AIR FORCES NEWS LETTER

MARCH-APRIL 1942

AIR FORCES NEWS LETTER

PUBLIC RELATIONS DIVISION, PUBLICATIONS SECTION
ARMY AIR FORCES, WASHINGTON, D. C.

VOL. 25 MARCH—APRIL, 1942 NO. 2

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S E C U R I T Y

SURPRISE IS A WEAPON AND MUST BE PROTECTED AS A WEAPON. IT IS DEPENDENT UPON CONCEALED PLANNING AND CONCEALED ACTION, FOR WITHOUT SECRECY SURPRISE IS NOT POSSIBLE. BETRAYED SECRECY CAN DESTROY MEN AND PLANES JUST AS SURELY AS A BOMB CAN DESTROY THEM.

EVERY MAN IN THE AIR FORCES HAS SOME INFORMATION THAT IS DESIRED BY THE ENEMY. CASUAL BITS OF INFORMATION MAY IN THEMSELVES APPEAR HARMLESS, BUT WHEN PUT TOGETHER THEY CAN FORM AN EXTREMELY IMPORTANT PATTERN. THERE IS NO REASON FOR NARROWING DOWN THE SPY'S MARGIN OF GUESSWORK.

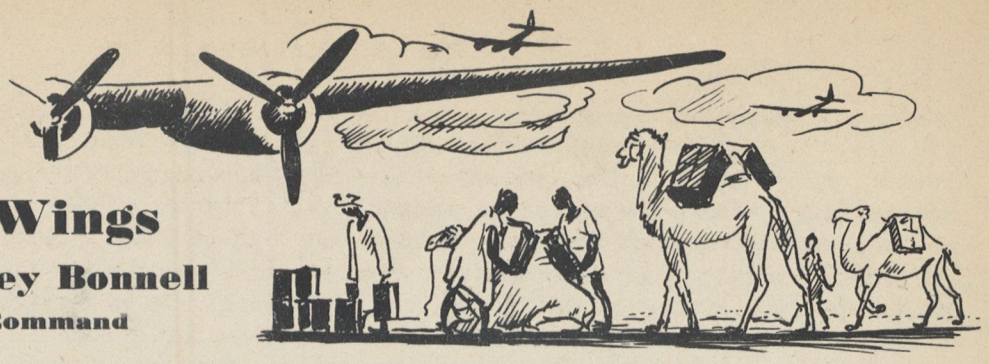
THE PUBLIC IS AND SHOULD BE INTERESTED IN LEARNING ALL IT CAN ABOUT THE AIR FORCES. A SPECIAL UNIT OF THE AIR FORCES EXISTS FOR TELLING THE PUBLIC ALL THAT IS DESIRABLE AND SAFE FOR IT TO KNOW. IT IS NOT THE DUTY OF OFFICERS AND MEN UNAFFILIATED WITH THAT UNIT TO ACT IN A PUBLIC RELATIONS CAPACITY, EXCEPT WHEN SPECIFICALLY ORDERED TO DO SO.

MILITARY INFORMATION WHICH IN ANY WAY MAY BE OF VALUE TO THE ENEMY SHOULD BE DISCUSSED WITH ANOTHER MEMBER OF THE AIR FORCES ONLY WHEN HE IS ENTITLED TO RECEIVE IT AND REQUIRES IT FOR THE PERFORMANCE OF DUTY.

THE WEAPON OF SURPRISE MUST BE GUARDED AS JEALOUSLY AS WE GUARD THE BOMBSIGHT. WE CANNOT AFFORD TO LEAVE WORDS ON THE GROUND THAT MAY TAKE OUR PLANES OUT OF THE AIR.

R. L. Walsh

R. L. WALSH,
Colonel, Air Corps,
Assistant Chief of the Air Staff, A-2.



Safari on Wings

By Major Geoffrey Bonnell

Air Force Ferry Command

FOUR months with the Ferry Command in Africa and the Middle East shows you how much of this war has to be won on the ground before it can be won in the air.

Service and supply are the heart of the Command.

Ferry pilots and flight crews are doing a great job, but every flyer knows that the backbone of the show is on the ground, in the hands of the maintenance men and mechanics who service the planes in a mess of sand and heat all the way along the line.

And before warplanes are ferried in quantity to the Far East, African natives carry tons of foundation rock for runways, and hundreds of camels carry fuel for engines. Camels and natives are in the thick of it over there.

The ground is being won. Airdromes are building up, supplies are coming in, and communications are much improved since we set up the first Ferry Command base in the Middle East last winter. At the moment I am some 9,000 flying miles away but only a few days out from my base, and I know that the ships are being pushed through as fast as possible. But it is one thing to talk about fighting an air war thousands of miles from home and another thing to do it. A lot of angles enter in when you start close to scratch.

There were service stations across Africa when we started, but they were British stations used only for ferrying single engine ships. The British shuttled the fighters on short hops in squadrons. The bulk of their bombers had to be based on the Isles to carry the war to Germany, so the British weren't ferrying big planes, and had no need for large airdromes.

We could use the British stations for forced landings, but to push across the four-motored jobs you need airdromes with plenty of length to the runways. You need room to get heavily loaded ships off the ground, and with all that weight they will run a long distance after alighting. We use the brakes as little as possible to save the linings.

Existing runways had to be made longer and their foundations strengthened. New runways and foundations had to be built. For this work natives are used. I have seen hundreds of half-naked African natives carrying crushed foundation stone in buckets balanced on their heads.

Desert sand has a habit of seeping into your engines while your ship is being warmed up, so concrete platforms had to be built. We use the engines as little as possible on the ground. When the sand is blowing you have to watch your fuel. Sand doesn't add octane to gasoline. Neither does the tropical sun.

Planning ahead for fuel is one of our biggest tasks, and the oil companies engaged in the work have done a splendid job in filling our needs. Fueling was done entirely from tin cans when we started. We travel light on fuel, carrying just enough for each trip, and we plan it carefully. Save on fuel and you gain on cargo space. And cargo space is gold when it holds tools and spare parts.

At one desert airdrome they had to employ a thousand camels in addition to desert trucks to keep up with the increasing demand for fuel. Each of the big lumbering animals brought in 35 gallons of fuel in cans. Supplying fuel by camel, you have to figure on something like a 25 per cent loss; camels are high off the ground and many cans break when the natives unload. But the camels kept the ships flying on.

Servicing is important enough for us to build our flight schedules around it. Long hops, for instance, are made principally at night. We time them for dawn arrivals, allowing ground crews as many daylight hours as possible for repair work.

You use a minimum of signals to keep the enemy from getting in on the party. This means that your radio is used sparingly, and that navigation is usually celestial. We started out with French maps on the desert, but they offered few landmarks, many of those misplaced. We have our own maps now.

Major Bonnell was one of the first Ferry Command staff officers in the Middle East, from which he has just returned. A veteran in aviation, he flew with the first English scout squadron to leave for France in the last war, and later joined the American Army and flew with the famous First Pursuit Group. After the war Major Bonnell organized the Florida-West Indies Airway, called the first airline to carry U.S. mail to a foreign port. He spent 20 years on Wall Street before rejoining the Air Forces in July, 1941.

