports, and rings the BC to inform him of the situation. In a very short time the BC enters and checks the plots. The radar crew reports that the radar is searching.

When the plots indicate to the AAOR that the local port is definitely the objective the warning "Condition Red" is received. The BC presses a button which sounds the local siren. In less than three minutes after the sounding of the siren the guns are completely manned and ready for action.

When the plots on the long-range chart have reached the proper area, they are transferred to the short-range chart. A report is received over the "command line" that the radar is "on target." The computer operator adjusts his dials and notes that the fuze dial is "off scale"—the target is beyond range. Slowly the fuze dial creeps down to 30 seconds (time of flight of the projectile) and then lower. At 26 seconds the BC gives "Commence Firing." Soon the Chief Radar Operator reports "target destroyed." A new target is assigned, and the guns swing over to it and renew their firing. So to the end of the raid, when "Condition White" is announced, signalling the "all clear." The BC then makes out his report.

The "close-up" above was a view of one type of antiaircraft artillery unit in only one type of action. There are other types of units in the antiaircraft, each capable of performing multiple types of missions.

The antiaircraft gun battery, in addition to its primary function of defense against aircraft, is prepared when the situation demands—and has done so in the past war—to blast pillboxes with direct fire, to fight tanks, to fire long-range harassing fire, to interdict enemy supply roads, to destroy personnel and unarmored vehicles with time fire, to attack vital pin-point targets at long range, to place guide lines of aerial bursts for directing our aircraft to their targets, to em

gage in counterbattery fire, to destroy enemy OP's, to give close support to the infantry and to destroy buzz bombs.

The antiaircraft gun battery can perform these missions swiftly and with tremendous fire power. At Toulon, when French Army "B" Headquarters wanted to take advantage of a target of opportunity, a column of trucks carrying enemy reinforcements, they called on the antiaircraft. Two batteries put more than 200 rounds of 90mm HE shells in the air before the first round landed. The target was smothered, all rounds falling within 65 seconds.

Rivaling the heavy gun in versatility and deadliness are the 40mm and 37mm automatic antiaircraft cannon. During the war they could be found anywhere and usually were. These guns, capable of firing 120 high explosive projectiles per minute, each weighing two pounds and fitted with supersensitive fuzes, were the best known of all Antiaircraft weapons to troops of other branches. They gave added security to our front-line soldiers during the early days of the war in Africa when Stuka Valley and Messerschmitt Lane were well travelled aerial highways; "H" hour, "D" day, of every amphibious operation in this war found these guns in large numbers in the early waves of boats streaming for the beach. Mounted on half-tracks the M15, with one 37mm antiaircraft gun and 2 coaxial .50 cal. machine guns were familiar and reassuring sights to countless infantry and armored force soldiers. Each of these M-15's was accompanied by an M-16. The M16 was also a half-track vehicle on which was mounted a turret carrying four .50 cal. machine guns. This electrically operated turret could be traversed and elevated rapidly while pouring out streams of bullets. These broke up many an enemy aerial assault on our armored and infantry spearheads.

In later stages of the war, more numerous by far than any other type of antiaircraft automatic cannon was the 40mm gun, with its accompanying 4-barreled .50 caliber machine gun, turret mounted. This pair could be seen everywhere; on airfields in the rear areas, along every important supply route and deployed in the fighting zones. Divisions had complete battalions of them attached. Every Field Artillery battery had them as neighbors. They could always be found in the most forward positions of the front lines. Here with their tremendous fire power, they were death to low-flying planes and of superlative worth in their alternative missions of laying down supporting fire for our infantry attacks and for resisting enemy counterattacks. They could be found in position to protect and cover river crossings. In Italy they were on the banks of the Rapido River in the bloodiest battles of the Italian campaign. There on one occasion they covered the approach of the assault troops for a crossing and protected their retreat when the assault failed. They were on the beaches in the landings on Pacific Islands. The "40" and its companion, the "quadruple .50," were used for simulating attacks by infantry at night, for marking, with tracer fire, boundaries between units in night attacks and for reducing enemy machine-gun nests. When the final scores are totaled for World War II the automatic antiaircraft cannon will receive a higher score of enemy aircraft destroyed than will any of the other antiaircraft weapons.

The searchlights, when supplanted by the radar for night firing, were shifted to artificial moonlight assignments, and proved so useful in forward areas that they will be retained for that use.

In the closing days of World War II the Antiaircraft Artillery had the most modern artillery weapons in our Army. It included firing data devices that continuously transmitted data to the guns automatically, mechanisms that made a battery fully automatic except for gun loading. Guns that traversed and elevated with speeds to match the fastest flying targets, turrets with quadruple mounts which reacted to the slightest touch of a finger.

The greatest improvements made were directly attributable to the radar as conceived and developed by the Signal Corps and the Antiaircraft Artillery. This opened up an entirely new field of investigations as to application of principles, and resulted in such side developments as the proximity fuze and controlled bombs.

In automatic weapons the development trend has been toward increased fire power and speed of action. To this end the .50 cal. single mount has been transformed into the quadruple turret mount, and the Bofors 40 is now dual mounted on a full-track vehicle. The guns too have stressed rapidity of laying, but with them accuracy of fire has been considered more important than volume. The 90mm gun has proven more effective in a dual role than the much touted German 88, and shows superiority in both air and ground firing. The lower silhouette of the 88 is about its only advantage.

Newest and most vital addition to the matériel of the antiaircraft artilleryman is the radar. Its electric scrutiny of the sky is unhindered by darkness, by rain, fog or snow. It can pick a target out of the sky and follow it automatically and smoothly. It determines the distance to the target by measuring the almost infinitesimal time interval that occurs between the moment an electric impulse is projected toward the target by the radar and the moment of its return. This range, and the direction to the target, it transmits automatically to the director, which is the computing instrument of the battery, for conversion of this information into firing data.

The first radar, the SCR-268 [illegible] hed the antiaire[illegible] soldier about 1940. Intended t[illegible] ound ator it was primarily searchlig[illegible] possibilities for use as a gun p[illegible] mediately recognized and nece[illegible] complished. It went to war wit[illegible] see action, and despite its cruc[illegible] successful defense against en[illegible] around Algiers, North Africa an[illegible] 1944, the antiaircraft received its [illegible] signed for gun laying. This se[illegible] answer to the antiaircraft artiller[illegible] the antiaircraft artilleryman cou[illegible] night as he could in daylight. [illegible] shooting too, since he coul[illegible] 000 yards), and therefo[illegible] time to make his data sm[illegible]

Born of the antiaircraft [illegible] seeing the target unde[illegible] weather, the SCR-584 b[illegible] [illegible] The Field Artill[illegible] [illegible] nd for locati[illegible]

Force used it to direct planes to their targets on close support missions. When equipped with a standard air force bombsight this radar was actually used to release, at the proper instant, a bomb carried by a dive bomber 20 miles away and diving on its target through a blanket of fog. The SCR-584 played its greatest roles in England during the battle against the V-1 and in Belgium in the anti-Buzz-bomb defense of Antwerp.

The antiaircraft artillery weapons with which we ended the war will most certainly be used at the start of any future wars. The importance of antiaircraft artillery has been recognized by making them an organic part of the infantry division. However, our present equipment has limitations which future developments in offensive weapons may render obsolete; for example, the German V-1 weapon flew at a speed of between 300 and 400 miles an hour. Developments today indicate that this same weapon equipped with a ram-jet engine may have a speed upwards from 1,500 miles an hour and a range of up to a thousand miles. Our present antiaircraft equipment could not cope with these missiles nor with medium or high flying bombers traveling at supersonic speeds. At the present moment this supersonic barrier is being attacked by both England and America, and success appears imminent. No counterweapon has yet been developed for the V-2 rocket, which has a speed of 3,500 miles an hour and a range of 200 miles. The Antiaircraft Artillery is deep in the problem of guided missiles for this purpose as well as for use on the offense.

Present weapons must not be discarded. They are still vital and will play their role in the future. The Army Air Forces do not believe that *tactical* aircraft, engaged in ground strafing and low-level bombing attacks, will exceed the speed of the present-day fighter bomber. Even if aircraft assigned to tactical missions are capable of flying at supersonic speeds they will have to be slowed down to approximately 400 miles per hour when they make their attack. It is impractical to strafe or bomb accurately at low levels and high speeds. Therefore, our present automatic weapons are capable of functioning efficiently against such types of attack.

The Antiaircraft Artillery has a brilliant future in the light of present research and development. With the cognizance that the research laboratories must work hand in hand with the professional in the field, the next 10 years will show amazing advances in this branch of the Service.

No Antiaircraft Artilleryman will ever be satisfied until he has a missile with a muzzle velocity equal to the speed of light, with an accuracy of 100 per cent hits and with the ability to engage targets that travel at speeds in excess of 5,000 miles an hour. He will demand that this missile have a lethal range from a few hundred feet to the outer limits of the stratosphere.

Unusual Air Weapons Used During War

One day during the war, the Nazis' aircraft alarm network alerted Cologne that a formation of high-flying Boeing B-17 Flying Fortresses was headed toward the city. Sirens wailed and German flak gunners manned their guns, but the four-engine bombers flew within sight of the city and unexpectedly turned back toward their English bases. The Nazis' gunners relaxed, wondering why their city had been spared another [illegible] stating attack.

Sudd[illegible] [illegible]nged bombs began to fall into

[illegible] f the war, a flotilla of Japanese [illegible] or in a harbor apparently well [illegible] ring of heavy antiaircraft gun [illegible] warning a small formation of [illegible] close to the water's surface. [illegible] began firing, the bombers swung [illegible] sea. The Japs believed the Ameri[illegible] sed.

[illegible] of small, winged objects began [illegible]. Within seconds several ships [illegible] et afire, and others were barely

[illegible] Army Air Forces quietly [illegible] its first effective controlled

[illegible] mitted creation of an er[illegible] try was caught napping [illegible] ontrolled air weapon[illegible] however, has [illegible] that at least four different general types of controlled air weapons were used in combat, and development was well under way on a number of others when the war ended.

The burghers of Cologne were introduced unexpectedly to the first of a series of AAF glide bombs, a simple method of attaching wings and controllable tail surfaces to standard 2,000-pound general purpose bomb. The glide bombs have ranges up to 30 miles from point of release, although they are most effective when launched from either B-17's or North American B-25 Mitchells from a distance of 17 miles or less from the target, well outside the normal antiaircraft range. The glide ratio is approximately 6 to 1, which means that the missile would glide forward six feet for every foot it dropped through the air. When dropped from 15,000 feet altitude, it is in the air about four minutes at average speed of 250 to 300 miles an hour.

The AAF glide bomb is guided by various means.

Some are designed to be guided by television cameras, radio, radar, and a flight control box containing batteries, gyros and servo motors. Others use flare seeking units or heat seeking devices which seek out factories in cities that attract to the source of greatest heat, usually an industrial plant.

The rudder control surfaces are stabilized by a directional gyro to give roll and azimuth control, although the GB (glide bomb) series does not include ailerons. Recent tests with the GB-4 proved that the missile has an average circular error of 200 feet or less, which is amazingly accurate for a guided weapon.

Antiaircraft Artillery In Amphibious Operations*

By Lieutenant Colonel R. H. Holt, Coast Artillery Corps

World War II has provided extensive tests of the effectiveness of existing War Department doctrine in the tactical employment of antiaircraft artillery units. The purpose of this article is to re-examine that doctrine as it pertains to amphibious operations.

Born as a purely defensive arm, the past war has proved antiaircraft artillery to be equally valuable as an offensive arm. In all operations, and particularly in amphibious operations, the antiaircraft problem requires the application of science, skill, technique and the employment of highly specialized and intricate equipment. The past war taught most ground commanders that this equipment was equally as effective in ground support missions as it was in its primary mission—antiaircraft defense. Likewise, the antiaircraft artillery commander learned that he should have a good concept of the capabilities and limitations of all the ground arms. The continuous application of sound tactics, the cooperation with air, ground, and service units, and the need for continuous operations, make this officer's job exacting and arduous.

FM 31-5 teaches that there are six general phases in the execution of an amphibious operation. These phases are: (1) planning, (2) concentration and specialized training, (3) embarkation, (4) voyages, (5) landing, (6) consolidation.

All of these six phases need and require antiaircraft protection. In many amphibious operations of the past war, the antiaircraft protection of some of the phases was completely overlooked, due at times to the haste of organizing and conducting the operations, but generally to the lack of understanding and comprehension of the antiaircraft artillery arm.

The senior antiaircraft officer assigned to any amphibious operation should be a member of the task force commander's special staff. As such he performs special staff functions which pertain to antiaircraft artillery. He is a specialist and the commander should call on him for advice and recommendations in the use of antiaircraft artillery. Let us examine some of the items in which this officer would be interested, in the planning phase of an amphibious operation.

1. *Antiaircraft protection of the embarkation area.*—What units are to furnish this protection? Normally such protection is a responsibility of the embarkation area commander, and not of the task force commander. All units of the force, including the antiaircraft units, are generally too busy with final embarkation plans and preparations to assume any tactical duties or responsibilities of this nature.

2. *The amount and type of antiaircraft units to be assigned to the operation.*—This is directly proportional to the degree of friendly air superiority over the target area, the size of the target area, the density of defense required, and the amount of lift available. One of the greatest difficulties involved in planning arises from the general uncertainty of the shipping to be available and the lack of correct ships' characteristics. Antiaircraft units, particularly the gun units, have a tremendous amount of heavy and bulky equipment, and in planning the lift required for such units, the antiaircraft officer should have complete and accurate figures on the shipping.

3. *Antiaircraft protection of the convoy en route.*—The Navy is responsible for furnishing this protection with its organic antiaircraft weapons in the various ships. In many cases, however, the naval commander will ask for army antiaircraft units to augment this protection. The antiaircraft automatic weapons units (40mm, mobile or self-propelled) are the types used for this purpose. To perform this mission the units must be deck loaded and plans must be made for the early debarkation of these units.

4. *The operational plan for the force after the landing.*—The antiaircraft officer must know this in order to plan logically for the use of the antiaircraft artillery in ground support missions. It must be kept in mind that antiaircraft artillery units have both primary and secondary missions. A typical order to antiaircraft artillery units might read as follows:

"Assist in the antiaircraft defense while afloat and upon landing provide antiaircraft defense for the landing beaches, airstrips, beached craft, bridges, troop concentrations, supply installations, and other vital installations." In addition to the above primary mission, these antiaircraft units attached to the assault landing forces would have secondary missions. Among these might be included: antimechanized defense, assault on enemy pillboxes and other strong points, and anti-small-boat defense.

5. *A complete terrain study of the target area.*—The antiaircraft officer needs this to select tentative positions for his units. This terrain study is a necessity because it will influence the speed with which the antiaircraft defense can be established—a most important factor in all amphibious operations.

6. *The general plan of coordination between the ground, naval, and air units for the coordination and control of antiaircraft fire.*—This plan is a *must*, and should be formulated and published as early as possible.

*The Military Review, C&SC, Fort Leavenworth, Kansas.

Supplies on a beach present a profitable target.

a. Ground: Specific rules for the use of small arms and organic machine guns against hostile aircraft by ground units must be formulated.

b. Navy: Specific rules for the coordination of antiaircraft fire between army antiaircraft units ashore and naval antiaircraft units on shipboard must be published.

c. Air: Plans for the antiaircraft artillery coordination with air units with particular emphasis on recognition, identification and approach procedures for friendly aircraft must be formulated.

The control of antiaircraft fire is a major problem in all amphibious operations. The initial control is a responsibility of the Navy. The support aircraft controller exercises control over all aircraft in the objective area, and assisted by the fighter director and fighter controller, directs fighter activities and disseminates air warning information, conditions of alert, and control of antiaircraft fire.

When the fighter control center (ashore), with the antiaircraft operations room (AAOR) is ready for operation, and at a time determined by the attack force commander, the control of antiaircraft fire passes from the support aircraft controller (Navy) to the air task force commander (Army). From that time, the control of antiaircraft and friendly fighter aircraft rests ashore.

7. *Shipping for antiaircraft units.*—The antiaircraft officer must insist that his units get a high priority of shipping space and that the units are loaded as a tactical entity; that is, armament, personnel, ammunition, and equipment are loaded together.

After getting all of the information possible on the above subjects, and tying down the details of coordination, the antiaircraft officer is ready to prepare the annex to the field order for the employment of the antiaircraft units assigned to the operation.

Each amphibious operation will differ in many respects as to the use of, and time of landing, of antiaircraft units. No two situations will be the same and each commander has his own ideas on how and when the antiaircraft units will be landed. It should be understood that the antiaircraft defenses of a beachhead should be built up early and quickly. There are definite types of weapons that help to achieve these requirements. These weapons are listed as follows:

1. *Antiaircraft machine guns.*—These form the initial antiaircraft defense of the beach. They must land early and certainly prior to the beaching of LST's. They are carried ashore by hand and set up to provide a line defense of the beach. In the Normandy invasion, provisional antiaircraft machine-gun battalions were organized and went ashore in the initial waves.

2. *40mm self-propelled units.*—These are the next antiaircraft units ashore. They are usually attached to the infantry assault units, in the ratio of one self-propelled battery to each battalion landing team. These units not only build up the antiaircraft defense ashore, but also fan out to protect the beach exits and their supported infantry units. When the tactical situation permits, these units revert to division or corps control and take their place in the integrated and coordinated antiaircraft defense of the beachhead.

3. *40mm mobile units (towed).*—These cannot cross beaches until wire roadways have been laid. They are brought in "on call" and employed to expand the defense to an area, and to replace the self-propelled units which have the capability of moving inland over rough terrain.

4. *90mm guns with organic radar.*—These must be ashore and in firing position to provide area defense prior to dark of D-day. Prior to the establishment of an air warn

ing service, and the establishment of night fighter facilities, the 90mm units are the primary means of defense against night bombings.

From the above, it can be seen that the antiaircraft defense of the beachhead is gradually built up. This build-up must be accomplished before large numbers of craft are beached and concentrations of craft, troops, vehicles, and supplies on the beaches present a profitable target to the enemy air. The object of the build-up is to assure the uninterrupted flow of supplies, vehicles, and troops over the beaches.

When the antiaircraft artillery defense is finally established ashore, one of the key parts of that defense will be the antiaircraft operations room. Stress must be laid on the prompt establishment of a simple and effective early warning service. Elaborate arrangements are not practicable and not desired. This early warning system is generally established by a signal air warning unit, equipped with long-range radar. This service is augmented by the antiaircraft artillery intelligence service. All of these warning services report into the AAOR, which is manned by a special antiaircraft operations detachment, if available. If there are no such units, an antiaircraft operations detachment must be improvised from the antiaircraft group or battalion headquarters personnel. The AAOR is normally established as close as possible, in the same tent or building, if practicable, to the fighter control center to facilitate close coordination.

In summary, the following points are pertinent in the use of antiaircraft artillery in amphibious operations:

1. All phases of an amphibious operation require antiaircraft protection.

2. Antiaircraft automatic weapons units, self-propelled, are normally attached to the assault landing forces in the ratio of one self-propelled battery to each battalion landing team.

3. A major plan for air defense during the entire operations, thoroughly coordinated between ground, naval and air force units must be a part of the prior planning for an amphibious operation.

4. A high priority of available shipping space must be given to antiaircraft units.

5. The Navy is charged with the antiaircraft protection of the convoy en route to the target area. Army antiaircraft units generally augment this protection.

6. Antiaircraft units must be landed early, on call of the supported unit commander or on order of the ground force commander.

7. Antiaircraft defense of the beachhead is a "build-up." Machine guns first, then self-propelled units, then mobile units, and finally the gun units are landed, until an all around antiaircraft defense is established.

90mm guns must be in position and ready to fire prior to dark of D day.

Dependent Housing In The Philippines*

Since the publication of the article "Accommodations for Dependents," in the last issue of the JOURNAL, the following additional information has been received and augments or supersedes that already published.

There is a difference in the housing situation for dependents in a conquered and a liberated country. From Germany, Italy, and Japan we receive reports of luxurious living. Home life in the Philippines is not luxurious. The little of luxury that exists will soon be gone. The rate at which leased property in the Manila area is being returned to owners indicates that all dependents will be in Army-owned quarters by early 1947. With minor exceptions, all these quarters are of temporary construction. In a few cases the Army has either purchased or already owned certain permanent buildings, but such quarters will accommodate an almost negligible number of dependents. The civilian community suffered a tremendous loss in residences during the war, and it is mandatory that homes now under lease be returned to their owners at the earliest possible moment. Final plans for permanent Army construction cannot be made until the present negotiations between the United States and the Philippines for permanent bases are completed. Until these agreements have been reached and many months of construction completed, only an economical type of temporary shelter can be expected for assignment to any dependents coming to this theater.

Dependent housing now under construction conforms to a standard design but varies locally both in structural arrangement and outside colors. All are of a bungalow type of either converted quonsets or prefabricated wood. Old-timers will recognize some similarity between this type of housing and that made available at non-permanent United States stations after World War I. All roofs are made of corrugated iron. Most floors are wood. The sidings are a combination of corrugated iron or aluminum and the native sawali. The latter material is a closely woven matting of bamboo strips used principally for interior partitions and ceilings. It is more suitable than regular wall boarding in this type of construction because it is lighter and offers better ventilation. All doors and windows are screened, although they are not as waterproof as might be desired. The number and size of rooms vary enough to take care of all sizes of families. The floor plan for these bungalows is much the same as one might expect anywhere in the United States. All houses have at least one bathroom with a cold water shower.

Considerable effort is being made by the Army to supply the minimum furnishings. The availability of local materials such as rattan has solved the living room problem. Kitchens and bedrooms have not fared so well. The experiences of early arrivals in meeting these and other problems not completely solved by the Army are both interesting and instructive.