Adequate communications develop only after an organization has passed through its early stages, particularly in the type of country we are working. The communications network is getting smoothed out, but I've seen the day when the message carrying your departure time reached your objective after you got there. Signal changes are a necessity; keeping up with the changes is a job in itself. It pays to be ready with the right answers. Mistakes in signalling may mean anti-aircraft fire.

The African landscape doesn't have a reputation for carpets, so it isn't ideal country for forced landings. Flying miles of jungle 50 feet up, I've seen a natural zoo, with lions, elephants, antelopes and all the main attractions. We actually had a lion greet us after one landing, but it was at an airdrome and the lion was a cub, a pet of one of the boys. The lion ran around the airdrome like a dog. I really felt sorry for him, because everyone wanted their pictures taken holding him in their arms.

Operating a ferrying service over desert and jungle has a thousand side shows, and a thousand problems. Sabotage, for instance, is always a threat. It forces you to double check every detail before a take-off, even though everything has functioned perfectly on the last leg of the trip. No matter how strange or difficult the problem, each man pitches in to solve it. The personnel is top rate.

Having served with the RAF in the last war and knowing how they had built up an air force to function in all parts of the world without established bases or the proper equipment, I got a great kick out of our first formation of heavy bombers to come in at a British airdrome. They arrived in perfect formation and after landing the crews carried on like veterans.

Our officers and men get along famously with RAF personnel, with whom we are housed and messed. Mess halls are like trading posts, where cigarettes, pith helmets, shorts and the like are continually being swapped. Captured Italian and German revolvers and field glasses bring large trades.

The British fix up comfortable living quarters and mess halls, and there is a good table all along the way. But the coffee is bad; if you're coming, bring your own. We are very careful about food and water, and either you lay off food which doctors advise against or you get Gippy Tummy (a form of dysentery). Each plane carries enough water for the trip; at the hotels we drink bottle water. And it pays to personally see to it that your table utensils are clean.

Actually, the little things count most over there. Food, rest and a change of clothes are the necessities, especially on long ferrying flights. There is a lot of psychology tied up in it. Day in and day out a man can do a better job when he is shaved and clean and smart looking. It is up to the captain of each plane to see that his crew is neat appearing.

We wear summer uniforms, topped by pith helmets in which the boys all want their pictures taken, and we are fast adopting shorts. Not that it is hot—a mere 120 degrees when I left. But you get a dry heat over there and it does cool off at night. The heat doesn't seem to affect the engines, but it can affect the men, and keeping fit is important. High boots are issued on reaching the coast as a protection against mosquitoes; we sleep under nets. Some of those bugs seem as big as the planes we flew in the last war.

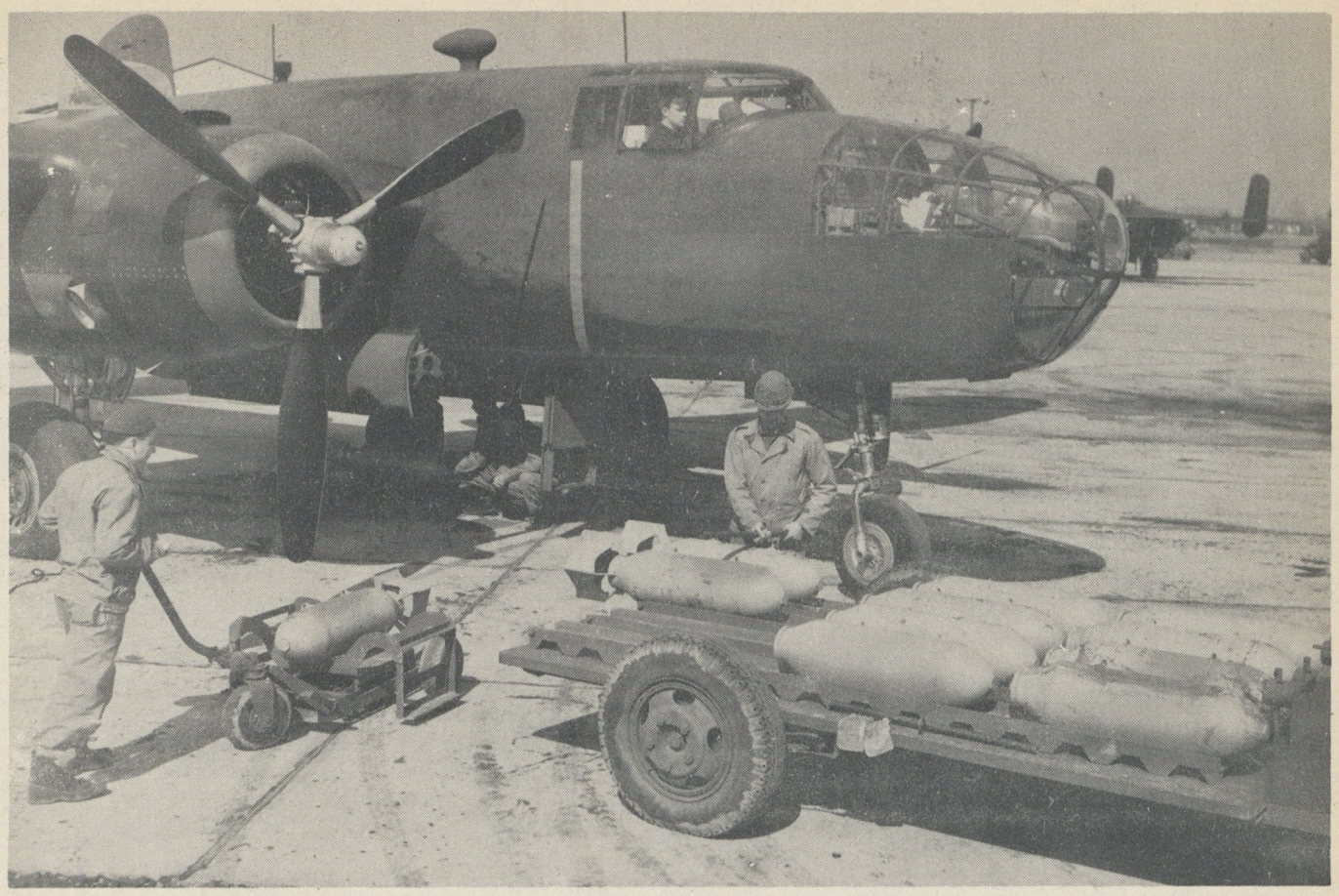
Much of the pioneering has been done, but it is as great a show as ever and we are all proud to take part in it. When you're a thousand miles from nowhere it means something to have your crews thinking and working as teams. That is half the battle. The esprit de corps is doing a lot to push the planes up front.

NEW OFFICERS' SCHOOL

AIR Forces enlisted men are now eligible to become commissioned officers for administrative posts, and an Officers Candidate School has been established for this training at Miami Beach, Fla. Also eligible for the school are Air Forces Warrant Officers and Aviation Cadets recommended by their school commandants.