MESS—Some families in leased civilian houses and a few in the temporary type Army quarters have adequate kitchen facilities. The rest of the dependents eat at central messes. Stoves and refrigerators are the critical items. Anyone who is looking forward to establishing a family mess should bring both of these items. The normal equipment for kitchens now under operation consists of a two-burner Coleman gasoline stove, supplemented by either a standard field range or a hot plate, and sometimes, a refrigerator. No gas is available, except in cylinders at prohibitive cost. Families faced with feeding an infant should bring a full supply of canned foods. The commissary has attempted to keep a supply of baby foods but to date the supply has been undependable.

Most foods are rationed and conform generally in amount to that issued to troops. Strict records are maintained by the Army Commissary of all foods issued, but the ration has proven adequate in most cases. The availability of such items as fresh fruits, vegetables, and meats constitutes a greater problem than the ration. However, the supply of all items except meats has improved during these first three months, and it can be safely assumed that plenty of food will be available to any family fortunate enough to have the necessary equipment to establish a family mess.

ELECTRICAL HOUSEHOLD APPLIANCES—These items are strictly rationed and promise to remain critical for some time.

RUGS AND UPHOLSTERED FURNITURE—These items should not be brought until a more permanent type of construction has been completed. The present quarters do not offer the necessary protection against the driving rains to prevent severe damage, especially to rugs. The native type of rugs and floor mats are entirely adequate.

LINENS AND TOWELS—A moderate supply of these items is issued by the Army. However, a few extras will be necessary for comfort.

RAINCOATS—Many dependents have failed to realize the severity and duration of the rainy season in the Philippines. Durable raincoats are essential.

YARD GOODS—Civilian markets in the Manila area are well stocked with cotton and fine dress goods most of which are reasonably priced.

SHOES—Shoes are scarce, especially in small sizes, and prices are exorbitant.

STORAGE SPACE—Those who have shipped all their belongings to the Philippines have as their number one problem at most Army installations the location of secure, waterproof storage. Dry locker space provided in most quarters is inadequate for the average sized family. Only the barest essentials should be brought.

*Released by PRO, Philippine Ground Forces.

Automobiles—An automobile is a great convenience, because of the shortage of government transportation. The roads are rough and dusty, making it inadvisable to bring an entirely new car. Services are not yet satisfactory but are improving. Two PX service stations have been established in the Manila area and others will be established as needed.

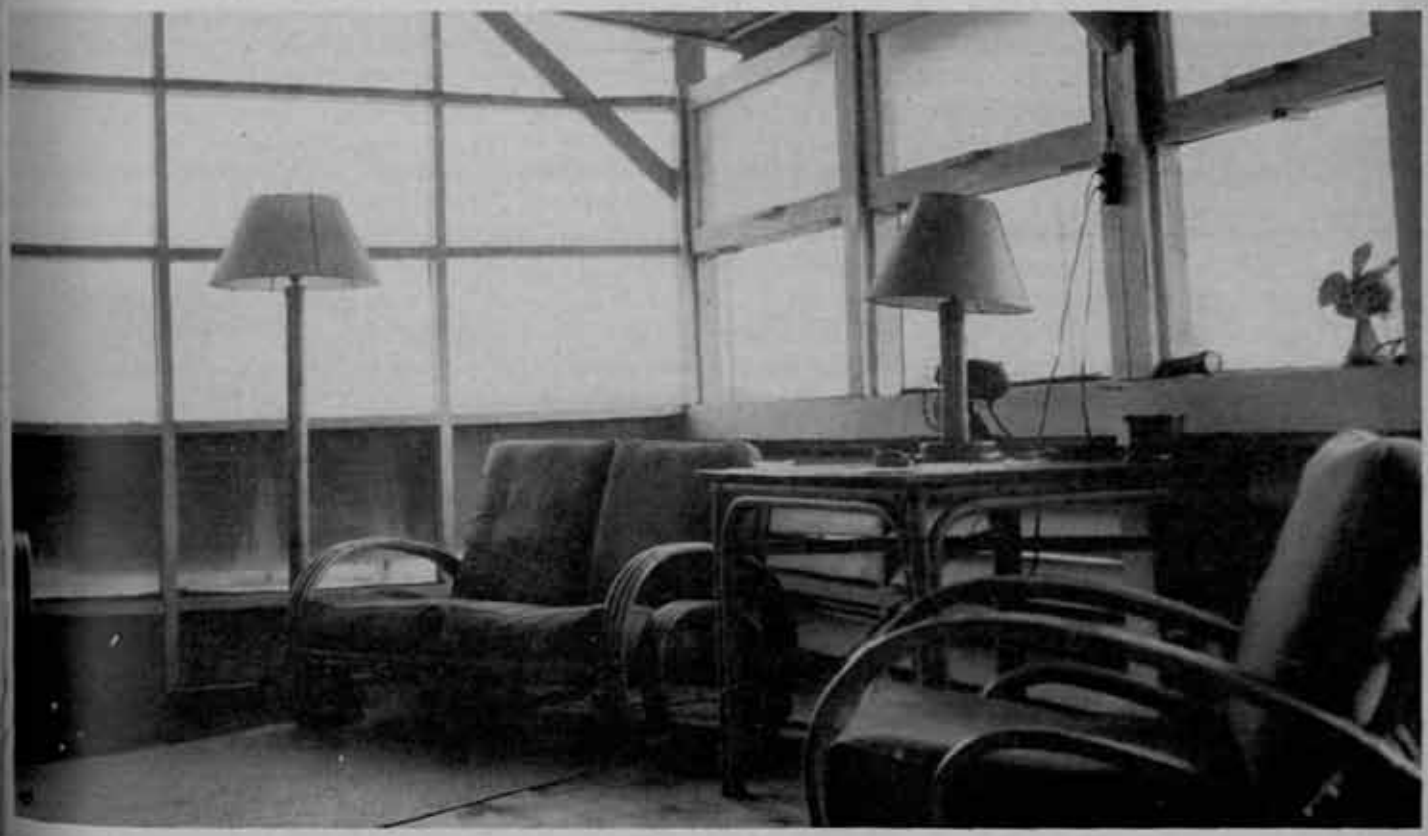
Where an officer or enlisted man will live is not determined by his branch of service. Quarters are assigned at the most convenient location. At all places where United States troops are stationed in the Philippines dependent housing either exists or has been planned as follows:

Location	*Number of Sets Authorized*	*No. of Sets Completed 1 October 46*
Manila Area	905	389
Fort Stotsenberg Area (Tarlac)	17	12
San Marcelino (AAATC) (Zambales)	17	9
Base M (San Fernando, La Union)	21	14
Camp John Hay (Baguio)	9	9
Camp O'Donnell (Tarlac)	50	0
Base K (Tacloban)	26	26
Base A (Batangas)	15	9
Total	1060	468

The general outlook is not too encouraging. Over 2,500 applications have been received for the travel of dependents to this theater. Only 1,060 sets of quarters have been authorized, and only 468 sets were completed as of 1 October 46. Present plans call for the completion of about 200 more sets shortly. This will leave about 2,000 applicants without quarters and, consequently, without authority to move their families. Although some improvement must come with the War Department policy of making service in the Pacific more attractive, the picture undoubtedly will remain dark for several months. The future holds one bright spot in the large number of ships available for bringing dependents to this area. The last carpenter scarcely has time to clear away his tools before the family arrives from the States. In many cases the family has had the pleasure of installing lighting fixtures, painting walls, and putting the finishing touches to their own home.

To help the dependents in the initial leg of the journey AFWESPAC mails a booklet entitled "Traveling Aid" to their States addresses. This covers all the details relative to transportation, passports, orders, baggage, medical requirements, and a few facts about local living conditions. Upon arrival the dependents are issued another booklet entitled "You're in Manila Now," which goes into more detail on the local situations. The best sources of information are the early arrivals who have by this time seen most of the highlights.

It should be remembered that conditions in the Philippines have changed greatly from those of prewar days. Destruction and damage have greatly altered both the outward appearance and economic conditions. Old-timers may be somewhat surprised and shocked at these changes in Manila. Life for dependents is not as easy or well-ordered as it once was. Inconvenience must be expected. Present housing is constructed only on an interim basis until permanent housing can be provided at old Army Posts and the new negotiated bases. Only then will dependent housing become possible as was provided in prewar days.



View of a living room in one of the homes at Philippine University for families of Army personnel stationed in the Manila Area.

Next Stop The Moon*

By G. Edward Pendray

The conquest of space is now only a matter of time and engineering, and some of us will probably live to read the story of the exploration and colonization of the moon by visitors from the earth. The first trip is not going to be a Sunday-afternoon picnic. It will be physically arduous and it will cost a tremendous sum of money, perhaps so much that only a sizable national treasury can afford to sponsor it.

But this voyage will be more significant and more important than any other since the beginning of time. It will be watched breathlessly by the peoples of every nation, for after the conquest of space our world will never be the same again.

At present the moon seems very far away. Its average distance is about 240,000 miles, equivalent to 10 trips around the earth at the equator. The closest the earth and moon can approach in their normal motions is 216,420 miles. At the speed of a space rocket it will take about 100 hours to fly that distance—about four days time, or the interval now required to cross the Atlantic by fast ocean liner.

To the unaided eye the full moon is merely a bright disk, mottled with darker patches—the face of the Man in the Moon. These are the surface indications of the satellite: deserts and plains, mountains and enormous lava flows, valleys and craters. Most of the earth's familiar features are there but there are no lakes, oceans or living things.

The lunar surface has been carefully and accurately mapped, and astronomers know more about its pits, craters, valleys and plains than geographers know about some of the more out-of-the-way places on the earth.

Much is also known about conditions on the moon. The extremes of temperature from day to night are very great. In the lunar day, which lasts two earth weeks, the sun's rays strike the surface directly without the intervention of a blanket of air such as we have on the earth. As a result, the rocks at midday get hot enough to boil water. Only in the shadows of caves or sheltered clefts, where darkness continues even in full day, could human beings survive for any length of time.

In the lunar night, which also lasts two weeks, the heat of the surface quickly escapes into space by radiation. The temperature may fall low enough then to freeze any known liquid. Human beings could exist under such conditions only with the aid of very special insulation and heating equipment.

More serious than either of these difficulties is the lack of atmosphere. A man transported from the earth and put down unprotected on the moon would simply explode from the pressure of the air inside his body, like some of the deep-sea fish when brought too rapidly to the surface.

To protect himself from these hazards—intense heat, extreme cold and powerful blasts of ultraviolet and other killing radiations from the sun and stars—the moon explorer will require very special equipment. He will need some kind of "moon suit," a highly developed, thoroughly planned, all-enclosing mobile shelter that will provide air at atmospheric pressure like a diver's suit; in addition it must supply other vital necessities for lunar existence, such as temperature control, mobility and electric power to manipulate large tools.

A ponderous suit of this kind would be impractical on earth, for it would weigh too much. However, the gravitational attraction on the lunar surface is only about one-fifth of that on the earth. A 180-pound man would tip the scale at only 35 pounds on the moon. A suit weighing 700 pounds on the earth would weigh only 140 pounds on the moon. The suit, in addition to protecting the man, would serve as ballast, enabling him to maintain his balance and control his muscles.

This 700-pound suit could be of almost any size or shape. It would have to be strong enough to withstand an internal pressure of about 15 pounds to the square inch, yet flexible enough to permit the occupant to move about easily. It would require its own power plant—perhaps an electric generator operated by sun power for the lunar daytime, and a storage battery at night. Its air-conditioning plant should be capable of reprocessing continuously the precious air breathed by the occupant, putting it back into the circulating supply after enriching it with fresh oxygen. It would probably have to extract breathed and perspired moisture from the air, purifying it for re-use, for both water and air must be brought from the earth.

The moon suit would require an internal and external lighting system to permit operations in the lunar night; also heat insulation and heating and cooling equipment for night and day conditions; motors and controls for manipulating "arms," "fingers" and other external working members; radio and radar apparatus for communication, direction finding and charting, and food storage to permit lengthy exploring trips away from the base. Other items might also be required to provide for the comfort, health and work assignments of the occupant.

Granted that such suits could be constructed—and there seems to be no good reason why they could not be—resourceful and determined explorers would not only be able to live for short periods on the surface of the moon, but they could thoroughly explore and study it.

Rocket motors at least twice as efficient as the best now in existence will be required to make the trip to the moon. The space rocket will have to build up to the tremendous speed of about seven miles a second, which is known to

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physicists as the earth's "speed of liberation." That is, once the rocket has reached this speed, the motors can be shut off and the rocket will coast away from the earth by momentum alone. If its aim is good, it will hit the moon.

To attain this speed the gas molecules in the jet of such a rocket would have velocities of three miles a second or better. Even the most theoretical velocities of the most powerful rocket fuels in common use today—gasoline or alcohol combined with liquid oxygen—are considerably less than this. But so rapidly are rockets being developed, so promising are certain new secret fuels and improved methods, to say nothing of atomic power possibilities, that even Army engineers have begun to turn their eyes toward space. One of the projects being considered by military rocketers is the development of jet-driven projectiles capable of being shot completely away from the earth.

Perhaps the foremost question now is: Why attempt a trip to the moon? What will the explorers be looking for?

When Columbus approached Queen Isabella about supporting his voyage to the New World, he had some rather tangible inducements to offer. There were the much-talked-of new trade routes for the spices and other products of the East. There was, of course, the possibility of new knowledge, prized by scholars. More appealing to sovereigns both then and now, there was also the promise of wealth and power.

The same inducements, though on a larger, more modern scale, beckon to the sponsors of a pioneering voyage across space's vast unknowns. There may be no spices on the moon, but as we shall see, the moon is a key point in future trade routes with the planets. Who knows what 21st century equivalents of rare spices will ultimately be discovered on them?

For the scholars, there will certainly be much new knowledge in the special venture. In fact, discovery of new knowledge must begin even before the journey starts. Lots of it will be required to build a vehicle to take explorers across the void.

Wealth? Gold isn't as much prized in these times as formerly, but uranium is now an even more precious metal and there are good—or at least interesting—arguments for the possibility of large deposits of uranium and other radioactive metals on the moon.

Power? Our satellite, by its position, size and other advantages, is the natural watchman of the crossroads of space. Its gravitational attraction is so small that rockets only a little faster than the German V-2s could bombard the earth from the moon. With the aid of suitable guiding devices, such rockets could hit any city on the globe with devastating effect. A return attack from the earth would require rockets many times more powerful to carry the same pay load of destruction; and they would, moreover, have to be launched under much more adverse conditions for hitting a small target, such as the moon colony.

So far as sovereign power is concerned, therefore, control of the moon in the interplanetary world of the atomic future could mean military control of our whole portion of the solar system. Its dominance could include not only the earth but also Mars and Venus, the two other possibly habitable planets.

Whether permanent colonies could be founded on the moon might depend on whether uranium or other practical sources of atomic energy are discovered. On the earth, uranium seems to be concentrated mostly in the outer crust. The moon, some astronomers believe, was once a part of that crust, having been thrown into space out of the pit where the Pacific Ocean now rolls, during a violent paroxysm in the earlier history of our globe.

It is possible, therefore, that our satellite, being composed entirely of earth's crustal materials, may be relatively rich in uranium. Should this turn out to be a fact, it would be simple to construct reacting atomic "piles" on the moon like those of the Manhattan Project, only bigger. These could produce heat for melting lunar sand into thick glass slabs, which would be employed for constructing an air-tight roof over a crevice or one of the small craters. Atomic piles could furnish power to heat, light and air-condition a small city in such a sheltered place. The power might even enable chemists to extract oxygen, hydrogen and nitrogen from lunar minerals to create a water supply and an adequate atmosphere in the domed city.

Obviously, establishing a moon colony would take some doing. It will not be accomplished by the first rocket ship to visit the premises. There will have to be at least four stages to the process of conquering the moon—each step probably consisting of several abortive trials before attaining success. Assuming rockets capable of shooting away from the earth, the four stages may be these:

1. *The Target Shots.* Unmanned instrument-carrying rockets will be sent first, to test out flight calculations and controls. They will carry self-operating radio-equipped instruments to provide preliminary information about the range of temperatures, radiation, gravitational influences and other conditions to be encountered on the journey and on the lunar surface. These instrument-carrying rockets will not be equipped to return. They will land on the moon and transmit continuous automatic messages back to earth as long as their power supply lasts.

2. *The Pilot Expedition* will be the first manned space rocket. It will carry a crew of perhaps five, with all necessary equipment. Its mission: to spend a lunar day and night —28 earth days—on the moon, gathering all data possible in the allowed period, then returning to the earth. The crew probably will consist of a pilot-navigator, a copilot and mechanic engineer, a medical man, a physicist-chemist who is also a radio and radiation expert, and a geologist-mineralogist. These five will be selected not only for unusual skill and proficiency in their several technical fields, but also for resourcefulness, physical hardness, courage and ability to observe.

3. *The Moonhead Expedition* will be the first small group of pioneers assigned to a settlement on the moon. Its size, make-up and equipment will depend on what is learned by the Pilot Expedition, but it may consist of perhaps 10 men, supplied at regular intervals by additional cargo rockets, either unmanned and robot-controlled, or staffed with small crews. Regular two-way communication and supply connections may be started in this way between the earth and moon.

4. *Full Colonization,* the final phase. It will begin after the Moonhead Expedition has established a firm foothold. The original small settlement will be increased in size and

conditions established for fairly normal life, considering the natural difficulties. A few especially courageous women may join their men in this phase, though it is not to be expected that anybody will remain on the moon for protracted periods. Colonists will probably take regular turns of service, alternating with periods of rest and recuperation at home on earth.

This sequence of events will probably cover several years, or several decades. The first target shots in all likelihood will miss the mark entirely, even when they succeed in getting away from the earth. A few pilot shots will undoubtedly fail, too, and the crews will be lost. But these uncertainties and dangers are not apt to deter resolute men from achieving ultimate success.

Judging by the rate at which the jet velocities of rocket motors are now being increased, the first unmanned rockets of the target phase can probably be sent in the not-too-distant future. (The Army has revealed plans for launching a guided missile or rocket at the moon within the next 18 months.) Doubling the present jet velocity—which might come within five to 10 years—could mean that an unmanned rocket, constructed with two large additional "steps" or booster rockets, might actually be sent to the moon with 100 pounds or so of self-operating radio and instrumental equipment. Such a rocket would be only two or three times the size of the 14-ton German V-2 rockets of World War II.

The Pilot Expedition Phase, however, will be more of a problem. This shot will require a very considerable further improvement in rocket motors and fuels. It may even have to await the development of atomic rocket engines, though the general expectation is that liquid-fuel chemical rocket motors can be developed that will be efficient enough—especially if the still entirely theoretical atomic engines are slow in coming.

Regardless of the source of rocket power, the members of the Pilot Expedition will have to subsist on an absolute minimum of everything. It may require at least 500 pounds of fuel at the launching for every pound of pay load transported to the moon. Therefore, the equipment taken will be most carefully chosen. Every unnecessary ounce will be trimmed away. Rough calculations on the necessary pay load (earth weights) might go something like this:

Five men, average weight 180 pounds	900 pounds
Food for 37 days, including 28 days on the moon and 9 days en route, out and back ..	500 pounds
Clothing and absolutely necessary personal items	200 pounds
Water, allowing a maximum of one gallon per day per man	1,500 pounds
Equipment, for moon research and exploration, including tools	1,000 pounds
Moon suits, at 700 pounds each	3,500 pounds

This adds up to 7,600 pounds, but probably the estimates are too small. The food and water allowances are based on Army Air Forces experience with distress and subsistence conditions, which indicates that healthy men with high morale can live for a month or so, and do good work, on about 2.7 pounds daily of properly selected foods, provided they have enough water. A gallon of water a day—about eight pounds per day per man—is considered the comfo minimum.

The right foods will be those rich in carbohydrates an fats, lean on proteins. Air Forces war experience showe that carbohydrates and fats not only provide most ener for their weight, but require least water.

Some protein would be needed, too, but assuming th moon explorers were physically hardy and in good cond tion at the start, they would not, in such a short period this, require much tissue-building type of food.

The water allowance is a big item and could possibly b reduced by including equipment to reclaim lost bodily mo ture. Whether this is practical will depend on the weig of the reclaiming equipment. If it weighs more than th water saved, or as much, it would be better to take the wate

Heaviest single items are the moon suits. But these a actually mobile laboratories and workshops, and hence ca carry much of the equipment needed for exploration. I any case they are absolutely necessary to provide protecti and mobility for the explorers.

The rocket itself, in addition to the project pay load, wi have to be equipped with long-range radio able to carry o two-way contact with the earth throughout the trip. I will also need radar equipment for spotting large meteors e route; air-conditioning equipment to regulate pressu moisture level, oxygen, carbondioxide content and contam nation of the breathing air; air locks in the cabin to perm exit and entrance without appreciable loss of pressu navigation instruments, a galley, sleeping quarters, machin shop and repair equipment, a small laboratory, photo graphic equipment, medical supplies and many simil items.

Provision for enough fuel to transport all this equip ment, pay load and other necessary items will make th first Pilot Expedition rocket a mighty impressive object it stands in its earthly cradle, ready for the start of th moon trip. If chemical propellants are used, it may be tall as the 1,046-foot Chrysler Building in New Yor Loaded with fuel, it may weigh as much as a big battl ship. More than two-thirds of its starting weight probabl will consist of fuel. As the fuel is burned, the tanks will b discarded in segments. The part of the rocket actual arriving on the moon will therefore be only a small fra ment of the original projectile.

It will still, however, weigh 40 or 50 tons, representin about one eight-hundredth of the space ship's origin starting mass.

The best time for the Pilot Expedition to arrive at th moon, probably, will be the lunar morning. This will pe mit the explorers two earth weeks of daylight to get use to their equipment, set up suitable living routines and ge acquainted with the local geography before being subjected to the ordeal of the long, cold lunar night.

Their first task after landing will probably be the righting of the rocket, preparing it for the return journey. Th explorers could then take turns venturing out on the luna plain; at first making brief trips to get used to their equip ment and overcome the queerness of their new existence then undertaking longer forays, traveling in pairs for mu tual assistance.