The men accepted will be trained for administrative duties such as squadron adjutants, and mess, supply and transportation officers. Upon satisfactory completion of the 12 weeks course, graduates will be commissioned Second Lieutenants in the Army of the United States and assigned to units of the Army Air Forces.

Applicants must have passed their 18th birthdays and not have reached their 36th birthday on the day of completion of the course for which they are selected. Other requirements include United States citizenship, a score of 110 or higher in the Army General Classification test, and three months of military service immediately preceding the date of enrollment, or a minimum of six months cumulative service within the 12 month period immediately preceding the date of enrollment. Men interested in enrolling in the school are instructed to apply to their Commanding Officer.



Hunting For Tin Fish

By Capt. Lynn Farnol

First Air Force

AS far back as the early 1930's the Army included off-shore patrolling in maneuvers, using Martin B-10s to sweep the Pacific for imaginary invaders; similar exercises were carried on by the Second Bombardment Wing at Langley Field.

Army flyers hunt real prey now. They seek "tin fish" off the coastlines of two oceans and the Gulf of Mexico. Hunting enemy submarines is exacting work. Day in and day out it is routine, but a routine flight can suddenly become alive, as happened recently on an off-shore patrol operating from an Air Force base on the Atlantic coast. Let's follow that flight.

The story really begins at various points in the country from seven months to a year before, at Kelly Field where the pilot was trained, at Barksdale with the bombardier, in Florida with the navigator, and with the training of the co-pilot, radio-man and gunner. On patrol duty the crew does not include an engineer. Each member can handle a machine gun. On this flight the gunner also mans the camera.

At a "brief" held shortly before take-off the squadron commander sketches the route of the patrol on a green hydrographic chart while the crewmen stuff themselves into heavy sheepskin flying clothes. An Army "jeep" takes them to their B-25 in battle paint. A gasoline trailer and several ammunition trucks are moving away from the plane as they arrive. The crewmen stand in front of the ship while the engineer gives the Twin Wrights a final check. He makes the pre-flight—checking the gas tanks, manifold pressure, oil temperature, vertical and horizontal controls, and tachometer. The others wait while the pilot-commander holds a hurried conference with the radio-man to check over the call letters for the day—special daily signals to the base in case of emergency.

Radio-man and gunner climb into the tail. Pilot, co-pilot, navigator and bombardier go up front. The pilot takes the controls. There is a powerful roar, and the plane taxies across the field.

Up over the treetops, and over the surf, and each man is at his post, from the bombardier in the nose to the gunner in the tail. The intercom links them together. Eyes strain in every

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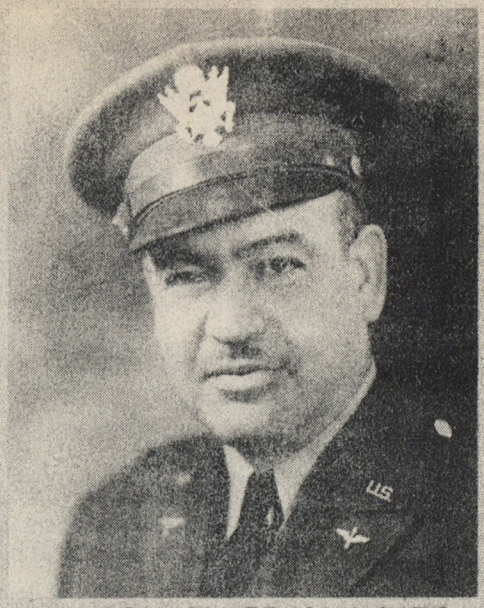
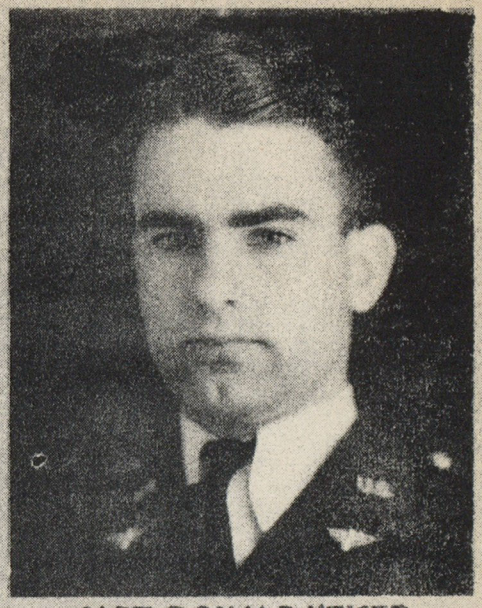
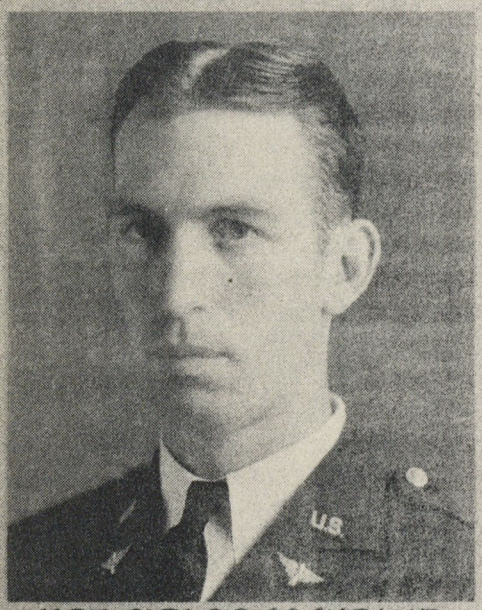
COL. EUGENE L. EUBANK



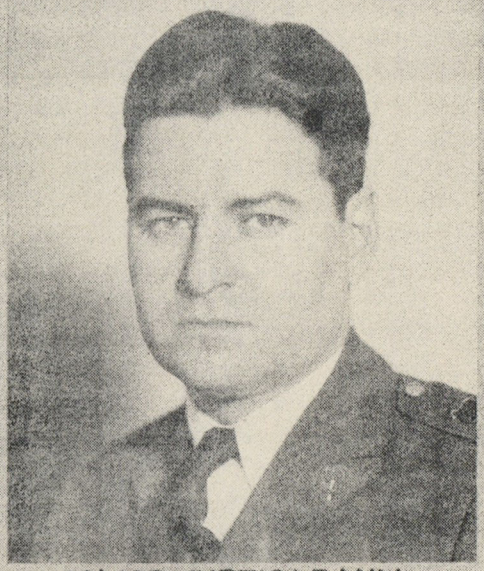
LT. COL. CALEB V. HAYNES



CAPT. DONALD KEISER



CAPT. CARLOS COCHRANE



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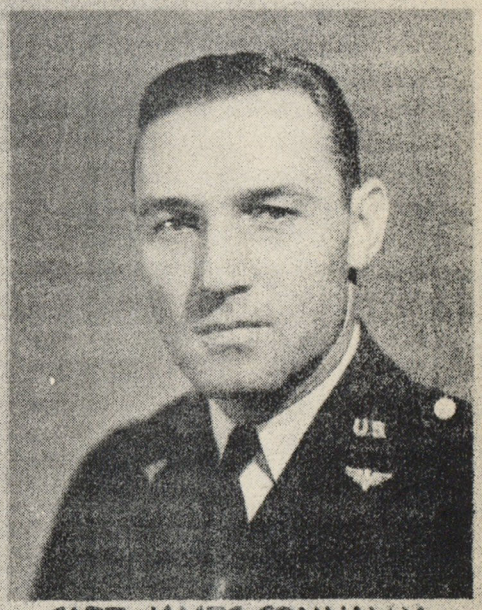
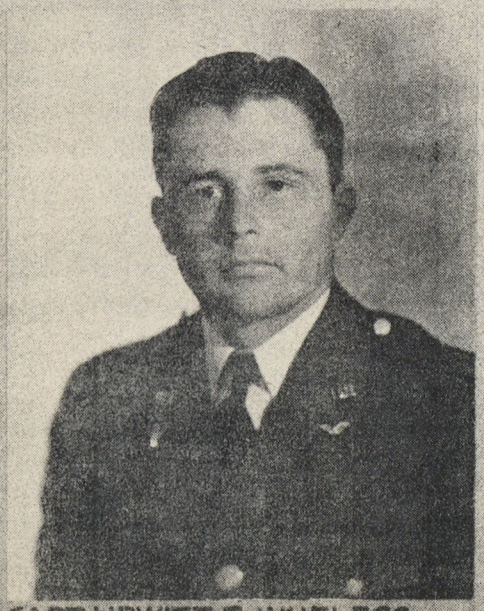


CAPT. JAMES CONNALLY

LT. COL. STANLEY K. ROBINSON



CAPT. HEWITT T. WHELESS

SGT. RICHARD E. MARTIN

SGT. ADOLPH CATTARIUS

HONOR ROLL

DISTINGUISHED SERVICE CROSS

LIEUT. COL. STANLEY K. ROBINSON-*for leading a group of 17 bombers against enemy transports in the Philippines sinking one, hitting another and damaging an enemy cruiser. The award was made posthumously after he failed to return from recent bombing operations.*

MAJOR LUTHER C. HEIDGER-*for administering first aid to wounded and consequently saving many lives during an attack by 150 Japanese planes on a Philippines air field. Major Heidger is a medical officer attached to the Air Corps.*

CAPT. ALVIN J. MUELLER-*for participating in a bombing attack on a Japanese airdrome in the Philippines. His plane was twice hit by anti-aircraft fire and attacked by 10 Jap fighters. He maintained his place in formation and protected the formation leader's plane fighting off attacks for 20 minutes. Captain Mueller landed his plane despite damaged controls. It had been hit in more than 100 places.*

CAPT. JAMES CONNALLY-*for successfully completing a hazardous mission during which he destroyed a 15,500 ton Japanese transport and then evacuated 25 badly needed AAF pilots. The mission was completed under adverse weather conditions.*

CAPT. DONALD KEISER-*for extraordinary achievement during an attack on enemy shipping resulting in a direct hit on a Japanese cruiser. He returned to his base through an equatorial storm.*

CAPT. WALTER R. FORD-*for commanding a B-17 that attacked enemy warships. He insisted on going with his ship although he had malaria. He flew 1,500 miles, directed operations and returned safely although near collapse.*

CAPT. FRED T. CUMMINGS-*for attempting to salvage his plane from a burning hanger during an air raid on a Philippines air field on December 8. He succeeded in taxiing the machine outside the hangar but Japanese dive bombers spotted him and machine gunned him blasting the plane to bits and wounding Captain Cummings in the head and arms.*

CAPT. HEWITT T. WHELESS-*for fighting off 18 enemy pursuit planes for 25 minutes and safely returning to his base with a damaged motor.*

STAFF SGT. JOSEPH L. LOCKHARD- *for voluntarily remaining on duty in charge of an anti-aircraft detector unit on the Island of Oahu, December 7 and detecting the approach of unidentified aircraft which proved to be the Japanese planes which raided Pearl Harbor. Sergeant Lockhard detected the planes at 7:02 a.m. approximately 132 miles off Oahu. After rechecking the distance and azimuth Sergeant Lockhard reported to the duty officer and furnished him with complete particulars of his findings. Subsequent investigations have proved conclusively that the planes reported by Sergeant Lockhard were the large Japanese air force that attacked the Island of Oahu at approximately 7:55 a.m. The service of Sergeant Lockhard was also noted in the report of the Roberts board investigating the Pearl Harbor attack. Sergeant Lockhard was promoted from a private in recognition of his services and is now attending an officers training school in the United States.*

MASTER SGT. LOUIS SILVA- *for manning a side gun on the leading plane of a bomber squadron attacking Japanese shipping. Silva destroyed at least three of an attacking Jap pursuit squadron.*

PURPLE HEART AND SILVER STAR

COL. EUGENE L. EUBANK- *for successfully dispersing and protecting his squadron's planes during a Japanese raid on a Philippines air base. Col. Eubank was previously awarded the Distinguished Flying Cross for leading a flight of B-17s from San Francisco to the Philippines shortly before the outbreak of war.*

A GROUP OF GUNNERS *on one B-17 were awarded Silver Stars for "gallantry in action" during which they manned their guns in a badly hit and burning B-17. All the gunners were wounded but the mission was successfully completed and the damaged plane landed. Another B-17 gunner was awarded the Silver Star for sticking to his post after receiving a shattering wound above his left knee. He fought off three attacks after being wounded and remained at his post firing until he collapsed from lack of blood. Unfortunately due to disrupted cable facilities the names of these gunners are not yet available.*

DISTINGUISHED FLYING CROSS

LIEUT. COL. CALEB V. HAYNES, *pilot; Major Curtis Le May, co-pilot; Capt. Carlos Cochrane, navigator; Master Sgt. Adolph Cattarius, flight engineer; Tech. Sgt. Richard E. Martin, engineer; and Master Sgt. James E. Sands, radio operator--for "heroism and extraordinary achievement in successfully pioneering ocean airlanes and amassing extensive information on trans-oceanic flying by landplanes". These officers and men comprised the crew of a B-24 which flew a 26,000 mile survey flight to Asia and return. Lieut. Colonel Haynes was awarded an Oak Leaf Cluster to the Cross having won the award previously for piloting the B-15 to Santiago, Chile and return carrying Red Cross Supplies to earthquake victims.*

Physical Training in the Army Air Forces

By Maj. Gen. Walter R. Weaver

Chief, Air Force Technical Training Command

Major General Walter R. Weaver

IF it is true that an army travels on its stomach, it is just as true that an air force flies and fights on the stamina, coordination and competitive spirit of the men who man its planes. This is the fundamental principle upon which the United States Army Air Corps physical training program is founded.

It is obvious that it takes more than good physical condition to make a combat crewman. Intelligence, skill and natural aptitude are all demanded. But it is equally obvious that no one who is not in first-rate physical condition can expect to have the endurance, the lightning coordination and the will-to-win necessary in modern warfare.