Each man, carefully briefed and drilled for his part b

ore leaving the earth, would have a rigorous assignment of closely scheduled tasks. The pilot-navigator would probably stay with the ship, maintaining continuous communication with members of the expedition and with the earth. The geologist-mineralogist would be exploring for valuable metals and minerals, studying the possibilities of various sites for colonies, taking samples of moon rocks for further study on earth.

The medical man would be checking health and living conditions, studying the effect on human beings of low gravity, airlessness, life in moon suits, intense radiation and other factors. The physicist-chemist's job would include checking earthly computations of the gravitational constants of the moon, measuring and recording the intensity of cosmic rays and other radiation, measuring temperatures, observing the effect of vacuum and other lunar conditions on physical equipment, and the like.

These data would be fed promptly to stations on the earth, in case accident should befall the expedition, preventing its return. The explorers would necessarily be prepared to sacrifice their lives for the information they had been sent to get.

Just at dawn of the second lunar day, 28 earth days after the landing, the return journey could probably be started. On its outward trip from the earth the space ship must build up a speed of seven miles a second to escape, but on its return it will need a velocity only about one-fifth as great, because the moon's speed of liberation is 1.4 miles a second. For this reason only a small amount of fuel, compared to that used on leaving the earth, will be needed to permit the rocket to return. The return fuel, of course, must be provided in the original cargo carried from the earth.

The relatively enormous amount of fuel needed to get away from the earth, and the much smaller amount required to escape from the moon is, incidentally, one of the reasons why the moon is so attractive as a starting place for multi-million-mile journeys to the near-by planets.

Very large ships might be economically launched from the moon for exploration and commercial trips to Mars and Venus, our nearest planetary neighbors. Ships for the same cargo, constructed to be launched from the earth, could well be so huge and costly, even in an atomic age, as to make such traffic forever impractical.

The moon, therefore, is well worth studying these days. It may be the fortress of the next conqueror of the earth. It may also be the first stop on the interplanetary transportation system of the next century.

Japan — Then and Now

By Lieutenant Colonel Robert C. Gaskill, M. C.

When Japan surrendered in 1945 she was still a proud and haughty nation. Those of us who were prisoners of war in the land of the "Rising Sun" can tell you as much. There was no easing of the terrific punishment that we received because they knew the end was near. Men still died because of insufficient food—starvation—and men still died of beatings in August before the surrender. My Jap Camp Commander, whom I saw at Sugamo Prison in Tokyo, about a month ago, told me that the women of the near-by village, where we were held prisoners, complained to him that he was too kindhearted to the Americans. That did not influence him to "lay off" his beatings. And, everyone knows of the fantastic plans for the final defense of the Empire—the underwater "kamikazes," the arming of all civilians regardless of age or sex. We were told by sympathetic fellow slaves of the Empire, men of oriental origin, unwillingly working in Japan, that if the Japanese Homeland were invaded—we would be summarily disposed of.

Go to Japan today—what do you see? The utmost servility! It is not uncommon to see American women travelling alone to places miles from a fellow American. At Kamakura, I encountered two staid ladies, on foot, visiting the shrines, by the aid of a guidebook. They were two of the five people I saw that day, of American origin, in that vicinity. Were they in danger? Probably not, yet how does that compare to a little over a year ago when we prisoners were spat upon and kicked about, if not killed?

One of the most vicious men in our stockade gave me the most reverential bows, kowtows and "breath intakings through the teeth" that I have ever received, when I visited him, for identification purposes, at Sugamo Prison. I knew him well and he knew me well. Yet it took quite some coaxing for him to remember the time when he, apparently of his own volition, after the Jap Commander had done likewise, stepped out and slapped the American and British officers present, rupturing the eardrum of one man in the process.

The truth is that the whole thing has gone into reverse. People who had no wartime contact with them have told me that they thought the Japanese were the most polite people they had ever encountered. I am referring to Americans now doing duty in Japan. They cannot conceive of such nice pretty girls, such polite men, being anything but what they seem; but remember that in Japan, where women outnumber the men, the children spend most of their time with the mothers and older sisters and thereby get their first impressions. Is it possible that the leopard can really change its spots?

Why is it that we must take our horror with a sugar coating—is it not possible for us to encounter the truth, even though it is not to our liking, without revulsion to the mere reporting of it? I have yet to see one single article published that told the whole truth, as I see it. Apparently no one wants to hear it. It would seem that we like to stick our heads in the sands of apathy and let the rest of the world go by.

Let us not be deceived by well trained actors. As a child I knew what apple polishing meant. If a generation is thirty years, we must do what is being done for sixty years; that is, until the school children of the postwar period are in their dotage and are past being taken seriously.

A SLIGHT MISTAKE

By Lieutenant Lawrence Sanders

"Look at them," Ernest says. "Young animals, that's all they are. Beasts. Like horses."

"What's with you?" I says. "They're just kids with a lot of energy."

"Beasts," he says. "Young horses."

We were standing on the edge of the parade ground at San Diego. The —th Battalion of Raiders had come in from the East Coast the night before.

The Raiders were duck-walking across the parade ground in single file, wearing combat packs and holding their rifles over their heads. They were laughing like maniacs, yelling, racing, knocking each other over. A lot of them were chewing tobacco and spitting out long streams as they waddled by a G.I. can.

"How can they do it?" I says. "Those packs must weigh 40 pounds. And the rifle, and all that gear!"

Ernest shook his head sadly. "They don't think," he says. "Probably can't even feel. Trained killers, that's all they are. Did you see them throwing knives last night? Made me shudder."

I nodded. The Raiders had been billeted in the evening. No sooner were they squared away than they were outside throwing sheath knives at trees. They pinned up playing cards and threw stilettos at them. The cards were sliced to ribbons.

"Let's go over and get a beer," I says. We walked over to the slop chute, and I wondered how many of those kids would be alive to duck-walk the same time next year.

"Well, those are the boys who are going to win the war," I says to Ernest. "They're the heroes."

"Nonsense," Ernest says. "This is a war of specialists. Brains will win this war; the technicians are the boys."

"Like you, you mean," I says.

"Like me," he admits. "Look, the government has spent a lot of cash making a radar expert out of me. I'll be intrusted with delicate equipment. I may never see the enemy, but I'll be just as valuable as those killers. That's because I'm a specialist, and I know my job. It's a war of technicians, my boy."

We sat down with our brew. Ernest peered around him with those thick glasses he wore. A couple of Raiders were sitting near us drinking beer. They were chewing tobacco too.

"Tough boys," I says.

"Strong back, weak mind," Ernest says. "They can march twenty miles with a full pack, but can they do delicate plotting or repair sensitive instruments? Obviously not. They can't use their brains. Beasts, that's all. Young animals."

Ernest and I were in a casual company waiting for our draft to be filled. We were heading for the Combat Replacement Pool at Pearl Harbor.

Ernest had just completed an 18 months' course as radar technician. I had been through Sea School and had b chasing my ship for the last eight months. I was hopin catch it at Pearl before it pulled out for Australia.

We just sat around, taking it easy, drinking beer, watching the Raiders get ready for combat. And we plenty to watch!

Those Raiders turned the camp upside down. T weren't vicious, just full of high spirits. They went on ouac, upset all the outhouses within twenty miles. Tol gather firewood, they lit TNT blocks, tossed them into air, and ducked. The blast cut down all the branches needed.

They threw knives, hatchets, and their own special lettos. They went on speed marches and came back camp singing at the tops of their voices.

They ate at a special mess, and one of the cooks told m frightened him, the way they ate. They threw rolls at other, cut their meat with sheath knives, went back seconds, thirds, and complained when there were fourths. The cook gave up trying to satisfy them.

They trained ceaselessly: long marches, jiu-jitsu, c thenics, close order drill without end, weapons classes, onet drill, everything. They sure knew their stuff.

There were a lot of vacant houses on the reservation, the Raiders went whooping through the woods toss grenades down chimneys and into windows. Finally command decided maybe they better have practice nades to play with. You know, the blue kind that popp a cork out one end when the powder charge went off.

After that, your life wasn't worth a cent. Everyth in camp was booby-trapped. You couldn't lower a toilet without a damn cork popping out at you.

Ernest had his bunk booby-trapped. He pulled back covers, and a cork popped at him. He got into bed, another went off beneath the spring. He pulled his pil angrily, and a third cork whizzed past his ear. He got of bed to dress and go beat his gums to the Top Serge He reached for his shoes and set off a smoke grenade.

"Animals," he says. "Beasts."

He gave a sigh of relief when we woke one morning discovered the Raiders had shipped out in the night.

"Thank God," Ernest says. "I'd be a nervous wreck they stayed around much longer."

"Well, luck to them," I says. "Another beer?"

"No, thanks," Ernest says, squinting at me out of h thick glasses. "No more beer. My digestion hasn't been good lately. I've been getting these headaches."

"You've been sitting around here too long," I sa "We'll be shipping out pretty soon."

"I certainly trust so," he tells me. "After all, I have ceived considerable technical training at government pense, and I'd like the opportunity to put some of theory into practice."

That's the way he talked. But he was a nice little guy and didn't mean any harm.

We shipped out the following week. When we got to Oahu, my tub was in the harbor, and after eight months of chasing it, I finally reported aboard. "Where the hell have you been?" the First Sergeant says. (You can't win.)

I left Ernest in the Combat Replacement Pool, and we shook hands.

"Well, take care of yourself," I says.

"Sure," he says. "I'm really anxious to get going. I know radar from A to Izzard, and I'd like to get working on sets again before I forget what I know. I'll get an outfit soon."

"Sure thing," I says. "Well, I'll see you around."

"Yeah," he says. "So long."

My ship pulled out for Australia, and there was plenty to keep me busy. Once or twice I wondered what happened to Ernest, but I gradually forgot about him. You meet so many guys you never see again. I figured he ended up with an AA outfit on some beach and spent the day watching a screen or listening at ear phones.

I saw a lot of war in the next twenty months. I got used to beans for breakfast, salt water showers, and I swabbed more decks than I like to remember. It was while we were anchored in Majuro that orders for my rotation to the States finally came through. I caught an oiler going back to Pearl Harbor.

I was walking down the street in the Replacement Center one afternoon when I heard a war whoop that scared the pants off me. Before I had a chance to turn around, someone had jumped on my back, and I was rolling around in the dirt. When I finally got the dust out of my eyes, there was Ernest sitting on my chest.

"Hello, horse thief," he grins at me.

"My God, Ernest," I says. "Will you let me up?"

He hauled me to my feet and pounded the dust off my back. "Been looking for someone I knew," he says. "Waiting for a ship to the States?"

I told him I was.

"Well, come on over and get slopped up while you're waiting," he says.

He had three more stripes than the last time I saw him. He ranked me now. But it was more than the stripes that surprised me. I couldn't believe he was the same man. He seemed about three inches taller. He was heavier; his shoulders were wider; he carried himself straight and proud. His hair was sun-bleached almost white, and there was more of it. His shirt was unbuttoned, and on his tanned chest was a matted growth of hair like a patch of Tulagi jungle.

"What in Heaven's name happened to you?" I says.

"What's the matter?" he grins. "Don't you recognize me?"

"Hell no," I says. "You used to be a skinny little runt with a bald spot. What you been doing, eating vitamin pills?"

"Oh, something very funny happened to me," he smiles.

"It must have been hilarious," I says. "What about those thick glasses you wore?"

"The cheaters? Oh, I found I didn't need those except for very close work. They were giving me headaches. I can see all right without them. Watch."

We were walking along the road toward the PX. Ernest slipped a long, two-edged knife from a sheath strapped low on his leg and let fly at a palm tree. The knife twanged home and stuck quivering in the wood.

"Nice shot," I says.

"Nine out of ten times," he says. "Got me a Nip that way once."

I looked at him curiously. He was striding along that road like he owned the world. Something sure had happened to him. He was full of beans.

We got our beers and went over to a shaded table to drink them.

"Okay," I says. "Now give. What happened to you?"

"Well," he says, "wait a second." He downed his beers in straight gulps and went back for two more. He returned and stretched his legs under the table.

"Remember the last time you saw me?" he asks me.

"Sure," I says. "It was almost two years ago, right here in this Replacement Depot. I went aboard ship, and you were waiting to be assigned."

"That's right," he says. "Well, we waited around a couple of weeks with guys going out every day. We had to muster every morning, but otherwise I just lay around on my duff waiting for assignment."

"Come on, come on, get to the point," I says. "How come you look so different?"

"I'm coming to it," he says. "Well, our classification cards never did catch up with us. So they'd have these musters, and they'd ask for guys with experience cooking, or clerking, or heavy machine guns, or whatever they needed. And if a guy knew anything about it, he'd raise his hand, and they'd ship him right off to the outfit."

"Don't tell me the guys volunteered," I says. "I can't believe that."

"Well, it wasn't exactly volunteering," Ernest says. "They needed replacements bad right then, and everyone was going out anyway. Most of the guys figured they might as well get into something they liked. Anyway, we were standing around one day, and the First Sergeant gets up and says, "Any of you guys got radar experience?"

"And that's what you were waiting for?"

"Right. Remember how hot I used to be about technicians will win the war, and the training I'd had and all. Well, I shot up my mitt, and before I knew it, I was traveling down to the dock with my gear, ready to go aboard ship and join some outfit that was shipping out."

"What was it?" I asks him. "Antiaircraft? Air warning squadron?"

"Take it easy," he says. "I'm getting to it. They took me out to this attack transport, and no sooner was I aboard than she up-anchored and started out past Diamond Head. It took me almost an hour to find the First Sergeant. You know how fouled-up sailings are."

"You're telling me about confusion aboard ship?" I says. "Wait till I get a chance to tell you. Well, go on, what happened?"

"I found the Top Sergeant all right, and he looks me up and down, and says, "Kind of scrawny, ain't you?"

"Yeah," I tells him, "I'm a little thin, but what's that got to do with it? I know my job."

"Okay, okay," he says. "As long as you know your stuff,"

"I've had nearly two years training," I says. What kind of equipment you got?"

"Equipment?" he says. "Oh, we got a lot of stuff."

"I'm best on the big sets," I tells him. "I suppose your heavy stuff is down in the hold?"

"Heavy stuff?" he says. "Well, we really ain't got anything heavier than a Browning Light."

"No, no," I says. "Not weapons. I mean your equipment. Have you any mobile trailers?"

Well, this First Sergeant looks at me funny like. "Say listen, Mac," he says. "What kind of an outfit do you think this is?"

"Why, a radar outfit," I says. "That's why they sent me. I'm a radar technician."

"Radar?" he says. "What the hell is that? We're *Raiders*. This is the —th Raider Battalion. That jerk over at the Replacement Depot made a slight mistake. We wanted a man with Raider training."

"Raider?" I says, my stomach sagging down around my knees, "Are you the —th Raider Battalion that was at San Diego?"

"That's right," he says, smiling proudly. "I guess you heard of us."

"I certainly have," I says. "Stop the ship. Call the Captain. I got to get off."

"Take it easy," he says. "You can't get off."

"Well, I'll get off at the next stop," I says. "I'm no Raider. I can't even slit a man's throat. What's your next stop?"

The Top grins. "Everyone gets off at the next stop," he says. "We're invading a little island down near New Georgia."

"My God, Ernest," I interrupts, reaching for my second beer. "What a spot to be in."

"I tell you, I was nearly sick," Ernest says. "I looked around the compartment, and all those tough babies were sharpening bayonets and sewing extra pockets on their dungarees to hold more grenades. That was no place for me."

"What did you do?"

"Well, I went up on deck and watched Diamond Head sink into the sea and decided I couldn't swim for it. Then I saw everyone on that ship from the Chaplain to the stewards' mates. Everyone said it was a shame such a mistake had been made, but there was nothing they could do about it. Besides, they needed every man, including me, and didn't I have boot training, and didn't I know how to handle a rifle? Well, what was I worrying about?"

"Couldn't you get transferred to Sick Bay or something like that?"

"I tried," he says. "I went down to see the doc and told him I had these darting pains in my abdomen, and blood was coming out my pores. He was very sympathetic, gave me some green pills, and returned me to duty. There was nothing to do but go through with it or shoot off a foot, and I didn't exactly feel up to that."

"What happened in the invasion?" I asks him.

"I'm getting to that," Ernest says. "How about more beer?"

"Sure," I says.

We went back on line and got two more each. Then we came back to our table and got comfortable aga

"You've certainly developed a taste for beer," I says Ernest.

"Yeah," he grins, "Or anything else I can get. Have chaw?"

He pulled a long, black plug of chewing tobacco from hip pocket, dusted the sand off it, and offered it to me.

"No, thanks," I says.

He bit off a wad that filled his cheek, and there silence a few minutes till he got it chomped down to wh he could tuck it in one cheek. Then looking like a ch munk, he went on talking, pausing now and then to s noisily in the general direction of a G.I. can. He didn't it, but he was all around it.

"They put me in the second wave," he says. "I ne thought I'd live to hit the beach. I couldn't even thi straight. I just kept hearing, "Radar-Raider, Raider-Rada and those damn words went round and around in head. They spilled us out, and we went up the beach ways and got some kind of perimeter set up."

"How was it?"

"Hell on earth," he says. "I'll never be afraid of an thing again, because nothing could be that bad."

"You weren't alone, were you?" I asks him.

"No, thank God, I wasn't alone. If I'd been alone, wouldn't be here today. They took care of me. When nig came, there were six of us in a bomb crater about 300 yar up the beach. The Nips came right down to us. The wasn't exactly a line. We were all fouled-up. There we whispers, yells, curses all night. There were flares goi up. There were terrible screams and firecrackers going off.

I lit a cigarette for him. He was a little excited, and hands were trembling as he talked about that first night the beach. He inhaled deeply, then looked at me and beg again.

"We stayed awake all night. The other guys knew didn't really belong there, that I was really a stranger, b there I was, and it was enough for them. I caught a N sliding down into our hole, and they felt better about after that. And it made me feel better to know I was entirely helpless."

"You attacked again in the morning?" I asks him.

"Well, they pulled back," he says. "But what I was goi to tell you: it was just getting light when a Nip grena came flipping through the air toward us. It hit the rim our crater and bounced down toward me. I watched th black thing come rolling toward me, and I couldn't mov

"And?"

"Well, of course those guys moved as fast as they though It was my sergeant, a big, tough guy, a guy I had figure for a mean cuss."

"Flop on it?"

"Yeah, he flopped on it," Ernest says. "Maybe I shoul have done that, or thrown it out, but I couldn't think fas enough. But this big sergeant just flopped right on top of and took the whole blast in his stomach and chest. He wa the only casualty in the crater that night. The rest of us g out all right."

"That's the way those guys were," I says.

"Yeah," he says. "That's the way they were all righ They talked a lot about how it was every man for himse

and the only guy to look out for was number one, but when it came right down to it, why, every man was your friend. You could depend on him, and he depended on you. It was nice to know that. That sure was a good outfit. There never was an outfit like that one."

"How about the rest of the campaign?" I asks him.

"For me, nothing was ever as bad as that first night. Hell, you know all about that stuff. Sometimes when I think of all the guys who caught it, I wonder how I rate." He rapped on wood. "Well, it's a great war. I'd just like to see the end of it, that's all. I never did like continued stories."

We sat there, drinking our beer, and thinking of the end of the war. It seemed a long way off right then.

"Those kids," Ernest says, a kind of dreamy light coming into his eyes. "Those crazy kids. You just couldn't beat them, that's all. They knew they were the best in the world, and before they'd let their outfit get thrown back into the sea, why, they'd die right where they were. And plenty of them did."

"Were you scared?" I asks him.

"Yeah, I was scared," he says. "I was plenty scared. We were all scared. But we had something bigger than fear. We had a pride in our outfit so big that we'd rather be blown to bits than shame it."

"Beasts, you called them," I reminds him. "Young animals."

"God forgive me," he says softly. "I didn't know. I just didn't know. They were kids, just young kids, but they accomplished miracles when only miracles would have saved us."

"So you've changed your mind about technicians winning the war?" I says.

"Well," he says, "I don't know. They were technicians too, very highly trained and skilled infantry specialists. That's a profession I guess will always win wars. Those boys knew their trade all right and really worked at it."

"They broke up that outfit, didn't they?" I says.

"Yeah," he says, looking at the ground. "They broke us up after Saipan. There wasn't enough left to make one good platoon anyway. There were only a few of us left. Just a handful."

I nodded. "Well," I says, "I guess you won't have to worry anymore. I guess you'll be going back to the States and sit out the rest of the war recruiting somewhere."

"What?" he says. "Not me! Say listen, I got me a real outfit now. I got a platoon of young kids right out of boot camp. They're kind of wild, but give me another month, and I'll lick 'em into shape. I'm teaching them all the tricks. I'm teaching them their trade. Yep," and he grins happily, "I'm making technicians out of them."

"Are you going out again?" I says.

"Going out? I hope to kiss a pig we're going out. We go aboard ship tomorrow." He leaned close and almost whispered to me. "It's something really big this time. Boy, I wouldn't miss it for a million dollars. My lads are all set." He leaned back. "You'll be hearing about us," he promises. "You'll be reading all about us. Man, we'll be making history."

"I guess you will," I says. "I guess you will at that. Well, whatever it is, here's luck." I raised my beer.

"Luck?" he says. "Oh, sure. Thanks."

He looked around the PX. "Hey, look there," he says, pointing at a near-by wall. Crawling up the plank was one of those big flying roaches you see out in Oahu.

"Watch," he says. He drew back his head a little, and then let fly a tremendous stream of tobacco juice at the roach. There was a "Splat!", and the stunned roach oozed gently back down the wall. Ernest grinned happily. "Got the son of a (——)," he says, slowly wiping away the excess juice at the corners of his mouth.

Changes of Address

Since the last issue of the JOURNAL was mailed out, over 100 copies were returned because addresses were not up to date.

We make every effort to get the JOURNAL to you—but you must cooperate.