The latest fighter plane is little better than useless in the hands of a flyer who fails in the pinch because he doesn't measure up physically. The heroes of our Air Forces in the Pacific war zone are the men who are hanging on and on—doggedly—in the face of numerically superior opposition, and who remain clear-headed and alert against the enemy.

This is the kind of man the Air Forces need, and this is the kind of man Air Corps physical directors are striving to produce.

System Is Scientific

Our directors are going about it in a progressive, scientific way. Soon after first reporting for flight training, each aviation cadet is analyzed physically from the standpoint of the job he will be called upon to do after his training is over. After he is "sized up", exercises are provided which will correct his deficiencies and develop his strong points until he has achieved maximum physical efficiency for his type. These he must perform in a daily class period of at least one hour in length.

The job of the physical training director is not easy. He must take young men familiar with an unregulated life and prepare them for a strictly-regulated military existance. He must take "soft" bodies and harden them for the strain of modern combat flying. He must take awkward muscles and develop control and coordination. From all kinds of backgrounds, from all types of environments, men come to Air Corps Reception Centers. These men must all be developed to meet uniformly high physical standards before they are permitted to fly for the Army. The Air Forces need and are building a modern, progressive physical training program.

No effort is made to standardize the physical development or aptitudes of all Air Forces personnel. The fact that there are many different types of physiques is recognized. The objective of the program is not to try to change these, but merely to classify each individual according to his body characteristics, and then condition and develop him to the point where his natural abilities are permitted to "bloom".

Tumbling Is Effective

It is the aim of the program not only to build up each individual to his maximum physical efficiency, but also to keep him that way. In order to take care of the building-up process, exercises designed to condition and harden the cadet are emphasized during the early part of his training. At this point special emphasis is

placed on tumbling, which not only builds muscles and develops coordination, but also teaches the student how to roll on the ground during a rough parachute landing.

Another form of exercise designed to develop balance and coordination is a kind of precision hop-scotch which must be executed with great accuracy and timing on a mat laid out in black and white squares. Still another is the "wand drill", in which cadets are taught timing and coordination by manipulating wooden staffs in unison. Music is often added to increase the sense of smoothness and relaxation of muscles necessary at the controls of an airplane.

Among the muscles brought into play most in piloting a plane are those of the abdomen, neck and back. These all receive special attention during the earlier phases of the Air Corps training program.

Later, as the cadet becomes conditioned, the time devoted to calisthenics and gymnastics is gradually reduced, and individual and group athletics substituted. These include games which can be used all through life for keeping in good physical condition. Some of the most common of these are tennis, handball, squash, wrestling, swimming, badminton, bowling, fencing and volleyball.

Before being used each sport is analyzed thoroughly to determine its demands on nerve control, its influence on blood pressure and respiration, the physical characteristics it cultivates and the muscles it develops before it is incorporated in the Air Corps program.

Sports which might seriously injure the cadet and incapacitate him as far as flight training is concerned, such as boxing, football and baseball, are not given. Other games, including softball and golf, are not used to any great extent because of their "inefficient" periods of inactivity.

The physical training program is continuous all through the Air Corps flying course. It is not limited to any one phase, such as primary or basic, and it does not have to stop and start over again every time a student changes schools.

When a new cadet reports to a Reception Center a physical record is begun which continues as long as he is a flying officer of the Air Forces. This record follows him from school to school, and even out into combat units. Continuous tab is kept on the physical condition of all Air Forces flying personnel by means of a standard physical efficiency and achievement test. This test, given periodically, measures each man's physical condition and shows him exactly where he stands in relation to his own highest state of physical fitness, and his relative status among the men of his organization.

Rating System Being Developed

The form of the achievement test has not yet been crystallized. At present there are a number of exercises which are being used with some degree of success. These include a standing broad jump, a high jump, a "chinning" exercise and a running test where the individual's time in covering distances of 50 and 150 feet is measured. Constant experimentation is going on in an effort to weld these many tests into a standard physical rating system. When this is accomplished it will be possible to keep a check on the fitness of all Air Forces flying personnel.

So that the beneficial effects of the scientific training given to aviation cadets is not wasted, a staff of physical instructors has been employed for the Air Force Combat Command. It is the job of these men to administer the periodic physical fitness test, and to see that flyers exercise often enough and wisely enough to keep in condition.

Under this program a physical director has been provided for Air Force Combat Command Headquarters, one for each Air Force, and one for each of the larger combat units. These men will be not so much physical instructors as advisers.

There is a negative value to the new development program as well as a positive one. This is the ability to predict through physical tests who will succeed and who will not succeed in pilot training. Experimentation is still going on along these lines, and no definite plan has so far been adopted.

One method, however, has shown a high degree of accuracy, in preliminary tests. The plan, which was discovered by James L. Livingston, one of the Air Corps physical training Assistant Directors, is built upon the natural and cross coordination necessary in piloting an airplane.

Cross Coordination Difficult

Walking with the right arm swinging in conjunction with the left leg is a sample of natural coordination. Cross coordination involves moving the right arm in unison with the right leg and the left arm in coordination with the left leg. Such movements do not come natural to the human body and require concentration or an artificially developed skill in order to perform.