LET US HAVE YOUR LATEST ADDRESS!

Active Duty Training For Reserve Officers

Under a letter of instructions recently issued by General Devers, the maximum amount of active duty training will be afforded to individual Army Ground Forces officers of the Organized Reserve Corps during the interim period.

Active duty training for officers who volunteer will be accomplished by the following means:

(a) Attendance of reserve officers at Regular Courses and at Associate Basic and Advanced Courses at all Army Ground Forces and Technical and Administrative Service Schools.

Quotas for the General Service Schools will be announced but attendance of reserve officers at schools on a level higher than the Command and Staff College is not contemplated.

Under Special Service Schools program, the Seacoast Branch will offer an Associated Basic Course of 13 weeks duration on about 14 April and an Advanced Gunnery Course of 13 weeks duration on about 10 March.

The AAA and Guided Missiles Branch will offer four 13-week Associate Basic Courses with tentative starting dates of 22 March, 12 April, 3 May and 24 May 1947.

Although Army Commanders are authorized to make exception, reserve officers will normally attend the Service School pertaining to the Arm or Service in which appointed or commissioned.

The ORC budget contains no funds for the travel of dependents or shipment of household goods for officers detailed to any of the courses.

(b) Fifteen-day indoctrination courses conducted by the Army Ground Forces Service Schools during the summer months.

This is a refresher course and is Branch Immaterial. It is for field and general officers and is designed to indoctrinate senior commanders and staffs in the latest divisional organization and the coordinated employment of its units, supporting arms and services.

This course will be held for CAC officers at the Seacoast Branch and at the AAA and Guided Missiles Branch on about 23 June 1947 for eleven days duration.

(c) Detail for not less than sixty days nor more than ninety days of specially qualified reserve officers, to higher headquarters to include the War Department, Headquarters Army Ground Forces, Offices of the Chiefs of Technical and Administrative Services, Army Headquarters, Corps Headquarters, Service Schools and RTCs. The number of officers receiving this training is contingent upon availability of funds.

(d) Year-round training of company-grade officers at replacement training centers for a minimum of twelve days exclusive of travel time, and a maximum of thirty days including travel time.

Reserve officers of company grade, who volunteer therefor, will be given active duty training at replacement training centers for a minimum of twelve days exclusive travel time, and a maximum of thirty days including tr time.

The replacement training centers will give branch material on-the-job training to reserve officers of branch. This type of training will be accomplished, in p in replacement training center training companies. more than two reserve officers of branches other than M ical and Chaplain Corps may be assigned per train company, and they will be employed as platoon leaders assistant instructors. In addition, on-the-job branch train will be given to reserve officers of the service branches replacement training centers in the replacement train center overhead and at post facilities servicing the repla ment training centers.

Within the quotas established, reserve officers may ordered to active duty training at replacement train centers at any time during the year except the period December to 1 January, both dates inclusive, subject availability of funds during the remainder of the fiscal y 1947. Armies are authorized to order reserve officers to placement training centers for active duty training in nu bers not to exceed, at any one time, the quotas set fo below:

ARMIES

RTC	*First*	*Second*	*Fourth*	*Fifth*	*Sixth*	*Seven*
Dix	48					
Lewis				38	18	
Ord			20	23	21	
Jackson	4	14	17	4	4	13
Knox		40		24		
Bragg	32	32				
McClellan						28
Totals	84	86	37	89	43	41

(e) Fifteen days detail to combat teams or larger (battalion or company size technical units) Regular Ar units, and with National Guard units during field perio

1. Subject to availability of funds, Army Command are authorized to order to active duty for training maximum number of reserve officers, consistent w facilities, that can be properly utilized and trained the Army headquarters and at replacement trainin centers under their commands.
2. Subject to the availability of funds, Army Comman ers are authorized to order to active duty for trainin the numbers of reserve officers desired by the W Department, Headquarters Army Ground Force Service Schools, and installations under the jurisd tion of the Chiefs of the Administrative and Technic Services. The requirements for each will be dete mined by Headquarters, Army Ground Forces a quotas will be assigned by specific authorization. Af

establishment of quotas, the Army Commanders will then establish qualifications of reserve officers. Within the established quotas, reserve officers may be requested by name by the using agency directly to the Army Commander concerned. Otherwise the quotas will be filled by selection by the Army Commanders.

(f) Detail as instructors at ROTC institutions and summer camps, of highly specialized reserve officers for not less than fifteen days nor more than ninety days.

Army Commanders are authorized to order to active duty, specially selected and qualified Reserve Officers for periods of from 15 days to 90 days with ROTC units:

(1) At educational institutions, reserve officers, in a number not to exceed six concurrently per institution, during the period of academic activity of the particular institutions.

(2) At ROTC Summer camps, reserve officers, in a number to be determined by the Army Commander, during the period of preparation, conduct and closing out of the annual Advanced ROTC Camps.

(g) Attendance of selected reserve officers for fifteen days at Army Area Troop Schools. (This will not be implemented prior to 1 January 1949.)

The active duty training of Organized Reserve Corps units or groups of Organized Reserve Corps personnel is not contemplated prior to 1948.

The general idea behind this program is to place emphasis on advancing the military education of younger officers in the grades of second lieutenant to lieutenant colonel.

Standards of eligibility are covered under War Department Circular 185 dated 25 June 1946 and Army Commanders will be guided in their selection of applicants by this circular.

In its general concept, this plan is projected through the fiscal year of 1948. However the detailed implementation is for the remainder of the year 1947 since detailed instructions for 1948 cannot be issued until the amount of funds to be made available is known.

Opportunity And The New Army*

By General Jacob L. Devers, Commanding General, Army Ground Forces

The New Army, with its increased pay scales and educational opportunities, now can compete on even terms with business and industry for the cream of our youth.

In fact, the New Army today presents the outstanding opportunity in America for the young man who has just graduated from high school. He starts out at $75 a month, in addition to his food, clothing, housing and medical care. He has unlimited opportunity for travel. In the highly technological Army of today, he will surely learn a useful trade or specialty.

If he marries, his wife will receive an allowance of $50 per month, of which he contributes only $22. If they have a child, her allowance is increased by $30 a month, and if they have a second child, by $20 more. These allowances remain in effect for the duration plus six months.

If he chooses to remain in the Army, he may progress all the way to first or master sergeant, at $165 a month plus longevity pay and allowances for rations and quarters. After 20 years of service, a first or master sergeant may retire with a monthly income of $107 for the remainder of his life; after 30 years, $185 per month.

Our New Army recruit of today has ample opportunities to earn a commission. Annually, a generous quota of enlisted men is selected to attend the United States Military Academy at West Point. The Officer Candidate School program is to be continued, and a substantial proportion of the additional 25,000 Regular Army commissions which Congress has authorized will be reserved for men who progress upwards through the noncommissioned ranks.

To our New Army, the families of America may entrust their sons and brothers, with a confidence which will not be misplaced. If they choose to serve but one term of enlistment, we will return them as good citizens, capable of serving their Nation as honorably as civilians as they served it as soldiers. They will have benefited from their schooling in the New Army, and if they have enlisted before 6 October 1946, they will be entitled to further civilian schooling. They will have benefited from their disciplinary training in the New Army, and will be better adjusted to the no less rigorous discipline demanded of the successful civilian.

Anyone who has experienced both military and civilian discipline knows that civilian discipline is equally as severe. If a man is not amenable to civilian discipline, in a store or office or factory, he can lose his job. But if the Army has succeeded—and about 98 percent of the time we do succeed—in teaching him self-discipline, he can keep that job, and live a useful and happy life. If we have also taught him leadership, a subject upon which we concentrate, he can go on to bigger and better jobs.

And if he chooses to remain in the New Army, we can promise a public-spirited young man a career as desirable as any he could achieve in civilian life, a career limited only by his own abilities and ambitions, and enhanced by the immeasurable pride and satisfaction to be derived from the knowledge that he is serving his country at home and abroad.

*From an address by General Jacob L. Devers, Commanding General, Army Ground Forces, before the District of Columbia convention of the American Legion. Reprinted from *The Army Information Digest*.

REDLEGS RIDE TANKS

By First Lieutenant Milton M. Meisels, FA-Res.

Observing artillery fire from a bucking and jolting tank is no picnic — but the call, "Hello, Fox Oboe, come up here right away, will you?" is always a tribute and a challenge to armored artillerymen.

Fires still burn in the German town just captured by American armor, and a rather decrepit looking tank bearing the task force's artillery observer section groans to a halt next to a large and very comforting brick wall. The reconnaissance sergeant lifts his tank helmet wearily.

"Lieutenant, do you suppose we'll *ever* get back to observing for a good old infantry outfit?"

"I don't know, Sergeant; perhaps never. After this deal we may find we've made a reputation as tankers, and I'm not too sure I'm happy about it if we have."

* * * * *

Spoken from the heart, the officer's remark emphasizes that observing fire from a moving tank virtually requires two sets of ears which can operate independently of each other, four eyes with built-in stabilizers, and a neck with 6,400 mils of traverse.

From a bucking and jolting tank, the control of the fire becomes uncertain, the fire itself is less effective, and the observer loses sight of the "big picture." There are situations, however, where the FO has to stick his tank out there with the leading platoon and do his job, despite the difficulties. It is impossible to read a map. The target keeps jumping around in the binoculars, and often blurs out entirely. The noise of the motor, the chattering of the other tankers on the radio, the racket of the bow gunner's machine gun, and the roar of friendly artillery bursting up ahead would make bedlam itself seem like a health sanatorium. A further distraction is the constant search that must be made for targets for the observer's tank. He has a 75mm gun and two machine guns aboard and the task force commander expects them to shoot!

For some reason, no matter how well the radio may be adjusted, communications invariably become difficult and uncertain while the tank is on the move. Messages become unintelligible . . . the tanker on the right shouts that something peculiar is sticking out of that haystack . . . the FDC wants a repeat on the last sensing . . . the tanks are near the objectives and the commander is screaming to lift that artillery. By this time the observer is really sweating—then, by the grace of God, communication is re-established, fire li and another objective is won.

If it can be avoided, the artillery observer should n make the initial onslaught with the tanks. The more e cient technique is to select a position well behind the le ing elements, preferably on high terrain, from which i possible to observe both the movement of the tanks and objectives. Thus situated, the efficient conduct of fire a continuous knowledge of the general situation are both easier and better achieved. If the objective is far off, st the terrain and displace the tank from time to time, alw being certain that the location of all units is known.

For the artillery observer to achieve this freedom movement requires that he earn and maintain the comp trust and confidence of the task force commander. Th relationship should be similar to that of a lawyer and client. Such a relationship isn't issued automatically w the T/O. In fact, at the start of a campaign, many ta officers are rather naïve about artillery matters. Some believe that Mr. Redlegs is just along for the ride, and sider his tank as just one more tank for their outfit— more gun and two more machine guns—and perhaps a go tank to put up at the head of the column because it can lost without reducing the organic strength of the compa

Fortunately, such an attitude doesn't last beyond first successful mission. When the tankers see how artillery can soften up an objective and note the protecti artillery fire affords attacking forces when laid down front of them, the observer becomes the fair-haired b Thereafter, his counsel is regarded as gospel, and he permitted to operate in a manner which insures the ma mum control of artillery fire.

But being the fair-haired boy isn't as simple as it m sound. When the tankers turn to artillery, they turn in big way. They're apt to become so artillery-conscious th they don't like to turn over their motors unless a few rou are falling out there to drown out the noise. They de attacking any town until it is first softened up by a he artillery preparation. Yes, the FO has become their Ho dini, who, presto, can make artillery fire appear in th places at once.

*Reprinted from Nov.-Dec. 1946 issue of *The Field Artillery Journal*.

"Hello, Fox Oboe. I want a smoke screen about 400 yards to the right of the road, and I want you to keep pounding the town up ahead until the tanks get there. Try to get the fire out there in about three minutes." Such sweeping demands flow easily from the lips of "artillery-minded" tankers. Of course, at such times the FO must deliver a fluent and convincing discourse on the limitations of artillery, enumerating the ammunition problem, the time it takes to properly adjust fire, and the difficulties of displacing a battery. He may even find it necessary to overdo it a bit now and then in order to dampen somewhat the tanker's ardor and enthusiasm for artillery and its capabilities. However, when a tank column is halted temporarily during a fast breakthrough, it is an eloquent tribute to artillery to know that the next call on the radio is more than apt to be "Come up here right away, will you?"

Because of the mobile nature of armored action, the conduct of artillery fire is difficult, particularly since the location on the ground of battery position becomes increasingly uncertain with each turn in the road. If gains of ten to fifteen miles are made before a fire mission is sent down, all the observer can hope is that his guns are back there some place along the axis of advance, and he is usually more than satisfied if one battery is in position to answer his call for fire. His constant prayer is to be able to see the first round. And incidentally, one must be extremely careful in observing those initial rounds as the GT line will probably be quite different from what is expected. Disconcerting, too, is to have the artillery battalion in direct support of several tank units elect to follow the advance of another outfit, in which case it will often drift so far away that a call for fire will be unheard and unheeded. Since this can easily occur within the short space of fifteen minutes, it is wise to have radio facilities and frequencies available to the observer in the tank for contacting other field artillery battalions in the area which may be able to lend support.

Forward observation methods are used exclusively for adjusting fire. A novel method of fire which often results from the pincer tactics employed by tank units is called "Shooting 'em backwards"—that is, when the target lies between the observers and the guns. Obviously, this makes a "short" an *over* and a "left" a *right*.

Because of the large area covered, the tank FO must be equipped with a veritable library of maps, detailing every action where there is a remote possibility that action may take place. Often the tankers don't know until ten minutes before crossing the I.P. what their mission is or what route is to be followed. As a result it is necessary to study the maps carefully, fold them neatly, and have them arranged in such an order that the proper one can be selected quickly. Yes, maps flow quickly during an armored breakthrough. Outfits may run unchallenged over many maps, but the right one must be on top at the right time—many lives may depend upon it, particularly since supported units do often place much faith on the artilleryman. Frequent is the radio query, "Hello, Fox Oboe, where in hell are we?" Many higher commanders leaned heavily upon the artillery observer for their leading elements' reports.

The physical handling of maps inside of a moving tank is a technique in itself. To maintain the good will of the gunner corporal don't lay the map board on the breechblock. It will soon slip off and hit him on the head!

FO tanks should be amply equipped with radio communications capable of listening in on the tank channel as well as the artillery net. It is well to carry as many different artillery channels as can be had and to check in frequently on these other battalions so they will get to know who you are. If possible a heavy rubber cable extension about 50 yards in length should be secured so that if the situation arises, the tank can be parked next to a house and the cable carried to the room where the OP is located. An SCR 510 radio can easily be carried on the rear deck of the tank and will come in handy if it is necessary to move out on foot. At least four SCR 536 radios should be on hand as the situation may require several observation posts. A good set-up is to park the tank in a safe place and leave one man in it with an SCR 536. Then it is possible to establish several OPs equipped with SCR 536 radios and use the tank as a relay station. This is an effective system in fighting around urban districts where it is slow and cumbersome to have to drive the tank to every house or barn which is contemplated as an OP.

An important consideration is selection of the proper type of tank. During the war the headquarters battery of armored field artillery battalions usually received second-hand Shermans which ordnance was probably glad to get off its hands. In fact, they often arrived bearing the notation, *non-combat* tank. Some of these tanks were not in the best of mechanical shape and the condition of weapons and appurtenances often left much to be desired. That sort of thing hardly stimulates the forward observer with enthusiasm to get out there and do his stuff!

One FO section received a well battered Sherman with a hole in its turret, made by an 88 and hastily covered over, and the white camouflage paint (put on for the Battle of the Bulge) peeling off in quantities. It was a strange spotted apparition among those new Pershings and clean double-hatched 76's of the tank battalions.

A good tank for forward observation purposes is the new light M-24 tank. It is extremely fast, maneuverable, and the wide tracks give increased flotation. The inside is luxurious by comparison with the Sherman. It is well padded in the right places and easier to work in. During cold weather the turret can be heated, a progressive feature considering the frigidaire qualities of the older tank. There is a handy light for safely reading maps at night with the hatch closed. The thick, bulletproof glass which extends around the top of the hatch affords all around vision even when the hatch is closed—although during combat it is necessary to keep unbuttoned and stick your head out to do really good observing. The driver's and bow gunner's hatches open sideways so that there is no danger that they will be pinned in if the tank is hit and the gunner neglects to bring his gun to the center position before bailing out. There is a double hatch which permits two men to jump out simultaneously, an important consideration when the tank must be abandoned.

Whether an M-24 can be secured or not, the importance and the hazards of the forward observer's role impels that he be equipped with a tank as good as those of the tank battalions.

Guided Missile Research*

By Albert L. Ruiz

As used against London, the A-4 or, V-2, had a range of 180-190 miles, although some went 220 miles, with a maximum altitude of 50-55 miles. This represents just about the maximum range obtainable with a rocket of this type. Using more fuel means increasing the size and weight of the rocket to hold it, consequently little or no gain is made in acceleration or, therefore, in range. True, some improvement can be made by using better fuels, but here again a limit is soon reached. For example, it has been calculated that to double the range of the A-4, a fuel must be used which has a 35% greater thrust for the same rate of burning. How, then, does one obtain the ranges of 2000 to 3000 miles or more that are talked about so glibly? Some of the answers may be found from a further consideration of the German work.

One of the rockets that had reached the paper design stage was the A-9. This was an A-4 with wings. Fired vertically, the A-9 was to follow a normal A-4 trajectory until, on the downward leg, it re-entered the atmosphere. From there on the wings would carry the missile in a flat glide. The effect of adding the wings would be to double the range.

The next step in the planned development was the A-10. This was to be a large rocket of about 100 tons weight, carrying as a pay load an A-9. The A-10 was to be fired in the same manner as the A-4, and it would when all burnt, be at an altitude of nearly 20 miles with a velocity of 5000 feet per second. At this point the A-9 and A-10 were to be separated, and the A-9 launched with its own jet operating. With this system it was calculated that the A-9 could attain a velocity of 11,000 feet per second, a maximum altitude of 180 miles, and a range of 3000 miles. For even longer ranges, three stages might be used, and so on.

The possibilities of multistage rockets are staggering to the imagination. Any point on the earth might be reached. With four stages, a velocity of about 24,000 feet per second could be attained, and this would be sufficient for the missile to keep on encircling the earth indefinitely. And with even more stages, a speed of 35,000 feet per second could probably be attained, enough to enable a missile to le the earth's gravitational field and fly to the moon or ano planet. True, many problems would arise. To mens only one, it is estimated that a 15-ton initial launch weight would be needed to produce a 7-pound satellite. present this does not appear economically practical, those who have enough imagination to conceive and de such satellite or inter-planetary rockets, no doubt also h enough imagination for finding good reasons for doing

But disregarding these out-of-the-World rockets, th are many applications for long-range rockets, not only military purposes, but also for commercial uses. It wo revolutionize transportation and communication system the A-9/A-10 combination, which could make the journ from New York to London in less than an hour, were veloped to carry freight or passengers.

To construct such rockets requires a tremendous amo of research and development. Improved fuels must be veloped. Bigger motors must be produced. More work needed in supersonic aerodynamics both theoretical and practical. Better controls must be developed, more curate navigation and guidance systems must be devis Complete information is needed on the characteristics the upper atmosphere.

Much of this work is under way. For example, there is the Aberdeen Proving Ground, Md., a supersonic wi tunnel that will soon be able to test models at air speeds f times that of sound. And at the White Sands Provi Ground, New Mexico, the Army Ordnance Department test firing V-2 rockets.

The A-4, or V-2, was the first successful long-ran rocket. It was only a first step, however, its final form b ing conditioned by the exigencies of war. The work th produced it and the rocket itself are now being used to tend our general knowledge and to develop improved a longer-range rockets, both for war and for peace. We c truthfully say that the Age of Rockets is here, and we c speculate convincingly on the possible uses of rock However, no one can say at this time with any assura whether it will take two years or two decades to mak rocket trip from New York to London in an hour a real

*Extracted from a talk given by Mr. Ruiz of the General Electric Company before the American Institute of Electrical Engineers, Chicago Section, 9 January 1947.

Register of Graduates and Former Cadets, U. S. M. A.

This book which contains a complete list of all graduates and former cadets of the United States Military Academy may be purchased through the West Point Alumni Foundation, 381 Fourth Street, New York 16, N. Y.

The purchase price is $2.50 to individuals now in the service and $3.00 to service organizations, libraries, and other institutions.

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.

COLONEL R. E. DINGEMAN, Director

LT. COL. JAMES T. BARBER
LT. COL. WILLIAM R. MURRIN
LT. COL. GEORGE B. WEBSTER, JR.
CAPTAIN RICHARD T. PULLEN, JR.
LT. COL. FREDERICK N. WALKER, JR.
MAJOR FRANCIS J. PALLISTER
MAJOR CHARLES W. ADCOCK
CAPTAIN HAROLD R. BRANTNER
1ST LIEUTENANT WILLIAM WHETTON

Air Conditioning Units for Radar Set AN/MPG-1. It is estimated that the electronic equipment of Radar Set AN/MPG-1 inside the Trailer V-9/MPG-1 liberates approximately 22,000 BTU of heat per hour. This is increased considerably by radiated heat due to outside ambient temperature and that emitted by personnel working inside the trailer. No effort was made in the design of the equipment to reduce this considerable amount of heat. As a consequence, air conditioning of the trailer is a necessity. The amount of cooling required necessitates the use of a large capacity air conditioning unit.

Two air conditioning units were tested with this radar set. One was a York Air Conditioning Unit Model V60, having a self-contained, gasoline engine driven unit. The other was a Chrysler Air-Temp Unit Model PR300C requiring an outside source of power to drive its four electric motors. Each unit is mobile mounted on two-wheel trailers.

The York Air Conditioning Unit is driven by a self-contained gasoline engine which requires approximately one gallon of gasoline per hour. Various combinations of two of the three existing roadside openings of the trailer were used for connecting the air conditioning unit. This unit operated very efficiently with one particular combination.

The Chrysler Air-Temp unit required a source of power other than the radar power plant, due to its excessive surge starting current. Various combinations of two of the three existing roadside openings of the trailer were used for connecting the air conditioning units. It was ascertained that the cooling capacity of this unit was not large enough to handle the heat liberated inside the trailer.

The York Air Conditioning Unit is superior to the Chrysler Air-Temp Unit in the following ways:

a. It has a larger cooling capacity.
b. It has its own power source (self-contained).
c. It will more efficiently reduce the temperature inside the trailer below the temperature outside the trailer.

In view of this, it has been recommended that the York Unit be adopted for use with all Radar Sets AN/MPG-1.

Offset Method Firing. Development of procedure for the offset method of firing with the AN/MPG-1 radar is continuing. During a recent 155mm regular service practice, the tracking scope of the AN/MPG-1 was photographed in order to test the camera set-up.

Current tests include the attachment of a second remote "B" (spotting) scope to the AN/MPG-1. It was found that photographing the tracking scope or the remote "B" scope on the radar interferes to some extent with the respective operators. It is planned to place the second remote "B" scope in a separate trailer or building, thereby removing the camera record section from the radar trailer. Tests to date have shown that a second remote "B" scope will operate satisfactorily without affecting the efficiency of the radar. Also under study is a method of photographing range and azimuth indicators on the radar in order that these data may be coordinated with the photographs of the splashes.

127-foot Mine Planter. Actual construction of the new mine planter, mentioned briefly in a previous issue, is expected to begin in a few months. The ship is to be built by the New York Engineering Company. Both design and construction are under the auspices of the Transportation Corps Board.

Some of the basic principles in design differ greatly from those of the M1 class mine planters. The 127-foot vessel while capable of handling lightweight cable is designed primarily as a mine planter and not a combination cable ship-mine planter. It will be a simple work boat, designed to be highly maneuverable. It will require a small crew and will not be a separate unit but part of the mine flotilla section. Special emphasis has been placed on ample deck space, and selection, design and location of deck equipment.

Every effort has been made to speed up, simplify and make safer the job of preparing and planting the mine.

The vessel will be 127 feet long with a 35-foot beam and 8-foot draft. It will be propelled by two 500-horsepower diesel engines through two Voith-Schneider cyclodal propellers. It is the first ship designed expressly for cyclodal propulsion to be built in this country. The propellers are captured German units. The cyclodal propeller differs radically from the conventional screw type propeller. The direction of thrust is controllable through 360 degrees. Hence, steering is accomplished through the propellers and no rudder is employed on the vessel. The system of propulsion is so flexible that the vessel may be brought out broadside from a dock in a crabbing motion. In tests conducted with a captured German vessel, equipped with cyclodal propellers, the vessel was brought to a standstill from full speed ahead in one-half the ship's length. This type of propeller should make the new mine planter highly maneuverable. Top speed is expected to be about 12 knots.

The deck arrangement includes a working space 30 feet long and 34 feet wide. There will be sufficient distance between the cathead and the reels to assure a reasonably level lay. The reel positions are to be equipped with elevators and a stub shaft arrangement so that cable reels may be changed in the mine field without using the ship's crane. The cathead is designed as an integral part of the bulwark. When it is being used, it is pushed out and when not being used, it is raised to form part of the rail. It will not have a long projection on the deck as has the present type cathead. The cathead sheave will be at deck height, thus obviating the use of snatch blocks on the deck for obtaining a favorable lead to the cable reels and capstans. Mines will be planted from davit cranes located both port and starboard just forward of the cargo ports. Those cranes a have power traverse and a 250-foot whip. These whips operate with the same speed as does the whip on the class mine planters. The davit crane machinery wil located in the 'tween decks space under the working A 10-ton crane will be mounted just forward of the house. This crane is to be used to load the planter and not designed for use while in the mine field. There will two capstans on the main deck working area, one forw and one aft, both on the centerline of the ship. Contr for the deck machinery are to be located in both the p and starboard sides of the pilot house, next to the cyclo drive control stands. Thus the master will have control the deck machinery operators. Moreover, the operators be able to see the entire working deck and can see over sides of the ship while watching the planting and cable ing operations.

The deckhouse on the main deck will contain the ga and mess room. A steam table will be in the galley so food may be prepared ashore and kept warm until requi The ship's crew and the planting crew can be fed in th sittings. Officers' and crews' quarters, will be on the l deck.

The pilot house will contain three control stands for cyclodal propellers; one on the port side, one on the s board side and one amidships. Deck machinery con stands will be located next to the port and starboard cyclo drive control stands. The ship's radio and chart table an be mounted in the rear of the pilot house just aft of center control stand. The ship's navigation equipment cludes radar, a recording fathometer and a radio direct finder. All in all it will be a much more efficient and nomical ship to operate.

Excerpts from an address by General George C. Kenney

This is a good country we have here in spite of the fact that every once in a while we get upset about something and loudly proclaim that it is going to the dogs. Actually we like it and we like what we have come to call our American way of life. We have fought for it before and if necessary we will fight again to preserve it. But if we do have to fight for it again, we should do what we can ahead of time to insure that we emerge from the conflict a winner.

We must not lose interest in national defense. We lost interest after the last war. Pearl Harbor woke us up barely in time. But if we lose interest again, we have only to l at the tangled wreckage of Hiroshima and Nagasaki to what price we will pay.

To defend this country of ours, its ideals, its princip its freedom, its civilization—all the things that make l worth-while to us, we need a strong, well-organized, m ern, intelligent, and effective military establishment. need it just as any city needs an effective police force maintain order and respect for law and the rules of comm decency.

Coast Artillery Journal

Fifty-fifth Year of Publication

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

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

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

This beach scene during the invasion of Moratai Island in the Halmahera Group has been used as a cover illustration for this issue since it symbolizes the participation of the 32d Brigade units in innumerable amphibious operations.

Organized Reserve Corps

The following additional list of state instructors and their locations has been announced by the War Department:

FIRST ARMY

Colonel Harold C. Vanderveer, FA, Senior Instructor, Boston, Massachusetts.

Colonel Irving C. Avery, Inf., Senior Instructor, Trenton, New Jersey.

SECOND ARMY

Colonel Henry F. Grimm, CAC, Senior Instructor, Columbus, Ohio.

Colonel Frederic W. Boye, Cav., Senior Instructor, Washington, D. C.

FIFTH ARMY

Colonel Charles C. Higgins, Inf., Senior Instructor, Topeka, Kansas.

Colonel Raymond R. Tourtillott, Inf., Senior Instructor, Minneapolis, Minn.

Colonel Luke D. Zech, Inf., Senior Instructor, Nebraska.

Colonel Lawrence B. Wyant, Cav., Senior Instructor, Bismarck, N. Dak.

Colonel John U. Ayotte, Inf., Senior Instructor, Rapid City, S. Dak.

Colonel Wilson T. Bals, Cav., Senior Instructor, Milwaukee, Wisconsin.

Colonel John E. Doyle, Inf., Senior Instructor, Cheyenne, Wyoming.

SIXTH ARMY

Col. Robert W. Yates, FA, Senior Instructor, Helena, Montana.

Colonel George D. Wahl, FA, Senior Instructor, Portland, Oregon.

The above list includes the following changes in assignment which have been announced: Colonel Henry F. Grimm, CAC, is now Senior Instructor for Ohio instead of Colonel George F. Young, Colonel Raymond R. Tourtillott, Inf., replaces Colonel John T. Landis as Senior Instructor for Minnesota and Colonel Luke D. Zech is Senior Instructor for Nebraska instead of North Dakota.

ERRATA—September-October Issue

The following officer's name was inadvertently omitted from the address supplement distributed with the September-October issue:

Colonel Edward E. Farnsworth, Jr.
Allied Control Commission for Rumania.
Bucharest, Rumania
APO No. 777, New York, New York.

General Hardy Given Federal Recognition

Federal Recognition as a General Officer of the National Guard has been given to Brigadier General David P. Hardy of San Francisco, California as Commanding General of the 112th AAA Brigade.

In 1915, General Hardy was commissioned a second lieutenant of Infantry in the California National Guard. He entered federal service for World War I in 1917.

He returned to the California National Guard as a Captain in the Coast Artillery Corps on 15 July 1920 and after serving through the intermediate ranks, he was promoted to Colonel on 24 October 1938.

General Hardy entered the Federal Service for World War II on 16 September 1940 and was ordered to Camp McQuaide, California as Commanding Officer of the 250th Coast Artillery (155mm Gun).

He took the regiment to Alaska in the summer of 1941 where his guns, emplaced from Sitka to Dutch Harbor, were the main defenses of Alaska for many months.

He was promoted to Brigadier General on 5 November 1941 and three days later left to assume command of Camp Pendleton, Virginia.

Pearl Harbor was attacked while he was en route so immediately upon arrival, he was assigned to command the Harbor Defenses of Chesapeake Bay.

In the fall of 1944, while he was commanding Headquarters and Headquarters Battery, Special Troops, AGF at Ford Ord, California, the XXXVI Corps arrived on the west coast and General Hardy was assigned as Deputy Corps Commander under Major General Charles H. Corlett.

Soon after V-J Day, General Hardy requested relief from active duty. Upon completion of his terminal leave, he w placed on the inactive list 12 February 1946.

Bigger Atomic Bombs in Prospect*

It is becoming tiresome to talk about the bomb. But the fact of the bomb at Hiroshima, Nagasaki and Bikini not sufficiently convincing, further potentialities of th bomb should be sufficient to startle the most sluggi minded among us. The bomb dropped at Nagasaki, whi was an "improvement" over the Hiroshima bomb (and was substantially the same type bombs which were explode at Bikini), was a very crude affair judged by the testimo of the men who made it. It is very crude compared to wh they believed is possible by way of purely mechanical im provement. By devices which are comparable to those em ployed in improving the Nagasaki bomb over the Hiroshi bomb it is certainly possible substantially to increase its de structive power. It is certainly possible to increase the quan tity of the fissionable material in the bomb. We talk tod of the bomb in terms of the equivalent of twenty thousa tons of TNT. From firsthand information given to me b the scientists whose prophecies were uncannily perfect du ing the course of the war, there can be little doubt th within the next ten years, to be conservative, bombs of size of the power equivalent of one hundred thousand to tw hundred fifty thousand tons of TNT can be made, som thing over ten times more powerful than the bomb dropp on Hiroshima. And if we can move to the other end of th periodic table and utilize hydrogen in the generation o energy, we would have a bomb somewhere around on thousand times as powerful as the Nagasaki bomb. I ha been told by scientists who are not mere theorists but wh actually planned and made the bomb which was explode in New Mexico that, given the same intensive effort whi was employed during the war toward the production that bomb, we were within two years time at the close the war of producing a bomb of the hydrogen-helium typ *i.e.*, a bomb of approximately one thousand times the pow of the present bombs. The rocket and jet propulsion an biological forces, all infinitely more effective than the ge eral public has yet comprehended, can be added to atom warfare and with them it does not require much imagin tion to understand how the rate of extermination on th planet can be increased.

All these are the potentialities of the bomb. If Bikini anything else has caused any of you to feel that the bom as we now have it was not so much after all—read Hersey account of what happened at 9:15 on the morning of Au gust 6 last year in a city on the other side of the wor This was the crudest type bomb of all. We do not use any more. It is not efficient enough. It only laid waste o city and only killed instantly 80,000 people.

It is weapons such as these which bring us within t deadly perimeter of destruction with a vengeance. But much as the character of modern weapons, our very p sition in the world insures that we shall be well within t perimeter should we have another war.

*From the article "Security in the Atomic Age" by John J. McC former Assistant Secretary of War, which appeared in the January 19 issue of the *Infantry Journal*.

[1]*Hiroshima*, by John Hersey. Published by Alfred A. Knopf, $1 This account was first published in *The New Yorker* magazine.

ROTC Summer Camps In 1947

Plans for the resumption of ROTC summer training periods, suspended after 1941, have been announced by General Jacob L. Devers, Commanding General, Army Ground Forces.

To be conducted at selected camps throughout the United States commencing this coming summer, the training is tentatively scheduled to be at least six weeks in length.

Students in the Advanced Course of the Senior ROTC (third and fourth year college level) will attend at least one of the summer camp sessions as a required supplement to the training received by them during the regular academic year. Attendance will normally be during the summer preceding their final year of college.

While attending camp, students will receive the pay of an army private—$75 a month—and will be paid for the necessary travel at the rate of five cents per mile from the school to the camp and return.

Approximately one-half of the training period will be devoted to instruction in subjects common to all branches of the service, with the remaining time devoted to the tactics and techniques of individual branches.

The training will consist of either five 8-hour days, or four 8-hour days and two 4-hour days, at the discretion of the camp commander.

Individual branch ROTC units, exclusive of Air Forces and Medical Department units, include Infantry, Field Artillery, Antiaircraft Artillery, Seacoast Artillery, Armored Cavalry, Military Police, Corps of Engineers, Signal, Transportation, Quartermaster, Ordnance, and Chemical Corps.

The traditional reveille and retreat formations will be held daily except Sunday or when the schedule calls for no afternoon training.

Textbooks required by students for the summer camp period will be furnished by their ROTC units prior to departure for camp.

AGF G-3 Section Sets Up Training, Operations Groups

Two major groups—one for training and the other for operations—have been created in a reorganization of the G-3 Section, Headquarters, Army Ground Forces, according to General Jacob L. Devers, Commanding General.

The section was reorganized by Major General Herbert L. Earnest, Assistant Chief of Staff, G-3, at General Devers' direction to achieve greater effectiveness and economy of operation.

The work of the G-3 Section has been materially increased in recent weeks by the inactivation of the Replacement and School Command, the assumption by AGF of responsibility for the recruit training of all Army enlisted personnel except those going to the Air Forces and increasing responsibility by AGF for the organization and training of civilian components.

Brigadier General Bruce C. Clarke will be head of the Training Group. This group will handle Schools, Replacement Training, Troop Training and Civilian Components.

Brigadier General George W. Smythe will be in charge of the Operations Group. This group will handle Operations, Organization and Equipment, and Training Publications and Aids.

Army Initiates New Officer Candidate Selection System

The United States Army has instituted a new officer candidate selection system which will guarantee the Army the best qualified and highest caliber men available in the ranks of the Army as officer candidates, the War Department announced recently.

It is thought that the new plan for the selection of officer candidates, effective February 1, 1947, will guarantee a sound and uniform method and procedure for the selection of officer candidates on an Army-wide competitive basis. For the first time in history, an enlisted man will evaluate the qualifications of another enlisted man to attend Officer Candidate School. The program also provides that selection for O.C.S. will be based more on intelligence and officer-like qualities than on a formal educational background.

The Officer Candidate School Program has been reorganized to provide that all enlisted men, flight officers, or warrant officers desiring commissions in any of the ground arms or the technical and administrative services must attend an Army Officer Candidate School of six months duration at Fort Benning, Georgia. Any such individual desiring a commission in the Army Air Forces (other than through flight training) must in addition attend the Army Air Forces Officer Candidate School, San Antonio, Texas for a like period.

Upon graduation from the Army Officer Candidate School, each individual will be commissioned as a 2d Lieutenant, Army of the United States, and assigned to a basic associate course of three months duration, conducted by the arm or service for which the individual has been selected.

At the successful completion of approximately three months of the specialized training offered at one of the basic associate courses, the individual officer will be assigned to duty within the arm or service conducting that particular course. Graduates of the Army Air Forces Officer Candidate School will be assigned to specialized, technical, or administrative officer training schools peculiar to the Army Air Forces.

Any enlisted man or warrant officer qualified under the provisions of the program may apply for either school.

In order to qualify for selection, an applicant must have attained his 19th birthday and must not have passed his 31st on the date of enrollment in the course for which selected. No waivers of age will be granted. He must be a citizen of the United States and must have had at least six weeks continuous service immediately preceding the date of application, and must have completed the Military Training Program or Army Air Force training standard prior to the date of enrollment. This provides that a man entering the Army can qualify for O.C.S. upon completion of his basic training. However, only those individuals receiving the highest composite scores will be permitted to attend O.C.S. from training centers. Army experience during the war proved that although a good percentage of eligible men brought into O.C.S. from training centers proved excellent officer material, the man completely familiar with the Army for a period of time was better equipped for his duties later in his career as an officer. Consequently, it is anticipated that the greater proportion of officer candidates will be made up of men who have served in the ranks for a time.

National Guard

In addition to the list published in the November-December issue, the following assignments of National Guard Senior and CAC instructors have been made:

California—Colonel John L. Goff, CAC, Brigade Instructor.
Florida—Colonel Kenyon P. Flagg, Senior Instructor.
Georgia—Major Rueben W. Mundy, CAC, Instructor.
Kansas—Colonel George I. Smith, Cavalry, Senior Instructor.
Maine—Major Edmund Castle, CAC, Instructor.
Massachusetts—Colonel Warren H. McNaught, FA, Senior Instructor.
Michigan—Colonel Edward R. Roberts, FA, Senior Instructor.
Minnesota—Major Andrew R. Grant, CAC, Instructor.
New Jersey—Lieutenant Colonel Robert T. Conner, CAC, Instructor.
New Mexico—Lieutenant Colonel John R. Seward, CAC, Instructor.
New Mexico—Lieutenant Colonel Seneca W. Foote, CAC, Instructor.
New Mexico—Captain Robert M. Walker, CAC, Instructor.
Pennsylvania—Lieutenant Colonel Earl M. Corothers, CAC, Instructor.
Virginia—Captain Harry T. Simpson, CAC, Instructor.
Virginia—Major Christopher B. Cushing, CAC, Instructor.
Washington—Lieutenant Colonel Fred E. Dueker, CAC, Instructor.

Lieutenant Colonel Robert B. Barry, Jr., is no longer assigned as a CAC instructor for the State of New York. Colonel Edwin E. Keatley has been transferred from the position of Senior Instructor, State of South Dakota, and Colonel Dean Luce is now a CAC instructor for the State of Washington instead of Senior Instructor.

Below listed by states and cities, are all the Coast Artillery Corps National Guard units which have been federally recognized since the last issue of the JOURNAL:

Delaware—Headquarters and Headquarters Battery, 736th AAA Gun Battalion (SM), Wilmington.
Florida—692d AAA AW Battalion (SP), Jacksonville.
Illinois—Headquarters and Headquarters Battery, 202d AAA Group, Chicago.
Minnesota—Battery C, 257th AAA AW Battalion (SM), Pine City.
New Jersey—Headquarters and Headquarters Battery, 310th AAA AW Battalion (SM), Jersey City.
Pennsylvania—Medical Detachment, 707th AAA Gun Battalion, Philadelphia; Battery A, 690th AAA AW Battalion (SP), Allentown and Harrisburg; Battery D, 690th AAA AW Battalion (SP), Lebanon and Pottsville; Battery C, 73rd AAA Gun Battalion, Bethlehem.
Rhode Island—Headquarters and Headquarters Battery, 243rd AAA Group, Providence; Headquarters and Headquarters Battery, 243rd AAA AW Battalion (SM), Providence; Headquarters and Headquarters Battery, 705th AAA Gun Battalion, Providence.
Texas—696th AAA AW Battalion (SP), El Paso.

National Guard Training Plan Announced

As the first step in carrying out its six-year training program for units of the National Guard the Army Ground Forces has completed its detailed plan for the first two years of the program.

The plan will be put into operation by National Guard commanders all over the country when individual organizations reach the required percentage of authorized officer and enlisted strength.

Under the over-all objective of standardizing the training of Guard units in every state, the plan provides detailed instructions for the training of individuals and units on a company level during the first and second years. Other plans, which will deal with training on a battalion level during the third and fourth years, on a regimental combat team and combat command level during the fifth year, and on a divisional level during the sixth year, will be announced at later dates.

A special course of instruction has been drawn up for each of fourteen types of units. These are Antiaircraft Artillery, Armored, Bands, Cavalry, Chemical, Seacoast Artillery, Engineer, Field Artillery, Infantry, Medical, Military Police, Ordnance, Signal, Quartermaster and Transportation Corps.

Each course is based on a minimum of 96 hours per year of armory training and a minimum of 92 hours per year of summer training. Troop schools will be conducted during the armory period.

A group of approximately 40 subjects will be taught during the two-year period. Instruction in basic and general subjects will be common to all branches. In addition to instruction common to all branches, specialized branch instruction will be given each branch in its own arms, equipment and tactical employment.

* * *

To the Editor

Lieutenant Colonel Orman, in his article on IFF in your November-December issue, asks for suggestions on a positive method of identification for aircraft. Here is one for what it is worth, if any:

Paint our aircraft, or at least the forward part of each airplane, with a non-reflecting coating such as was used on submarines during the late war. This coating will give a negligible radar echo in one narrow band of frequency. The search radar then simply has to be tuned (or an auxiliary set can be tuned) through this frequency band when an unidentified pip is seen. If the pip fades out at the proper point, the plane is friendly. If this fade-out point happened to coincide with a principal radar band of the enemy, a double purpose would be served in concealing our planes from his radar. If the coatings could be made up in plastic sheets, it might be possible to change them to different frequencies occasionally for secrecy, and they might not weigh much more than present IFF equipment.

I hope this suggestion isn't the most ridiculous one that you receive.

Yours truly,
RALPH H. PRYOR,
Lt. Col., CAC.

This letter is reproduced here with the hope that it will bring forth suggestions from other readers.—ED.