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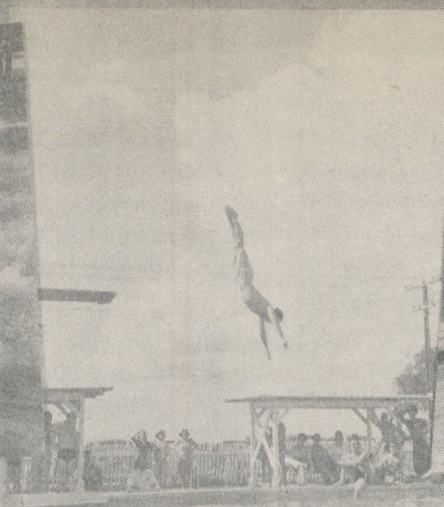
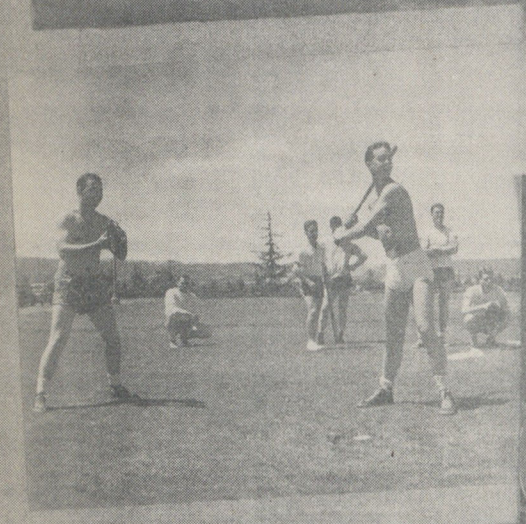
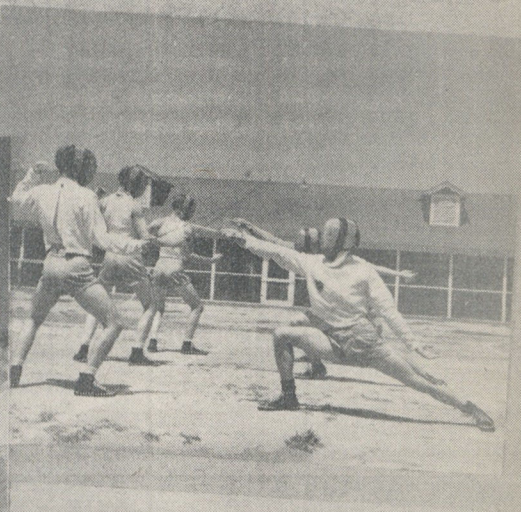
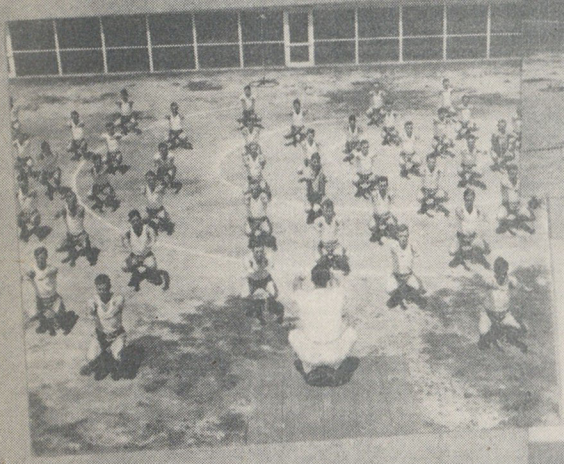
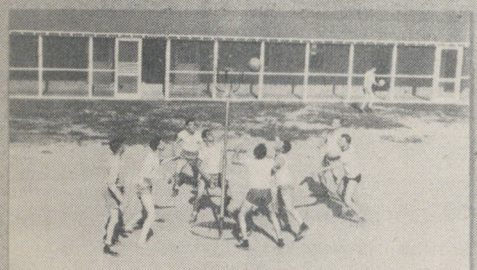
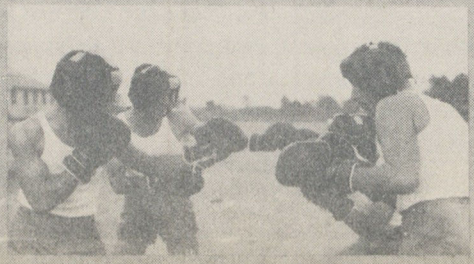












Basing his research upon the many natural and cross coordinating movements pilots are called upon to execute, Mr. Livingston developed three groups of exercises to measure physical aptitude for flying. These have been given to a cross-section of cadets during a preliminary test period—mixed in secretly with the other calisthenics flying students are now required to take at Replacement Centers.

All cadets who could execute these exercises correctly by the end of the first class period were graded "A". Those who could execute them at the end of the second class period were graded "B", and those who needed three periods were graded "C". All who took more than three periods to master the exercises were given a grade of "D". Cadets falling in the "D" classification, it was predicted, would not prove to be satisfactory pilot material. In the tests so far conducted the system has proved to be 88 percent accurate.

Another exercise test for pre-determining pilot failures is the modified Burpee test. In this exercise the subject throws himself from a standing to a horizontal "leaning rest" position and then leaps back to his feet again. Normal pilot candidates can accomplish this feat from 15 to 20 times in 30 seconds. Trainers figure that candidates who can perform this stunt only seven times or less in the prescribed time stand a good chance of being eliminated from flying school. Tests so far have shown them to be right 83 percent of the time.

If these and other physical aptitude tests stand up in subsequent trials throughout pilot training centers as convincingly as they have so far, they may prove invaluable in helping to determine the type of training aviation cadets should receive.

Predictions Made Early

If this could be done it would save the Air Corps a large amount of time and money. One of the most attractive features of the physical aptitude test is the fact that all predictions are made within the first week after the cadet reports for training.

Recognition by the Air Corps of the need for a progressive system of physical training for aviation cadets culminated in instructions being issued for the present program as far back as January, 1941. These instructions, issued from Air Corps headquarters, made a one-hour per day physical program compulsory for all aviation cadets, and provided for at least one physical instructor for each school and training center.

The selection of personnel to run this vast program was begun in February, 1941. Directors of physical training for the Army Air Forces and Units of the Command were appointed and placed in key coordinating positions in Washington. These included James E. Pixlee, former Director of Physical Education and Assistant to the President, George Washington University, appointed Physical Training Director for the Army Air Forces; and Birch Bayh, former physical and athletic education director of the Washington, D.C. City School System, appointed Physical Training Director for the Air Force Combat Command. In addition, each Air Corps flying training center and the Air Corps Technical Training Command selected directors to administer programs locally.

Chose Qualified Personnel

While the Director of Physical Training for the Air Forces was busy preparing a general guide for use in all Air Corps flying schools, the physical training directors of each flying training center were selecting the personnel who would serve as instructors. No one was even considered who did not have a college degree with a major in physical education, and at least one year's graduate study or three years of practical experience.

Always kept in mind in considering applicants was the difference between a purely athletic and a physical education background. The Air Corps decided at an early stage that no candidate was wanted who did not understand that it takes more than just muscular development and skill in a certain game to make an expert combat crewman.

After he was hired, but before any work was begun, each new instructor was given a six-weeks' training course in which he learned how to drill like a cadet, give orders like an officer, and generally become orientated to a military environment.

Then came conferences—days of them—in which each man was invited to contribute his ideas to the creation of the most advanced plan possible. Conferences were necessary, for these men were working in a field virtually without precedent.

Before they met there was no specialized physical training program for Air Corps personnel. Those instructions that did exist were included in the Army Field Manual on physical education, prepared with an eye primarily to the conditioning of soldiers for hand-to-hand fighting. As a result of this lack of a specific program, some

(Continued on Page 51)

Torpedoes Sprout Wings

By Lieut. F. J. Novitski, U. S. N.

COUPLING of the airplane and the torpedo has produced one of modern warfare's most deadly instruments of destruction.

The torpedo plane's victory record in the present conflict is impressive—three Italian battleships at Taranto; the Bismarck brought to bay so an English cruiser could finally torpedo her after battleships had fruitlessly poured heavy caliber shells into her drifting hulk; the Repulse and Prince of Wales sunk in a few hours by torpedo planes, and a score of Italian and British cruisers and transports sunk or damaged in the Mediterranean. And let us not forget Pearl Harbor.

The British aircraft Carrier Illustrious took a three hour pasting from a swarm of Junkers dive bombers one afternoon in the Mediterranean. Seven 2,000 pound bombs hit her flight and hangar decks but she steamed into Malta, stayed long enough to sustain another bombing attack and then steamed across the Atlantic for overhaul. The aircraft carrier Ark Royal, practically a sister ship, took one torpedo in her belly and went to the bottom.