About Our Authors

Lieutenant Colonel David B. Parker, after commanding he 934th Engineer Construction Group on Luzon and ater holding the position of Tokyo Area Engineer, reurned to the States in January 1946. In March he was ven his present assignment with the Manhattan Projct. *(Page 11.)*

Jim Marshall writes for *Collier's* and it is a reprint of one these articles that appears in this issue. *(Page 20.)*

Majors J. P. D'Arezzo and W. B. Sigley have been Army round Forces Liaison Officers at the Applied Physics Labatory, Johns Hopkins University for over a year. *(Page 1.)*

Lieutenant Colonel Leonard M. Orman runs his conecutive string of radar articles up to seven in this issue. For ur new readers, he is an instructor in the Department of lectronics and Electricity at the United States Military cademy. *(Page 26.)*

Lieutenant Colonel Harlan B. Ferrill is Chief of the rmy-Navy Flak Intelligence Group, Headquarters, Army ir Forces. From May 1944 to October 1945 he was Flak ntelligence Officer, 7th Air Force and Headquarters, U. S. rmy Strategic Air Forces, Pacific Ocean Areas. *(Page 30.)*

Colonel Carl F. Tischbein writes his second article on ussia for us. His first in the November-December issue was well received that we requested him to give us the one hich appears in this issue. *(Page 35.)*

Lieutenant Colonel Alvin T. Bowers is a member of rmy Ground Forces Board No. 4 at Fort Bliss. *(Page 39.)*

Lieutenant Colonel R. H. Holt is now an AAA instructor the School of Combined Arms of the Command and taff College. During his thirty months in the South Pacific as a battalion commander, a regimental S-3 and finally task force G-3, he participated in planning the combat oding for many AAA units. *(Page 43.)*

G. Edward Pendray is one of the country's foremost proonents of rocket power and has been associated with the evelopment of rockets since about 1930. He helped organize the American Rocket Society. He is now assistant the President of Westinghouse Electric and Manufacturing Company. *(Page 48.)*

Lieutenant Colonel Robert C. Gaskill as a prisoner of ar of the Japanese from April 1942 to VJ Day had an opportunity to observe them during the height of their triumphs and just recently witnessed the contrast when called Japan to appear before the War Trials Commission. his is Colonel Gaskill's third article for the JOURNAL. *Page 51.)*

Lieutenant Lawrence Sanders makes his third contribuon to the JOURNAL in as many issues. We think this is his st story to date. *(Page 52.)*

Lieutenant Milton M. Meisels has had extended combat perience in Europe as a forward observer with armored illery. *(Page 58.)*

Albert L. Ruiz is connected with the General Electric ompany's Federal and Marine Divisions. As an applicaon engineer in the marine field, Mr. Ruiz did extensive rk in the field of Naval Ordnance during the war. Durg his seventeen years with General Electric, he has also en associated with the Aeronautical and Marine Division that company. *(Page 60.)*

Unit Histories

The following unit histories have been received at the Journal office since the last issue:

35th AAA Brigade
548th AAA AW Battalion
602d AAA Gun Battalion

In the last issue, we erroneously reported receipt of the 38th AAA Brigade history. This should have been the 38th AAA Group.

Other units that have published histories or contemplate doing so, are urged to send copies to the JOURNAL for our permanent file which will be used as a readily accessible source of CAC history.

ROTC Interim Uniforms Authorized

The War Department has authorized new interim uniforms for students enrolled in Senior ROTC courses, according to Major General Edward S. Bres, Executive for Reserve and ROTC affairs.

Limited to students enrolled in ROTC courses at college level, the authorization calls for Elementary Course (first and second year) students to receive "green" blouses and trousers. Advanced Course (third and fourth year) students will be authorized "green" blouses and "pink" trousers. Both the elementary and advanced students will be furnished officer's short-style wool overcoats.

It is emphasized that the authorized issues are interim only until June 30, 1948, or such time thereafter that stocks become adequate to provide civilian component groups with uniforms of the same shade as now worn by the Regular Army or until it is definitely determined whether or not a distinctive uniform of a different shade will be adopted for issue to Senior ROTC students and adequate stocks of such uniforms permit issuance.

New Tablet For Heating Rations

During the Alaska and Aleutian tests this winter Army Ground Forces task forces "Frigid" and "Williwaw" will test a new type of heat tablet, known as trioxane, developed by the Quartermaster Corps for the use of soldiers in heating their combat rations while on field operations.

Tests heretofore conducted have indicated that this heat tablet is superior to other types previously used. It is nontoxic, burns with a steady blue flame and does not give off any appreciable odors. It is not easily extinguished by wind.

This trioxane tablet of 30 grams is approximately 3 inches long, 1¼ inches wide, and 5/16 inches thick, and is packed in a sheet of cellulose acetate laminated to aluminum foil. One tablet provides sufficient heat in still air to raise the temperature of a pound of water approximately 100 degrees Fahrenheit.

General Arnold Appointed AGF Chief of Plans Section

Major General Archibald V. Arnold, former Commanding General of the 7th Infantry Division in the Pacific Theater, has been named Chief of the Plans Section, Headquarters, Army Ground Forces, it has been announced by General Jacob L. Devers, Commanding General, Army Ground Forces.

Coast Artillery Newsletters

ANTIAIRCRAFT SECTION, GHQ, AFPAC, TOKYO, JAPAN, APO 500
BRIGADIER GENERAL WILLIAM F. MARQUAT, *Antiaircraft Officer*

Though progressing slowly, the improvement of conditions affecting antiaircraft artillery in the Pacific is apparent. Despite the almost full-time burden of operating personnel centers, supply depots, and occupation duties, some time is being found for active training of antiaircraft artillery units. It is hoped that the coming months will see a gradual lessening of the additional tasks required of these units so that they may once more engage in a thorough training program.

It is understood that recent War Department approval of the plan to utilize antiaircraft artillery technical instruction teams in this theater may be adopted on an army-wide basis. Antiaircraft Artillery commanders in this theater are looking forward to the arrival of the first group of instruction teams in order that they may supplement present training with the latest available technical information.

Antiaircraft Artillery target requirements, for this theater, for the current year and for 1948 have been forwarded to the War Department. Maximum use will be made of OQ and PQ type target planes. Towing planes will be provi by tactical aircraft; B-25's initially, and modified A-26 they become available. "R" flights, for the operation of r controlled PQ type planes, will be organized in Hawaii in the Philippines. The Philippines unit will serve Okin and Japan and the Hawaiian unit will serve Oahu and Marianas.

The "Report of AAA Activities in the Pacific War," pared under the supervision of this office, has been appro for publication by the Historical Division of the War D partment Special Staff. Distribution of this interesting do ment is now being made.

Colonels James G. Devine, Donald C. Tredennick, Harry S. Tubbs have recently arrived in Japan. Colo Devine is assigned to Hq., Eighth Army, and is perform military government duties. Colonel Tredennick has be assigned to the 138th AAA Group. Colonel Tubbs is signed as liaison officer between Hq., Eighth Army and H British Commonwealth Occupation Forces.

865TH AAA AW BATTALION (SP) KOREA, APO 712

LIEUTENANT COLONEL GEORGE A. BALDRY, *Commanding*

The 865th AAA Auto Wpns Battalion (SM) arrived at Inchon, Korea on 2 December 1946 and was immediately transported to Kimpo Airfield where it took over the facilities and missions of the 452d AAA AW Battalion (SP). A consolidated battalion area there is nearing completion and, although work is continuing in and around each battery, the battalion has quickly settled down to the normal performance of duties.

On 3 December 1946 the organization was redesigna 865th AAA AW Battalion (SP). The details incident this change, together with property transfer, readjustme of officer assignments to include all officers formerly signed to the 452d AAA AW Battalion (SP), and the in tivation of that battalion have consumed much of the ti since arrival. A part-time training program has been put effect.

The battalion is indebted to the members of the 4 AAA Auto Wpns Battalion (SP) for the foresight, plann and work accomplished in anticipation of our needs.

138th AAA Group, Yokohama, Japan, APO 503

Colonel Charles A. French, *Commanding*

The 138th AAA Group, comprising Group Headquarters and Headquarters Battery, 753rd AAA Gun Battalion (SM), 209th AAA AW Battalion (SP) and 933rd AAA AW Battalion (SM) continued its primary mission of performing security guard in the Yokohama area. Twenty-three arrests were made during October and November. Two other group units, the 162nd AAA OPS Detachment and Btry "C", 325th AAA Slt Battalion have training as their primary mission and are achieving excellent results at Johnson Army Air Base, Irumagawa.

Training is continuing on a rotation basis. The 209th AAA AW Battalion (SP) has wound up AA practice for all batteries. This included general field training and firing at towed targets. The 933rd AAA AW Battalion (SM) started AA firing practice in December when A Btry motored to Mito on 2 December.

Mito Air Field was a Japanese bombing and strafing practice school and has been taken over by the Fifth Air Force for the same purposes. The number and varied type of planes flying these bombing and strafing missions provide ideal tracking targets for units when tow missions are not down.

The firing point, a large bowl-shaped valley, opening toward the ocean, was heavily covered with trees and brush when the 209th AAA AW Battalion undertook the task of making it into a firing point. This did not prove too difficult however. The mayor of Haraiso turned out the whole town one Sunday to cut the brush and take it home for firewood.

Btry "A" 933rd AAA AW Battalion (SM) fired familiarization with their M-55s during the week 18-23 November 1946 at Chigasaki beach. The firing point was near picturesque Eno Shima, a long famous tourist mecca of Japan.

The 933rd AAA AW Battalion (SM) contributed three men to the Eighth Army (Chicks) football team. They also have a quartet which is fast gaining fame for its interpretation of hymns on Radio Station WVTR, having made some ten presentations over that station.

The men of the 753rd AAA Gun Battalion completed their chapel on Thanksgiving Day and are proud of the result. The chapel, set in a Shinto Shrine Park, suggests strongly the theme of freedom of worship. Made of a quonset hut, it has a twenty-five-foot tower, stained glass windows, indirect lighting and hand-carved doors and altar. It was constructed by Japanese laborers who bow to the shrine on their way to work. The chapel was built in the shrine park without disturbing any of the religious symbols in the park. In fact, the Japanese still come to pay tribute and pray before the Shrine which is located across the park from the chapel. The stained glass chapel windows were formerly in a Japanese ammunition storage dump. The bell in the chapel tower was formerly on a Japanese warship. The Gunners call their church the "Little White Chapel in the Park." The park is also quite scenic, being surrounded by an avenue of cherry trees.

The 138th AAA Group participated in an Armistice Day Parade 11 November 1946. A provisional battalion was formed consisting of two batteries from the 209th, two batteries from the 753rd and one battery from the 933rd. As in the 4th of July Parade, the Antiaircraft "stole the show" with vehicles and equipment in "tiptop" condition and precisely driven. The men, their helmets shellacked, alert and smartly turned out, presented a stirring spectacle and won the high praise of all who witnessed the parade. Commendations were received from Lt. Gen. Eichelberger, Eighth Army Commander, and Brig. Gen. Weible, Yokohama Base Commander, who was the reviewing officer.

Colonel Donald H. Tredennick, recently arrived from the Hawaiian Department, has joined the Group.

The chapel constructed by members of the 753rd AAA Gun Battalion.

32D AAA BRIGADE, LUZON, P.I., APO 707

BRIGADIER GENERAL FRANK C. MCCONNELL, *Commanding*

The most important event to be covered by this newsletter was the observance of "Brigade Day" on 21 October by all members of Headquarters and Headquarters Battery. On 13 May 1946, in General Orders No. 7, Hq, 32d AAA Brigade, General McConnell designated 20 October 1946, and the anniversaries thereof, as "Brigade Day." The announcement as contained in General Orders No. 7 is reproduced herewith:

ANNOUNCEMENT OF "BRIGADE DAY"

"In accordance with paragraph 7, Army Regulations 345-105, 18 November 1929, the designation of 20 October 1946 as "Brigade Day" is announced. This day and anniversaries thereof will be observed as a holiday by all personnel of this organization with suitable ceremonies to commemorate the history and traditions of the Brigade. As far as practicable, on that day all military duty for the organization concerned will be suspended. If it falls on Saturday, Sunday, or a holiday the day following or the day preceding will be designated as the official day. 20 October has especial significance in the Brigade history. On that day in 1944, its officers and men landed on Leyte, in the assault waves, thereby participating in the liberation of the Philippine Islands from the Japanese Invaders. This was the initial battle of the Southern Island campaign. The accomplishments of the 32d Antiaircraft Artillery Brigade in providing a highly effective antiaircraft defense during the initial phase of landing and during subsequent operations, reflect great credit upon the Brigade and its attached units. Its weapons made Japanese air attacks so costly in airplanes and men that by the latter part of December, such attacks had almost ceased. It is therefore deemed fitting that this date be designated as Brigade Day since it has a greater historical significance than the actual date of organization."

On the anniversary of this historic day, General McConnell addressed the personnel of Headquarters and Headquarters Battery at Camp Camarilla, after which the entire battery took a trip to famed Corregidor, located at the entrance to Manila Bay. The battery left the Small Boat Pool, located on Dewey Boulevard, aboard two FS boats, and after dinner, which was served at San Jose Beach, Corregidor, made a tour of the island, visiting Bottomside, Middleside, Topside, a number of the wrecked gun positions, including famous Batteries Geary and Way, and Malinta Tunnel. Since most of the men of the battery are new in the Army, Corregidor was selected because to many of us "old-timers," it now stands as a hallowed shrine in eternal memory of those gallant Coast Artillerymen who defended h courageously against the Japanese invaders.

More changes in the assignments and duties of o personnel took place during the month of October. Co Peter K. Kelly, CAC, was relieved from assignment to Headquarters and was assigned to Headquarters, Philip Ground Force Command, with duty as G-4. Major Pau Hannah, CAC, and Captain Nelville B. Lord, FA, return from 45 days TDY in the United States and were relie from assignment to this Headquarters and were assigned Headquarters, Philippine Ground Force Command. Mi William A. Ryan, Cav, was detailed Executive Office the Brigade and was designated Post Executive Off Camp Camarilla, in addition to his other duties. First L tenant Charles Y. Roberts, CAC, Headquarters Bat after completing a course in Motor Pool Operation at AFWESPAC Ordnance School, was detailed Motor O ficer, Camp Camarilla, in addition to his other duties.

Men of the Headquarters, 32d AAA Brigade visit Mali Tunnel, Corregidor during "Brigade Day" activities.

In addition to the on-the-job training which the men Headquarters Battery have been receiving, a number them have graduated from, or are attending the follow AFWESPAC Schools:

Ordnance (for automotive mechanics)
Signal (for the Communications Section)
Bakers and Cooks
Administrative Clerical School

Our radar repairman is attending the AAATC Rad School at San Marcelino.

Since our last newsletter, the A & R Section, AFWE PAC, has organized a new "Sweat Bowl" football leag composed of 16 teams. At this writing, the "Indians" fr Camp Camarilla are leading the league with three wins no losses.

On the 28th of September, a rainstorm and winds of h velocity caused minor damage to Headquarters and He quarters Battery buildings. Since then, the rains h lessened, there have been no typhoon warnings, and

ather has been generally pleasant, with warm days and l nights, making the out-of-doors working conditions uch more pleasant for all concerned.

Except for the absence of loved ones, Thanksgiving Day is year was as close to anything "Stateside" as one could sh for. Men in the hospital who were able to get passes the day were provided with transportation to take them to and from the Battery area. The same was done for those men on DS at the various schools in order that this "new" Battery might be together on their first Thanksgiving Day. The tables sagged from the assortment of foods that were placed on them. But the best of all was the cheerfully efficient waiter service provided by the senior NCO's of the battery to give this sumptuous repast its real finishing touch.

Lt. Col. Bernard J. Drew, *Commanding*

Still located at Army Supply Point No. 3, San Fernando, mpanga, Luzon, P. I., Headquarters and Headquarters ttery, 94th AAA Group continues the operation of a Sup- Point supplying all troops on central Luzon with Class II and IV Quartermaster supplies as well as procuring pplies of all the Technical Services for these same troops. Having operated this Supply Point since 15 June 1946, are beginning to get our feet firmly on the ground and to el like Quartermaster troops.

The exodus of personnel from Headquarters Battery to eplacement Centers during October and November leaves y one of the men present who arrived at this station with unit on 15 June. Replacements have arrived, but are mparatively new to the Army. Most are young high school aduates, eager to learn, and many are potential noncomssioned officers. As quotas are received, the more promis- are sent to Technical Schools in this area for training. any men have enrolled in the Philippine Institute for Armed Forces, in Manila, and attend classes three hts a week, even though it entails a ride of some eighty- miles nightly to attend these classes.

aptain Joseph P. McElligott, Executive Officer since rch 1946, having completed his tour of Overseas Duty, for reassignment in the United States on 16 November. Lieutenant Charles P. Mader, Class II and IV Officer of Supply Point since early September, left for the United tes for separation from the Service on 24 November. 1st utenant Walter W. Moore, who had been transferred to mp O'Donnell with the 10th QM Bakery Platoon on 17 ptember, was reassigned to the 84th QM Depot Supply Company on 24 October, but left for 25th Replacement Depot (PS) on 12 November for transfer to Okinawa. With the departure of these officers, the critical shortage of officers is making itself felt more than ever, with nearly all officers having three or more duties to perform.

Quotas are allotted to us from Philippine Ground Force Command for temporary duty at Camp John Hay, Baguio for rest and recuperation. All quotas for enlisted men were filled until 15 October on which date it was necessary to cancel quotas until 1 January, for the reason that no men were available with the necessary six months overseas service prior to period of temporary duty. All quotas for officers up to 18 November had been cancelled due to the critical shortage of officers to perform necessary duties.

On 25 October, the 9th Quartermaster Bakery Platoon was relieved from attached to 94th AAA Group and from assignment to Philippine Ground Force Command and was assigned to RYKOM. Simultaneously the 10th Quartermaster Bakery Platoon, which had been attached to the 94th AAA Group until 17 September was transferred to RYKOM. On this same day the 4th Platoon, 2078th Quartermaster Bakery Company (PS) (Prov) was attached to the 94th AAA Group and the 3rd Platoon, 2078th Quartermaster Bakery Company (PS) (Prov) was attached to the 12th Infantry Division (PS). All personnel from both the 9th and 10th Quartermaster Bakery Platoons were assigned to 84th Quartermaster Depot Supply Company, which is still attached to the 94th AAA Group and assisting in the operation of the Supply Point, and placed on temporary duty with the 4th and 3rd Platoons, 2078th Quartermaster Bakery Company (PS) (Prov) respectively, to assist in Phase III Training in Bakery Operation. This training being completed, these men returned to 84th Quartermaster Depot Supply Company on 14 November and the Philippine Scouts took over the operation of the Bakeries at ASP No. 3 and Camp O'Donnell.

Mrs. Kay S. Shook, wife of Captain Theodore Shook, Adjutant, 94th AAA Group, arrived in Manila on 25 August aboard the United States Army Transport, *General Aultman*. Mrs. Marion B. Drew, wife of Lieutenant Colonel Bernard J. Drew, Commanding Officer of the 94th AAA Group, arrived in Manila on 10 November aboard the United States Army Transport, *Admiral Hughes*. Both of these families are living at Clark Field, in the Ft. Stotsenburgh Area, in quarters furnished by the 313th Bombardment Wing (VH).

136th AAA Group, Okinawa, APO 331

Lieutenant Colonel F. T. Berg, *Commanding*

The effect of Readjustment Regulations has resulted in the decimation of the Antiaircraft Artillery enlisted strength during the past months. Strenuous effort has been made to continue the operation of the Group Headquarters by employing Filipino civilians and unskilled Okinawan natives. The contribution of the civilian employees has been limited because of the lack of supervisory personnel.

The recent arrival of the advance party of Philippine Scout units has already rejuvenated the Antiaircraft Artillery and increased the security, which had suffered because of personnel shortages and the inadequacy of the civilian guards.

Major General Christiansen, Commanding General, AFWESPAC, inspected the AAA area on 5 November 1946. He visited all battalion areas.

Officers received to date with the Philippine Scout troops are:

Major Roland E. Falls, CAC
Major Charles R. Rockwell, CAC
Captain John B. Cowgill, CAC
Second Lieutenant Benjamin P. Paras, CAC
Second Lieutenant Jose S. Capadocia, Inf
Second Lieutenant Juan N. Veracruz, CAC
Second Lieutenant Fructuoso Gallardo, CAC

Construction and improvement of the Awase Dependent Housing area is continuing under the Group's admin tion. As in the past, it is anticipated that units will co quarters for dependents scheduled to arrive on Okina

The Group looks forward with anticipation to the ing year. The combination of excellent area facilities, a climate and enthusiasm of the new personnel prom bright future for the AAA on Okinawa. The few o assigned to the original Antiaircraft Artillery units been transferred to Group Headquarters to fill the T vacancies. The Philippine Scout troops will arrive as plete units and will be attached to the Group. Their p nent designations have not yet been announced by the Department.

The new Okinawa AAA Officers Club building w ficially opened on 2 November 1946 when a formal was held.

The Club was honored with the presence of many o stationed at Okinawa including: Major General H berger, Commanding General, 1st Air Division; Bri General Hayden, Commanding General of Ryukyus C mand; Brigadier General Oliver, Chief of Staff, 1 Division.

"Typhoon Terrace" the AAA Red Cross Service C again in operation. This Club has been the center o diers' off-duty activities.

A training program for the Philippine Scouts has formulated to carry on the excellent training initiated b AAA Training Center at San Marcelino, P. I.

Antiaircraft Artillery Training Center

San Marcelino, P. I.

APO 74

Colonel Francis A. Hause, *Commanding*

The Training Center on 1 October 1946 had an officer strength of 65 officers and 3 Warrant Officers. This strength was increased by 1 November 1946 to 91 officers and 4 Warrant Officers. At the present date the officer strength is 111 officers and 5 Warrant Officers. The enlisted strength is 129 and there are 2,800 Philippine Scouts.

The first phase of training consisting of 13 weeks was completed and tests were held by the Philippine Ground Force Command. The results were satisfactory to the Commanding General. The training has continued with the 2086th AAA Searchlight Battalion displaying their beams nightly, tracking flying missions. The 2084th AAA Gun Battalion continued training on the 90mm gun and fire control instruments. The firing has been against terrestrial targets. The 2083rd AAA Automatic Weapons Battalion has been firing at terrestrial targets and upon OQ target planes with success.

The 2083rd AAA Automatic Weapons Battalion, the 2084th AAA Gun Battalion, the 2086th AAA Searchlight Battalion, and the 2085th AAA Operations Detach are preparing for overseas movement in the very near fu The Advanced Party consisting of 7 officers and 160 S left on 19th and 20th November to make preparation the main body.

Lieutenant Paul H. Stockdale, AGD, was assigne Adjutant replacing Major Charles D. Sauvinet, CAC, is now Public Relations Officer at AFWESPAC. L tenant Colonel Hubert duB. Lewis was relieved of mand of the 2083rd AAA Automatic Weapons Batt and replaced by Lieutenant Colonel Roland W. Estey. L tenant Colonel Lewis is now Commanding Officer of 2026th AAA Gun Battalion. Lieutenant Colonel Ce Bradley is now Commanding Officer of the 2086th A Searchlight Battalion. Lieutenant Colonel Lynn H. W has assumed command of the 70th AAA Group.

There are 8 families of officers now living on the res tion, Major Grambort's family having just arrived in Ma aboard the *Admiral Eberle* will be the ninth. The qua are being slowly completed and before long should be f occupied.

The recreation facilities have been very limited on Post due to excessive distance from a populated area. T have been boat trips to Corregidor Island on the Q Moving picture shows are now scheduled for every ev and a basketball league is being formed. The Service C damaged during the typhoon of 11 September 1946, process of being repaired and should be in operation b time this letter is published.

Hawaiian Artillery Command

COLONEL H. B. HOLMES, JR., *Commanding*

Since our last Newsletter, Major General Geo. F. Moore relinquished command of the Hawaiian Artillery Command and is now the Commanding General, Army Forces, Western Pacific.

Many of the officers of the Hawaiian Artillery Command are enrolled in the Oahu Officers Troop and Staff School at Schofield Barracks. This school was established by the Commanding General, AFMIDPAC, in compliance with WD Training Circular No. 9, 1946, and provides a standard course of instruction for officers who require additional schooling to round out their military education and prepare them to assume their responsibilities in the postwar Army.

All officers in the Hawaiian Artillery Command also are attending a brief course in atomic energy conducted under the auspices of Headquarters, Army Forces, Middle Pacific. The instructor in this course is Colonel C. H. Karlstad, Infantry, who, before coming to Hawaii, received a course in the same subject in the War Department. Colonel Karlstad is now assigned in the G-3 Section at Headquarters, AFMIDPAC.

Headquarters Hawaiian Seacoast Artillery Command

COLONEL LEONARD L. DAVIS, *Commanding*

As the year 1946 draws to a close, the personnel of the Hawaiian Seacoast Artillery Command can look back on a year which has brought about many changes in organization and personnel. Headquarters Detachment 57th CA Battalion and Headquarters Detachment 58th CA Battalion along with 607th CA Battery are the latest seacoast organizations to be inactivated. With the inactivation of Headquarters Detachment 58th CA Battalion on 10 December 1946 the last active seacoast organization on Oahu passed from existence. Thus ended for the time being a period of forty-five years during which there has always been an active seacoast unit on Oahu.

All seacoast troops have been removed from Fort Hase. This has resulted in a concentration of HSAC troops at Fort Kamehameha and Fort Ruger except for small maintenance detachments at the various seacoast batteries. Active units currently assigned to HSAC, consist of Batteries "A" and "B", 867th AAA AW Battalion, and Headquarters Battery HSAC at Fort Ruger.

Colonel Leonard L. Davis has replaced Colonel John T. de Camp as commanding officer of the Hawaiian Seacoast Artillery Command. Colonel de Camp has gone to Eighth Army.

During the period covered by this newsletter, the following officers have departed for the mainland: Major Allen Bennett, former Artillery Engineer, HSAC; Captain Francis J. O'Connell, former Battery Commander of Hq Detachment 57th CA Battalion and Captain Marcellus T. Hartman, former assistant S-3, HSAC.

Headquarters Hawaiian Antiaircraft Artillery Command

COLONEL WILLIAM L. MCPHERSON, *Commanding*

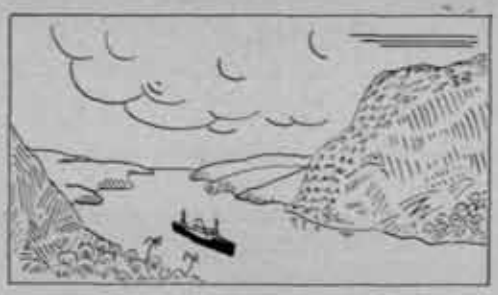
In keeping with the current reorganization throughout the Army, and in preparation for more efficient handling of peacetime duties, the Antiaircraft Artillery Command of Hawaii has undergone many changes in the past few months.

The 993d AAA Searchlight Battalion and the 295th AAA Searchlight Battalion have been inactivated. On 16 November, the 865th AAA AW Battalion, under the command of Lt. Colonel George A. Baldry, departed for duty in the Western Pacific. During the two months prior to embarkation, this unit was brought to full strength and received intensive training including day and night firing at towed and radio controlled targets.

Although the above has called for a maximum output of work by all personnel in the command, sports have not been neglected. Here, as in other parts of the world, football has been the particular interest of fans. The Hawaiian Artillery Command team, with a high percentage of antiaircraft artillery players, won the B league pennant but was defeated in the league play-offs. The prospects of an interesting basketball season are indicated by the organizing of seven basketball teams in the HAAAC.

Colonel William L. McPherson assumed command of the Hawaiian Antiaircraft Artillery Command after the transfer of Colonel Davis to the Hawaiian Seacoast Artillery Command.

Many officers who have been with the command since prewar days are leaving for the Continental United States, in compliance with a recent War Department Directive. Recent transfers to Japan included Colonels Pierre B. Denson, Donald C. Tredennick and Harry S. Tubbs.



ANTIAIRCRAFT ARTILLERY GROUP
PANAMA CANAL DEPARTMENT

COLONEL MARVIL G. ARMSTRONG, *Commanding*

On 1 December the Panama Coast Artillery Command was completely reorganized. The Harbor Defenses of Balboa became part of the Pacific Sector commanded by Brigadier General Francis P. Hardaway with Headquarters at Fort Clayton. The Harbor Defenses of Cristobal were absorbed by the Atlantic Sector commanded by Brigadier General Robert W. Berry with Headquarters at Fort Davis. A new AAA Group was formed to control the 903rd AAA AW Battalion and the 764th AAA Gun Battalion. This group, commanded by Colonel Marvil G. Armstrong with Headquarters at Fort Amador, is under the direct control of the Panama Canal Department.

The Harbor Defenses of Balboa and Cristobal both conducted mine practices during the months of November and December. The practice held at Balboa was a complete submarine practice with the usual two groups of mines. The practice was extremely successful. Due to personnel losses, the practice at Cristobal was, of necessity, modified to a large degree but both the mine battery and the Mine Planter *Weaver* obtained considerable training.

All units of the Coast Artillery Command participated in a Joint Army Navy operational exercise of the 14th and 15th of November 1946. This involved manning of all radar and gun positions and placing these on alert for tection of the attacking force which included the air carrier *Leyte* with a full complement of planes.

The antiaircraft gun and AW units of this command participated in a Joint exercise of the 26th of Novem 1946 with elements of the Sixth Fighter Wing. The S Fighter Wing staged an attack of fighter planes against locks area. The 903rd AAA AW Battalion provided a lated automatic weapons defense of the Pacific and Atl Locks Area.

All gun batteries of the 764th AAA Gun Battalion pleted firing of target practice with the 90mm guns. 903rd AAA AW Battalion has also completed target tices with 40mm guns.

Interest in athletic activities continues at a high particularly in boxing. The 903rd AAA AW Battalion the championship for the Panama Canal Department.

With the abolishment of the Panama Coast Art Command, the Coast Artillery Command Training Ce was redesignated the Latin American Training Ce During its existence from June 1940 to December 194 trained 6149 specialists in forty various courses. Le have been received from various civil institutions indicati that this training will be applied to the furtherance of school diplomas and college degrees for many of the dents.

In addition to its furtherance of the U.S. Military the Coast Artillery Command Training Center shared good neighbor policy to the extent of conducting selected and highly specialized courses completely in Sp ish for the benefit of ten of the Latin American Repub From these courses have been graduated a total of 125 La American students representing Chile, Ecuador, El Sa dor, Guatemala, Peru, Bolivia, Colombia, Paraguay, H duras and Nicaragua.

69TH AAA GROUP, SAIPAN, APO 244

COLONEL WILLIAM C. MCFADDEN, *Commanding*

Shortly after VJ-Day, the 69th AAA Group with its attached battalions was assigned the mission of operating the Western Pacific Base Command Personnel Center and Casual Depot. The mission of the Personnel Center and Casual Depot is to process and ship all ground and air forces personnel in the Western Pacific Base command, including civilian employees of the Government, going to or returning from the United States or Oahu. In addition the PC & CD also transports any casual personnel not stationed in the Western Pacific Base Command.

To date over 143,000 casuals have been processed by the Personnel Center and shipped to their destination.

This fall as the tempo of demobilization has slowly decreased, the 69th AAA Group started an antiaircraft artillery training program on 25 November 1946. It is expected by early spring of 1947 that one battery of 120mm guns and one battery of 40mm guns will be on the firing line.

Group schools are currently operating in the following subjects in preparation for spring target practi

120mm Gun Matériel School
Director School (Gun and AW)
Motor Transportation School
Communications School
Radar Operators Schools

A member of the 69th AAA Group, Captain James French with Mrs. French announced the arrival of a baby boy December 4, 1946, the first American child bo on Saipan.

Members of the 69th AAA Group whose families ha joined them on Saipan are:

Colonel William C. McFadden, Lieutenant Colo Joseph C. Moore, Major Adellon F. Hanson, Major El P. Curtis, Major George J. Bayerle, Jr., Major Jack Sweek, Captain John D. Coleman, Captain James French, Warrant Officer Junior Grade Raymond L. Fra Master Sergeant Arthur W. Mires, Master Sergeant D H. Warton, Technical Sergeant Jack W. Boles, Staff S geant James S. Vest.

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 November 1946:

ARRIVALS

Name	*Dept.*
Lt. Col. Evans B. Crowell	Not yet asgd to dy
Maj. Julius A. Marwitz	Not yet jd
Capt. Francis T. LeMere	Not yet jd
Capt. Carl H. Martin	Not yet jd
Capt. Temple C. Smith	S/D 3639 TC Trk Co
Capt. Stephen N. Snopkowski	Not yet jd
Capt. Matthew L. Tippit	Not yet jd
Capt. James A. Watts	Not yet jd
1st Lt. Martin J. Coyle	S/D 3639 QM TC Trk Co
1st Lt. Brandt Drymon	Hq Btry Motor Pool
1st Lt. Albin E. Fort	S-3
1st Lt. Arthur M. Huston	Aide de Camp
1st Lt. William R. Stierle	Hq Btry
WO Carlton T. Freese	Hq Btry Motor Pool
WO Gail M. Jackson	S/D AAA & GM Center, Fort Bliss, Tex

DEPARTURES

Name	*Destination*
Lt. Col. Albin T. Bowers	AGF Bd No. 4
Lt. Col. Wilson Forrest	Det of Pnts WBGH
Maj. Milton L. Rule	Sep Det 4001 ASU
Capt. William C. Barlow	O/S Repl Dep CP Stoneman, Calif.
Capt. Edwin H. Horeij	O/S Repl Dep CP Stoneman, Calif.
Capt. Robert H. Montgomery	Sep Det 4001 ASU
Capt. Norman M. Walker	O/S Repl Dep CP Stoneman, Calif.
1st Lt. William J. Coonley	Houston High School Houston, Tex.
1st Lt. Ernest L. Hanson	Sep Det 4001 ASU
1st Lt. John P. McDermott	O/S Repl Dep CP Stoneman, Calif.
1st Lt. Cread E. Miller	384th Gun Bn
1st Lt. William V. Sinkovic	O/S Repl Dep CP Stoneman, Calif.
WOJG Charles G. Goller	O/S Repl Dep CP Stoneman, Calif.

The following changes occurred during the month of December 1946:

ARRIVALS

Name	*Dept.*
Lt. Col. Irving D. Roth	Tactics
Major Jack K. Boyer	Not yet joined
Major Simon L. Grimes	Not yet joined
Major Dale F. Peter	S-4
Captain Walter C. Andrews	Not yet joined
Captain Paul H. Barton	Officers Mess
Captain Harold G. Burkett	Gunnery
Captain Ralph G. Duncan	Not yet joined
Captain Richard H. Ham	Not yet joined
Captain William B. Hilferty	Headquarters Commandant
Captain Ronald M. Kolda	Unassigned
Captain Karl W. Lehman	Not yet joined
Captain Arthur E. Malacky	Not yet joined
Captain John K. Nuwer	Not yet joined
1st Lt. William V. Clayton	Unassigned
1st Lt. Cecil Z. Holt	S/D Dispensary No. 1 Ft. Bliss, Texas
1st Lt. Edward E. Jordan	Not yet joined
1st Lt. Robert F. Krueger	Unassigned
1st Lt. Klare C. Moyer	Not yet joined
1st Lt. Gordon F. Zeitz	Not yet joined
2nd Lt. Thomas R. Oaks	Headquarters Battery

DEPARTURES

Name	*Destination*
Lt. Col. Francis L. Beaver	Officers Student Detachment
Major Wiley F. Shaver	O/S Replacement Depot, Cp. Stoneman, Calif.
Captain Edgar C. Cox	Officers Student Detachment
Captain Ray E. Ecker	Officers Student Detachment
Captain Ronald M. Kolda	Student Detachment, COAG Washington, D. C.
Captain Roger H. Lemaster	Officers Student Detachment
Captain Carl H. Martin	281st Ord. Ball. & Tech. Serv. Team, Ft Bliss, Texas
Captain Francis Murphy	Detachment of Patients, WBGH, El Paso, Tex.
Captain George W. Seabrook	Officers Student Detachment
1st Lt. Guy V. Martin	Detachment of Patients, WBGH, El Paso, Tex.
1st Lt. Frederick V. McWold	Officers Student Detachment
1st Lt. Roy F. Packer	Detachment of Patients, WBGH, El Paso, Tex.
1st Lt. Kendall L. Peterson	Officers Student Detachment
1st Lt. Edward R. Reum	Detachment of Patients, WBGH, El Paso, Tex.
1st Lt. Carleton D. Sherburne	Detachment of Patients, WBGH, El Paso, Tex.
1st Lt. Edward J. Skaggs	O/S Replacement Depot, Cp. Stoneman, Calif.
1st Lt. Erwin N. Schwab	O/S Replacement Depot, Cp. Stoneman, Calif.
1st Lt. Roger H. Williams	Officers Student Detachment
WOJG Walter B. Fike	Detachment of Patients, WBGH, El Paso, Tex.
WOJG Willis C. Williard	O/S Replacement Depot, Cp. Stoneman, Calif.

The Seacoast Branch, The Artillery School

MAJOR GENERAL ROBERT T. FREDERICK, *Officer In Charge*

The following changes occurred during the month of November:

ARRIVALS

Name	*Dept.*
Captain Leonard C. Barker	Instructor, Arty Gunnery, SBAS
Captain Leonard W. Davis	Adjutant, School Troops, SBAS
Captain Earl S. Brown	Instructor, Dept Sub-Mines, SBAS
1st Lt. Harold B. Anderson	Range Officer, Mine Det, SBAS
1st Lt. Glenn C. Clover	Asst Range Officer, Arty Det, SBAS

DEPARTURES

Name	*Destination*
Major Bert H. Backstrom	Trfd to Univ. of Washi Seattle, Washington
Lt. Col. John S. Sabine	Trfd to O/S Repl Depot
Major Raymond J. Conelly	Trfd to O/S Repl Depot
Major Willis T. Lind	Trfd to O/S Repl Depot
Major Joseph C. Stewart	Trfd to O/S Repl Depot
Captain William H. Deadwyler, Jr.	Trfd to O/S Repl Depot
Captain Lynn Neeley	Trfd to O/S Repl Depot
Captain Hjalmar L. Standal	Trfd to O/S Repl Depot
Captain John J. Ward	Trfd to O/S Repl Depot
1st Lt. Earl L. Sexton	Trfd to O/S Repl Depot
Captain James C. Drumgoole	Separated from service
Captain Edward K. Herrmann, Jr.	Separated from service
1st Lt. Gordon H. Fisher	Separated from service
1st Lt. Frank M. Kingston	Separated from service
1st Lt. David W. Lawrie	Separated from service
1st Lt. Wilburn M. Miller	Separated from service
1st Lt. Joseph A. Rybikowsky	Separated from service

The following changes occurred during the month December:

ARRIVALS

Name	*Dept.*
Lt. Col. Conrad G. Drexel	Dept Ex O, Dept of Eng & Hq Det, SC Br, TAS
Capt. Fletcher R. Vredenburgh	Writer, Dept Gunnery & tics, Hq & Hq Det, SC TAS.
1st Lt. John A. Remmie	Asst Ex O, Mine Det, SC TAS
WOJG Robert M. Wilder	Supply O, Dept Sub-Mi Hq & Hq Det, SC Br, T

DEPARTURES

Name	*Destination*
Capt. Emory L. Goggans, Jr.	Trfd to O/S Repl Depot

260th AAA Group (N.G.)

Washington, D. C.

COLONEL LEROY S. MANN, *Commanding*

The group was visited by two of its old officers during the Christmas holidays. Lieutenant Colonel Lee J. Rutz passed through on change of station from Korea to ROTC Headquarters, New York City, and Lieutenant Colonel Robert J. Martin, now Regular Army paid us a visit while changing station from Germany to Fort Bliss.

Information now at hand indicates that the armory at the foot of East Capitol Street may be available to the dis around the 1st of March. This modern building with indoor garage, storage, and drill space and its adequ battery day rooms and offices should be an aid to our cruiting campaign.

The 260th Group entered its second phase 3 Janu 1947. The 340th Searchlight Battalion entered its sec phase 4 January and the 380th Automatic Weapons talion on January 10th. Vacancies exist in all units qualified top ranking NCO's.

The radio stations in Washington and vicinity given splendid cooperation to the group by spot annou ments at various times during the broadcasting day.

COAST ARTILLERY ORDERS

WD and AGF Special Orders covering the period 18 October through 30 December, 1946. Promotions and demotions are not included.

Brigadier Generals

[illegible]ner, Thomas H., to be retired.
[illegible]mit, Harold F., to be retired.
[illegible]ney, Clesen H., to be retired.

Colonels

[illegible]xander, Dana S., to be retired.
[illegible]tt, Thomas J., detailed as member of GSC, assigned to GS w/troops.
[illegible]ms, Maitland, to be retired.
[illegible]wler, Louis J., to be retired.
[illegible]lene, Lathrop R., to Commandant US Disciplinary Barracks, Fort Leavenworth, Kans.
[illegible]aidy, John F., to detailed in TC, OCT, Washington, D. C.
[illegible]ams, William M., to be retired.
[illegible]owell, Evans R., to AAA & Gm Br The Arty Sch, Fort Bliss, Texas.
[illegible]eCarre, Octave, to be retired.
[illegible]boos, Bird S., to Sixth Army, Camp Beale, Calif.
[illegible]ms, Walter K., to First Army Hq & Hq Det, HD of Portsmouth, Camp Langdon, N. H.
[illegible]wards, Parmer W., to The Arty School, Fort Sill, Oklahoma.
[illegible]st, Paul, to First Army, Governors Island, N. Y., w/sta at NYU, University Heights, N. Y.
[illegible]ge, Kenyon P., to Hq Seventh Army, Atlanta, Ga., w/sta at St. Augustine, Fla. and detailed as Instructor, Fla. NG.
[illegible]k, Frank T., to AAA Repl Pool, Fort Bliss, Texas.
[illegible]mm, Henry F., to Hq Second Army, Baltimore, Md., w/sta at Columbus, Ohio. Detailed as Sr. Instructor OR State of Ohio.
[illegible]thrie, Robert E., to Seventh Army, Fort McClellan, Alabama.
[illegible]mpton, William A., to Stu Det Armed Forces Staff College, Norfolk, Va.
[illegible]ndwerk, Morris C., to RTC, Fort Ord, Calif.
[illegible]ady, Robert M., to detailed as member of GSC & assigned to WDGS.
[illegible]rington, John H., to 6601st ASU California NG Instr. Gp, c/o State AG Office, Bldg No. 1, Sacramento 14, Calif. w/sta at San Diego, Calif. Detailed as CA Instructor.
[illegible]rris, William H., to detailed in AGD.
[illegible]ings, Frank H., to be retired.
[illegible]gan, James P., to be retired.
[illegible]fords, Thomas E., to be retired.
[illegible]nson, Harold S., to Nevada NG Instr Gp, c/o State AG, Carson City, Nev. w/sta at Carson City, Nev. Detailed as Sr Ground Instr Nevada NG.
[illegible]nson, William L., to be retired.
[illegible]wder, James R., to be retired.
[illegible]er, Dean, to 6605th ASU, Washington NG Instr Gp, c/o State AG, Camp Murray, Fort Lewis, Wash., detailed as CA Instructor, w/sta at Olympia, Wash.
[illegible]cMullen, James D., to be retired.
[illegible]ntford, Frederick A., to be retired.
[illegible]sen, Ola A., to 1155rd ASU, Office of the Sr Instr NG for NH. detailed as Instr.
[illegible]erson, Charles G., to Stu Det Armed Forces Staff College, Norfolk, Va.
[illegible]ms, Webster F., to Hq Seventh Army, Atlanta, Ga., w/sta at Miami, Fla. detailed as Instructor Fla. NG.
[illegible]ville, William, to First Army Hq & Hq Det HD of Long Island Sound, Ft. H. G. Wright, N. Y.
[illegible]ield, Frank C., to be retired.
[illegible]ding, Alba C., to Hq First Army, Governors Island, N. Y.
[illegible]rton, Tom V., to Armed Forces Staff College, Norfolk, Va.
[illegible]rward, Wilfred H., to 5252d ASU Office Illinois State Sr Instr OR, Chicago, Ill., Detailed as CAC Instr.
Strickland, Henry E., to OC of S, Washington, D. C. for dy w/WD Manpower Board.
Sweet, William H., to Fourth Army, Fort Bliss, Texas.
Turley, Robert E., Jr., to Hq Fifth Army, Chicago, Ill., w/sta at Cheyenne, Wyo. Detailed Sr Ground Instr, Wyoming NG.
Turner, Harrison F., to be retired.
Weddell, William A., to AGO Casuals, Washington, D. C. w/sta Hq 1st SvC, Boston, Mass.
Young, George E., to Hq Second Army, Baltimore, Md., w/sta at Cincinnati, Ohio. Detailed as CA Instr., OR, State of Ohio.