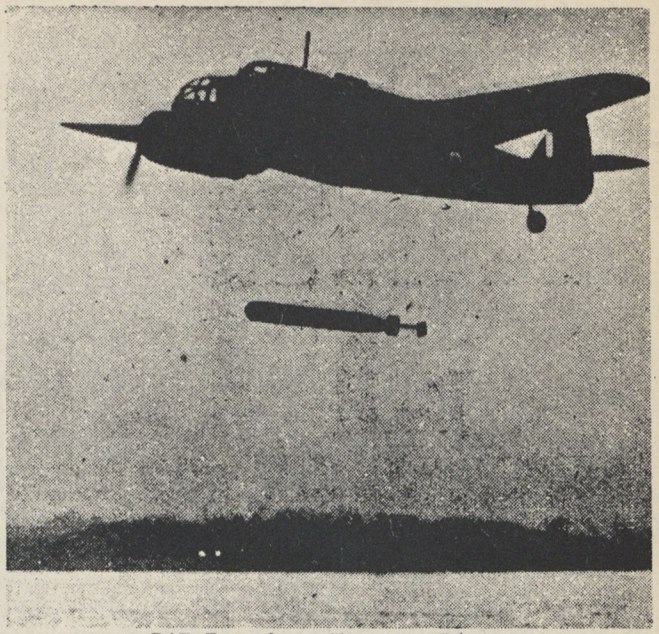
Clearly, the torpedo is this war's prime offensive weapon of the sea. An unofficial compilation of naval communiques indicates that a majority of warships of all nations sunk in the war have been destroyed by torpedoes.

What is a torpedo? Why is it so effective? How is it used by planes?

The modern torpedo is a self-propelled, self-controlled underwater missile carrying a heavy explosive charge. In size, shape and weight it is much the same as the heavier aerial bombs. It consists of four main sections, the warhead, airflask, afterbody and tail. Once launched, it will travel long distances at high speed. It will find and hold a pre-set depth. It will maintain within a fraction of a degree the course upon which it was launched or it will start on that course and then turn through a pre-determined angle to add deceptiveness to its attack.

Hits Weakest Spots

The torpedo's victims usually suffer a fatal blow because the torpedo hits them where they are softest and where the force of the explosion is confined—below the waterline. No naval architect has yet been able to protect a warship's underbody as well as her decks and sides. The



RAF Beaufort Torpedo Plane

Bismarck and Prince of Wales were the last word in British and German naval design. But when torpedoes hit them they went down.

The warhead is the business end of the torpedo and its simplest major part. It consists of a thin reinforced steel or bronze shell loaded with as many hundreds of pounds of explosive as the power plant will propel. It also contains a detonator and a mechanism which renders the charge harmless until after the torpedo has run a few seconds on its course.

Behind the warhead is the airflask which carries a sufficient supply of air to support combustion. It is made of high alloy steel only thick enough to withstand a pressure of 200 atmospheres and the shocks of launching. The ends of the airflask are closed with steel bulkheads. In the rear end of the bulkhead a small section of reduced wall thickness is set aside to carry water and a few pints of fuel, usually alcohol.

The afterbody carries in it the organs, brains and the nervous system of the torpedo. In outward appearance the afterbody is a tapered steel shell decorated with a variety of apertures and attachments which are streamlined to its shape. Inside an array of pipes twist and turn to find their way around shafts, gears, valves and sundry odd shapes of brass, bronze, steel and monel. Each has its own important function.

When a torpedo is launched air is released from the airflask to the combustion pot. Some of the air is diverted to force fuel into the same combustion pot while still another stream of air strikes a cap on the igniter, which pro-

trudes into the combustion pot, causing the igniter to burn. The combustion pot thus has flame, air and a spray of fuel and a merry blaze ensues. The resultant gases are led through nozzles to two counter-rotating turbines mounted on concentric shafts. After imparting their energy to the turbine wheels, the gases pass out through the tail into the sea, making the characteristic wake of the torpedo. The turbine wheels drive two counter-rotating propellers which drive the torpedo through the water.

Simultaneously with this action, a shot of high pressure air has spun a small gyroscope which thereafter constantly indicates to the torpedo its correct course. Any off course wanderings actuate a small air engine which operates the vertical rudders of the torpedo. For control in the vertical plane there is a hydrostatic diaphragm which indicates the correct depth at which the torpedo should run and a pendulum which prevents too radical changes in depth which would result in diving and broaching. These control another tiny air engine connected to horizontal rudders. The tail mounts the vertical and horizontal stabilizing surfaces in addition to the rudders and propellers.

Such is the torpedo, certainly one of the most ingenious devices of destruction ever made and now vastly more effective through its employment by fast, far ranging planes.

Originated Here

The torpedo plane is already 31 years old although the public became aware of it only in 1940. Like so many other mediums of attack it was conceived and given early development in the United States, only to be first used effectively by another nation. Rear Admiral Bradley A. Fiske, U.S.N., is generally credited with being the inventor of the torpedo plane. In 1911 he succeeded in launching a torpedo from a seaplane flying over the Potomac River at the dizzy height of 15 feet. Subsequent developments both here and abroad have progressed to the point where torpedoes can now be launched from high speed planes at an altitude considerably in excess of 15 feet.

The torpedo plane can be used wherever the bomber can be used against floating targets, and, as already indicated, is vastly more effective against such targets than the bomber. However, it should be obvious from the description of the torpedo that it is a delicate instrument. This fact naturally limits the speed and height of drop, which in turn imposes limitations on the tactics of the torpedo plane. Torpedoes can be loaded on wings, in the bomb bay or slung below the fuselage. The cockpit of a torpedo plane is equipped with a director for correctly aiming the torpedo.

The torpedo attack must be delivered from moderately low altitudes at extremely close range without using all the speed available in modern aircraft. The altitude must not be too low, or the splash from the dropped tin fish may fill the bomb bay and wreck the plane. On the other hand, if the altitude is too great the delicate mechanisms of the torpedo may be deranged by the drop. Speed must be limited for the same reason.

Approach Technique

The range must be close to insure accuracy and negate evasion tactics by the ships attacked. At the dropping point the torpedo plane must be in nearly normal flight position. If the plane were in a steep glide or dive the torpedo might nose over when it hits the water and run on a reverse course. Furthermore, the approach for the attack must cover several miles so that accurate observations can be taken. The approach must be flown under the same conditions as the main attack. There can be no long, fast swoop from high altitudes, no quick drop or speedy getaway.

It will not take pilots long to realize the risk involved in the combination of level flight at low altitude and comparatively slow speed over many miles of sea in view of the enemy. Torpedo plane pilots must have cold accuracy and a determination to close the range, must be impervious to danger. The torpedo plane presents a difficult target for enemy fighter planes because its low altitude makes diving attacks virtually impossible. If torpedo planes have their flanks covered by their own fighter screen they are virtually immune from other plane attacks. In breaking away the torpedo plane pilot's chief concern is flak fire from the ship he is attacking. Italian and Japanese pilots seem to prefer "hopping the quarterdeck"—opening their throttles in a speedy dash just over the decks of their ship victim. Other pilots prefer a sharp breakway turn and a speedy scoot just above the wave crests or between other ships if a formation is being attacked.