Lieutenant Colonels

Abrahams, Rolland S., to relieved from detail in IGD.
Adams, Lawrence W., to Hq Fifth Army, Chicago, Ill. w/sta at St. Paul, Minn., detailed as Instr Minn. NG.
Baker, Alverson E., to First Army, Governors Island, N. Y. w/sta at Princeton University, Princeton, N. J.
Barrett, John T., to 916th AAF Base Unit, Orlando Air Base, Fla.
Bell, Clarence O., to be retired.
Bendler, Fred D., to The Arty Sch, Fort Sill, Okla.
Bolt, Lewis G., to relieved from detailed in Inf.
Borden, Nathaniel E., to First Army, Fort Dix, N. J.
Buerkle, John G., to AAA & GM Br The Arty Sch, Fort Bliss, Texas.
Chandler, Martin B., to First Army, Governors Island, N. Y., w/sta at Harvard University, Cambridge, Mass.
Corum, Dabney R., to Fifth Army, Chicago, Ill., w/sta at Illinois Institute of Technology, Chicago, Illinois.
Cory, Ira W., to Second Army, Baltimore, Md., w/sta at Univ. of Penna., Philadelphia, Penna.
Day, Frederick E., to Fifth Army, Chicago, Ill., w/sta at Illinois Institute of Technology, Chicago, Ill.
Dodson, Minot B., to Sixth Army, Presidio of San Francisco, Calif., w/sta at Calif. Institute of Technology, Pasadena, Calif.
Donahue, Gerald M., to Sixth Army, Presidio of San Francisco, Calif., w/sta at Calif. Institute of Technology, Pasadena, Calif.
Dueker, Fred E., to 1943rd ASU, Washington NG Instr Gp., c/o State AG, Camp Murray, Fort Lewis, Wash., w/sta at Seattle, Wash., detailed as Instr Washington NG.
Eubank, Perry H., to Sixth Army, Presidio of San Francisco, Calif., w/sta at Calif. Institute of Technology, Pasadena, Calif.
Flynn, Ralph M., to The Infantry School, Fort Benning, Ga.
George, Max S., to First Army, Governors Island, N. Y. w/sta at NYU, University Heights, N. Y.
Gifford, James R., to Hq AGF, Fort Monroe, Va., w/sta at Washington, D. C. for dy with G1 Section AGF.
Hill, Charles W., to 1274th ASU Office Senior NG Instr for Delaware, Wilmington, Del. Detailed as CA Instr.
Hillberg, Lauri J., to Stu Det Armed Forces Staff College, Norfolk, Va.
Hoffman, Theodore L., to Fifth Army, Chicago, Ill., w/sta at Illinois Institute of Technology, Chicago, Ill.
Kallman, Maxwell M., to Second Army, Baltimore, Md. w/sta at Johns Hopkins Univ., Baltimore, Md.
Luczak, Bernard R., to detailed in Ord. Dept Research & Development Sv Suboffice (Rocket), Calif. Institute of Technology, Pasadena, Calif.
Lutz, Robert R., to Fifth Army, Chicago, Ill. w/sta at Univ. of Ill., Urbana, Ill.
McCormick, John K., to 6605th ASU Washington NG Instr Gp, c/o State AG, Camp Murray, Fort Lewis, Washington, w/sta at Tacoma, Wash., Detailed as CA Instr., Wash. NG.
McGoldrick, Francis M., to Sixth Army, Presidio of San Francisco, Calif., w/sta at Calif. Institute of Technology, Pasadena, Calif.
McMillan, Donald L., to Second Army, Baltimore, Md., w/sta at Univ. of Penna., Philadelphia, Penna.
MacKenzie, Alan F. S., to AGO Casuals, Washington, D. C.
May, Metticus W., Jr., to OC of S, Washington, D. C. for dy w/Civil Affairs Div.
Mendenhall, Clarence M., Jr., to be retired.
Moorman, Richard R., to Fifth Army, Chicago, Ill., w/sta at Univ. of Ill., Urbana, Ill.
Price, William H., to The Arty School, Fort Sill, Oklahoma.
Rauch, Alfred R., to Hq AGF, Fort Monroe, Va., w/sta at SFPE, Fort Mason, Calif. for dy as Ass't AGF Liaison Off.
Rawls, Jabus W., Jr., to Second Army, Baltimore, Md., w/sta at Johns Hopkins Univ., Baltimore, Md.
Roth, Irving D., to AAA & GM Br The Arty Sch, Fort Bliss, Texas.
Rothwell, Franklin G., to detailed as member of GSC & assgnd to GS w/troops.
Rutz, Lee J., to 1242nd ASU Office of the Sr. Instr, OR, State of NY, 90 Church Street, New York. Detailed as CA (AA) Instr.
Sell, Wendell B., to Second Army, Baltimore, Md., w/sta at Johns Hopkins Univ., Baltimore, Md.
Shumate, Ervin Hayne, to CA RTC, Fort Bragg, N. C.
Stevens, Ralph A., to AFPAC, Yokohama, Japan. Temp. mailing address Casual Officers Co., Camp Stoneman ORD, Pittsburg, Calif.
Urban, Peter L., to relieved from detail in Inf.
Ward, Edgar R. C., to First Army Hq & Hq Det HD of Portland, Fort Williams, Me.
Weinnig, Albert J., to Second Army, Baltimore, Md. w/sta at Univ. of Penna., Philadelphia, Penna.
White, Alan B., to First Army, Governors Island, NY, w/sta at NYU, Univ. Heights, N. Y.
Woodbury, Kenneth J., to Hq First Army, Governors Island, N. Y.
Wollaston, Pennock H., to 1941st ASU Oregon NG Instr Gp, w/sta at Portland, Oregon, detailed as Instr Oregon NG.

Majors

Abston, Aaron A., to Second Army, Baltimore, Md., w/sta at Johns Hopkins University, Baltimore, Md.
Allen, Carl M., Jr., to USFET, Frankfurt, Germany. Mailing Address, New Arrivals Sec, 25th Base Post Office, APO 800 c/o PM NY.
Barker, James W., II, to detailed in Cavalry.
Bates, Frank A., Jr., to Fifth Army, Chicago, Ill., w/sta at University of Michigan, Ann Arbor, Michigan.
Blackstrom, Bert H., to detailed at University of Washington, Seattle, Wash.
Bond, Thomas M., to Office Recorder-Custodian, Army Central Welfare Fund, Washington, DC.
Bull, Harcourt G., to Seventh Army Pratt GH, Coral Gables, Fla.
Buntyn, James R., to Sixth Army, Presidio of San Francisco, Calif. w/sta at University of Calif., Los Angeles, Calif.

Byrne, Jerome S., to First Army, Governors Island, N. Y. w/sta at NYU, University Heights, N. Y.
Castle, Edmund, to 1152nd ASU, Office Senior NG Instr for Maine, Augusta, Maine, w/sta at Bangor, Me. and detailed as CA Instr, Maine NG.
Clanton, Henry M., to Second Army, Baltimore, Md., w/sta at University of Penna., Philadelphia, Penna.
Cole, Norman E., to OC of S, Washington, D. C.
Corley, William E., Jr., to Hq Seventh Army, Atlanta, Ga., w/sta at Jacksonville, Fla. and detailed as Instr, Florida NG.
Cumpston, Sam E., to Fifth Army, Chicago, Ill., w/sta at University of Chicago, Chicago, Ill.
DeGregory, Arthur Michael, to CA Hq First Army, Governors Island, N. Y.
Dillon, James R., to Second Army, Baltimore, Md., w/sta at University of Penna., Philadelphia, Penna.
DuBois, Edmund L., to Fifth Army, Chicago, Ill., w/sta at University of Chicago, Chicago, Ill.
Dunlop, Claude E., Jr., to RTC, Ft. Knox, Ky.
Fairbanks, George C., to detailed in Cavalry.
Farr, Richard, to AFPAC, Yokahama, Japan. Temp mailing address, Casual Officers Co, Cp Stoneman, ORD, Pittsburg, Calif.
Freund, Robert L., to Sixth Army Hq & Hq Det, HD of Columbia, Ft. Stevens, Oregon.
Gauvreau, David G., to Fifth Army, Chicago, Ill., w/sta at University of Michigan, Ann Arbor, Michigan.
Gillmore, William K., to Fifth Army, Chicago, Ill., w/sta at Illinois Institute of Technology, Chicago, Ill.
Glade, Kenneth, to Fifth Army, Chicago, Ill., w/sta at University of Michigan, Ann Arbor, Mich.
Goldblum, Kirby E., to Hq AGF, Fort Monroe, Va., w/sta at New Orleans POE, New Orleans La., for dy as Ln Officer.
Grabove, Maxwell, to detailed at Marion Institute, Marion, Ala.
Grant, Andrew R., to 5206th ASU Office Senior Ground Instr, Minn. NG, St. Paul, Minn., w/sta at Duluth, Minn. detailed as CA Instructor.
Grimes, Simon L., to AA & GM Br the Arty Sch, Ft Bliss, Tex.
Grandin, Daniel G., to AAA Repl Pool, Ft Bliss, Tex.
Hall, Glenn Oleon, to reld fr active duty.
Heizer, James H., to Alaskan Department.
Hunegs, Harry, to Second Army Ohio Mil Dist., Columbus, Ohio.
Hutchinson, George W., to Fourth Army, Ft Bliss, Texas.
Hutmaker, Matthew A., to AFPAC Korea Shpmt, Temp mailing address, Casual Officers Co., Cp Stoneman, ORD, Pittsburg, Calif.
Hutson, Clarence J., to AFPAC, Yokohama, Japan. Temp mailing address, Casual Officers Co., Cp Stoneman ORD, Pittsburg, Calif.
Isenson, Raymond S., to Hq Fifth Army, Chicago, Ill., w/sta at Chicago, Ill., and detailed as Instr, Illinois NG.
Jensen, Martin E., to 4310th ASU, Office Senior Instr OR, State of Texas, 415 W. 4th St., Austin, Texas, w/sta at Beaumont, Texas. Detailed as CA Instructor.
Kelly, James J., Jr., to the Arty Sch, Ft Sill, Oklahoma.
Lambert, William H., to University of San Francisco, San Francisco, Calif.
Lawrence, Henry F., to Fifth Army Br US Disciplinary Bks., Ft. Leavenworth, Kans.
Leachman, Thomas E., to First Army Hq & Hq Det, HD of N. Y., Ft. Hancock, N. J.
Lea, Thomas R., Jr., to AFPAC, Yokohama, Japan, Temp mailing address, Casual Officers Co, Cp Stoneman ORD, Pittsburg, Calif.
Lechwar, Martin J., to AFPAC, Yokohama, Japan, Temp mailing address, Casual Officers Co, Cp Stoneman ORD, Pittsburg, Calif.
Leffinswell, William M., to AFPAC, Yokohama, Japan, Temp mailing address, Casual Officers Co, Cp Stoneman ORD, Pittsburg, Calif.
Lill, Eugene M., to detailed in CE, Hq Second AF, Offut Fld, Nebr.
Lind, Willis Theodore, to CAC Hq & Hq Det, CA Sch, Ft Winfield Scott, Calif.
Long, Jules H., to AARTC, Ft Bliss, Texas.
Louden, Edward K., to detailed in AGD.
Lucas, Eon C., to 4020th AAF Base Unit, Wright Field, Ohio.
Lynch, William J., to First Army, Governors Island, N. Y., w/sta at NYU, University Heights, N. Y.
McCann, Kevin C., to OC of S, Washington, DC for dy w/Secretariat.
McCauley, Robert H., to OC of S, Washington, D. C.
McCracken, Reed J., to Xavier High School, 30 West 16th St., New York 11, N. Y.
McFadden, David B., Jr., to AFPAC, Yokohama, Japan, Temp mailing address, Casual Officers Co, Cp Stoneman ORD, Pittsburg, Calif.
Maline, Paul J., to OSW, Washington, DC, with dy w/Joint Research and Development Board.
Mitchell, Donald E., to detailed in TC.
Mize, Willard W., to AAA Repl Pool, Ft Bliss, Tex.
Mover, Maynard G., to Stu Det, Hq First Army, Governors Island, N. Y., w/sta at Yale University, New Haven, Conn.
Murphy, John J., to The Armored Sch, Ft Knox, Ky.
Peter, Dale F., to AAA & GM Br The Arty Sch, Ft Bliss, Tex.
Peterson, Harold, to 60th AAA AW Bn., Ft Bliss, Texas.
Price, William M., to First Army, Governors Island, N. Y., w/sta at University of Rochester, Rochester, N. Y.
Ricciardelli, Angelo M., to CA (SC) ORP, Ft Winfield Scott, Calif.
Ridgell, Joel McF., to detailed in TC OCT, Washington, D. C.
Robinson, John L., to Sixth Army, Presidio of San Francisco, Calif., w/sta at University of Calif., Los Angeles, Calif.
Ronch, Richard R., to Hq AGF, Ft Monroe, Va., w/sta at Washington, D. C.
Russell, William T., to Sixth Army, Presidio of San Francisco, Calif., w/sta at Calif. Institute of Technology, Pasadena, Calif.
Schafer, Robert W., to detailed in F.A.
Stanford, Marvin N., to First Army, Governors Island, N. Y., w/sta at Princeton University, Princeton, N. J.
Stevens, Donald K., to AAA & GM Ctr, Ft Bliss, Texas.
Tilson, George E., to AAA & GM Ctr, Ft Bliss, Texas.
Tison, Gerald Jackson, to CA Hq Sixth Army, Presidio of San Francisco, Calif.
Vivian, James A., to detailed in CE.
Whitaker, Willis F., to 5252nd ASU, Office Ill. State Sr Instr OR, Chicago, Ill., and detailed as CAC Instr.
Williams, Daniel B., to AA & GM Br the Arty Sch, Ft Bliss, Texas.
Willis, Harold P., to AGF Bd No. 4, Ft Bliss, Tex., w/sta at Washington, D. C.

CAPTAINS

Allen, Frank Dixon, to relieved from active duty.
Aman, Paul W., to Alaskan Department.
Anderson, Edwin A., to AA & Gm Br the Arty Sch, Ft Bliss, Tex.
Anderson, Paul E., to detailed in TC.
Andrews, Walter G., to AAA & GM Br the Arty Sch, Ft Bliss, Tex.
Armour, Bernard M., to 916th AAF Base Unit, Orlando Air Base, Fla.
Barton, Paul H., to AA & GM Br the Arty Sch, Ft Bliss, Tex.
Barwick, William R., to Fifth Army, Chicago, Ill., w/sta at University of Michigan, Ann Arbor, Mich.
Bianley, Francis W., to Fishburne Military School, Waynesboro, Va.
Bolton, Lee D., to AAA Repl Pool, Ft Bliss, Tex.
Bright, Charles W., to AFPAC, Yokohama, Japan, temp mailing address Casual Officers Co, Cp Stoneman ORD, Pittsburg, Calif.
Buchanan, Russell B., to AAA & GM Br, The Arty School, Ft Bliss, Tex.
Campbell, C. D., to AFPAC, Yokohama, temp mailing address Casual Officers Co, Stoneman ORD, Pittsburg, Calif.
Cancellare, Anthony D., to fr HD of D Miles, Del. to Alaskan Dept., Temp address, Casual Officers Co., Cp S ORD, Pittsburg, Calif.
Cox, John P., to AAA Repl Pool, Ft Bli
Daudelin, Roland G., to AGF Bd No. Bliss, Tex.
Detwiler, Robert P., to Stu Det, Hq Army, Baltimore, Md., w/sta at John kins University, Baltimore, Md.
Dickinson, David L., to AAA Repl Po Bliss, Tex.
Dufault, Robert C., to AFPAC, Yoko Japan, temp mailing address, Casual Co., Cp Stoneman, ORD, Pittsburg, Ca
Dugan, Edward Francis, to AAA & GM Br Arty Sch, Ft Bliss, Tex.
Duke, Thomas A., to SC Br of the Ar Ft Winfield Scott, Calif.
Duncan, Ralph G., to AA & GM Br the Sch, Ft Bliss, Tex.
Eisenhart, Harry E., to AFPAC, Yoko Japan, temp mailing address, Casual Co, Cp Stoneman ORD, Pittsburg, Calif
Esatow, Theodore R., to AFPAC, Yoko Japan, temp mailing address, Casual Co, Camp Stoneman ORD, Pittsburg, Ca
Fisher, Harry G., to AARTC, Ft Bliss Te
Galligan, Edward P., to 82d Abn Div, Ft Bra N. C.
Gardner, Milo S., to Seventh Army, Tenn Dist., Nashville, Tenn.
Gershon, Gordon M., to First Army, Gover Island, N. Y., w/sta at N.Y.U., Univ Heights, N. Y.
Greiner, John B., to 111th CIC Det, Hq Se Army, Atlanta, Ga.
Greiner, Robert J., to detailed in TC.
Griffith, Hiram H., to Alaskan Departmen
Grossman, Harold, to detailed in Ord Dep
Hallowell, Noel E., to AFPAC, Yoko Japan, temp mailing address, Casual Off Co., Cp Stoneman ORD, Pittsburg, Calif
Ham, Richard Harold, to AA & GM Br Arty Sch, Ft Bliss, Tex.
Hamilton, Calvin L., to USFET, Frank Germany.
Hartley, Harold J., to CIC Center, Holabird Depot, Baltimore, Md.
Hendren, Kenneth H., to AAA & GM Ctr Bliss, Tex.
Henry, Gregg, to AAA & GM Br The Arty Ft Bliss, Tex.
Hendren, Kenneth H., to 267th AAA Gp Bliss, Texas.
Hilferty, William B., to AA & GM Br the Sch, Ft Bliss, Tex.
Hill, Benjamin I., to Fifth Army, Chicago, w/sta at Illinois Institute of Technology, cago, Ill.
Holmberg, Ernest Edward, to be relieved active duty.
Israelson, Nathaniel H., to Panama Canal D
Josephson, Stanton W., to Sixth Army, Pre of San Francisco, Calif. w/sta at Univ of Calif., Los Angeles, Calif.
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...k, John G., to Second Army, Baltimore, Md., w/sta at University of Penna., Philadelphia, Penna.
...nik, Stazy J., to Second Army, Ft Story, Va.
...tz, Alva W., to detailed in TC.
...er, Thomas H., to detailed as a member of GSC and assgd to WDGS.
...ler, Wyman D., to detailed in MAC.
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...rt, Anthony J., to AA & GM Br The Arty Sch, Ft Bliss, Texas.
...e, Joseph David, to CAC 1150th ASU, Ft Knox, Ky.
...e, William A., to Hq Seventh Army, Atlanta, Ga.
...er, Ralph J., the First Army, Governors Island, N. Y., w/sta at N.Y.U., University Heights, N. Y.
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Brooks, Arthur Chase, Jr., to Seacoast Br The Arty Sch., Fort Winfield Scott, Calif.
Bryan, William J., to AA & GM Br The Arty Sch., Fort Bliss, Texas.
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Catania, Goedo R., to Alaskan Department.
Chandler, John A., to Alaskan Department.
Chin, George, to CA (SC) ORP, Fort Winfield Scott, Calif.
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Ore, Edwin F., to AA & GM Br The Arty Sch., Fort Bliss, Texas.
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Stringer, John L., to RC RTC, Fort Bragg, N. C.
Throop, Vernon D., to USFET, Frankfurt, Germany.
Tomaw, Dellie W., to USFET, Frankfurt, Germany.
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Way, Powell E., to Alaskan Department, T mailing address, Casual Officers Co., C Stoneman ORD, Pittsburg, Calif.

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Olhausen, James N.
Ranney, Daniel A.
Sabine, John S.
Tandy, Frank G.
Worthy, Clair M.

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Cone, Sidney L.
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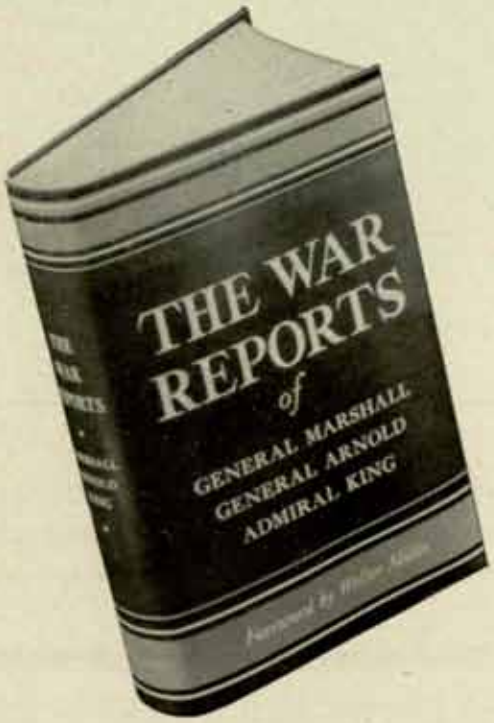

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