There need be no prescribed form for a torpedo plane attack on ships in port. Success depends mainly on surprise. For an attack on ships underway the customary formation is a wide ech-

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Air Service Command Supplies the World

By Maj. Gen. Henry J. F. Miller
Chief ot the Air Service Command

STRETCHING across the length and breadth of the continental United States and reaching into the overseas possessions of this nation a huge organization is working constantly, day and night, to keep Army airplanes ready for action wherever they are needed. Membership of the organization is made up of thousands of civilians, men and women from all walks of life, all knuckling down to a vitally important task under the direction of military personnel. Their job is to repair and maintain all Army aircraft, and to do all the mechanical and clerical work incidental to the main task. Their organization is the Air Service Command of the United States Army Air Forces; their slogan, "We Keep 'Em Flying."

Many of these workers and their officers are engaged in the vital, specialized tasks of repairing damaged airplanes, overhauling and rebuilding aircraft engines, maintaining gauges, navigation instruments and radio equipment, all of which are important units in the modern Army airplanes.

The large volume of paper work required by the extensive operation of the Air Service Command is handled by thousands of civilian office workers, office managers, stenographers, typists, auditors, clerks and trained specialists in many different classifications—all under the direction of military personnel. Much of this work is carried on in offices at Wright Field, Dayton, Ohio, and much of it at the various Air Depots. The whole organization of the Air Service Command is directed from headquarters in Washington.

Duties of the Air Service Command were originally discharged by the former Maintenance Command, which was a branch of the Materiel Division of the Army Air Corps. Under Air Force regulations issued from Washington on October 17, 1941, (A.A.F. Regulations No.20-4) the Maintenance Command was inactivated and the Air Service Command was established immediately to take over the work of repairing and maintaining Army aircraft. Under the latest Army re-organization effective on March 9, 1942, the Air Service Command was placed on equal footing with seven other Commands.

The same regulations which announced the organization of the Air Service Command to supersede the Maintenance Command also announced the establishment of the First, Second, Third and Fourth Air Service Area Commands and the inclusion of the already-established 50th Transport Wing as component parts of the Air Service Command. Each one of the Air Service Area Commands corresponds to one of the Air Force Areas. Each one covers approximately one-fourth of the United States. Every continental Air Depot and sub-depot is included in one or another of these areas. Overseas depots are under the technical control of the Air Service Command.

There are now seven continental air depots, located in various sections of the United States. The addition of new depots from time to time will greatly increase the strength of the Air Service Command. Four new depots are already planned.

Seven Big Depots

Of the seven continental depots now existing, all but three control numerous sub-depots, and these three will be given the control of sub-depots to be activated in the future. Forty-seven sub-depots now come under the jurisdiction of the existing four continental control depots.

These four are: the Fairfield Air Depot at Patterson Field, Fairfield, Ohio, near Dayton; the Middletown Air Depot at Olmsted Field, Middletown, Pennsylvania; the San Antonio Air Depot at Duncan Field, San Antonio, Texas; the Sacramento Air Depot at McClellan Field, Sacramento, California.

The San Antonio Air Depot now controls 19 sub-depots in Texas, Louisiana, Colorado, Oklahoma, and Arizona. Fairfield controls 18 sub-depots in Alabama, Georgia, Florida, Illinois, Mississippi, and South Carolina. Nine sub-depots, in California, and Nevada are controlled by Sacramento. The Middletown Air Depot controls one sub-depot at Bolling Field, Anacostia, D.C.

The three continental depots which will be given the control of proposed sub-depots are Mobile at Brookley Field, Mobile, Alabama; Ogden at Hill Field, Ogden, Utah; and the Wellston Air Depot at Wellston, Georgia.

It is obvious that a staggering volume of work is required at headquarters and in the far-flung air depots and sub-depots in order that the life blood of the Air Forces may be kept flowing. In an operation so vitally connected with the efficient action of war planes and other Army aircraft, there are multitudes of details, involving myriad problems in engineering and mechanics, supply and transportation, personnel work, office management, and routine activity in mechanical and clerical jobs of almost every description. All this detail must be handled expertly. And in order that it may be so handled, the work must be divided and subdivided and assigned to well qualified specialists. The principal assignments thus made under the General Staff of the Air Service Command are those handled by the following offices: Engineering, Supply, Training and Operations, Personnel, and the 50th Transport Wing.

Actual maintenance of aircraft, equipment and supplies which are delivered to the Air Corps for use in peace or war is a part of the responsibility resting upon Staff Engineering for the Air Service Command. The Staff Engineering Officer is charged also with the formulation of plans and policies pertaining to the design and operation of engineering staffs of Air Corps Depots.

Specifically, the Staff Engineering Officer must supervise—in coordination with the Field Service Section and the Assistant Chief of the Air Service Command—the issuance of necessary instructions for the correction of major maintenance difficulties encountered in the field. Whenever the need arises for the change or improvement of existing policies applying to engineering and maintenance procedures, the Staff Engineering Officer must supervise the making of such changes and improvements, in coordination with the Inspection Section, Office of the Chief of the Air Corps. He must coordinate all special engineering projects and make recommendations on personnel matters concerning military and civilian personnel in the engineering activities of the Air Service Command. In making any recommendation on such personnel matters, he works in close coordination with the Assistant Chief of Staff—Personnel.

Depot Engineering Staffs perform maintenance work on United States Army and National Guard aircraft, aircraft engines, accessories, unit assemblies and auxiliary equipment.

These duties are carried out by an extensive organization of officers and civilian workers. The depot Engineering Superintendent is under the direct command of a Chief Engineering Officer appointed by the Commanding Officer of the depot. Several Assistant Engineering Officers make up the military staff of the Chief Engineering Officer. One of these assistants is in charge of the Administrative Section; another, in charge of the Inspection Section; still another, in charge of the Flight Test Section; and one, in charge of the Radio Repair Section.

The civilian staff of the Engineering Officer consists of a general superintendent of aircraft shops, a superintendent of aircraft shops, a general foreman of Air Corps shops, principal clerk, principal draftsman, and senior stock tracer.

All sections of the Engineering Staff are divided into branches, and the branches are subdivided into units, each charged with its own specific duties and all welded together into one intricate organization.

One job essential for the smooth, efficient operation of the Air Service Command is the distribution of necessary supplies to depots. Equipment and materials ranging from office supplies to complete airplanes must be furnished whenever they are needed. The responsibility of planning the distribution of supplies and the administration of policies and procedure are functions of the staff officer in charge of Supply. The actual distribution and the storage of supplies are handled by the Supply Branch of the Field Service Section.

Among six main branches of the Field Service Section is the Supply Branch, in charge of the actual distribution, storage and issue of such supplies as spare parts and accessories for airplanes and aircraft engines, combat equipment and armament, miscellaneous aircraft equipment, fuel, lubricants, chemicals and paint, machinery, tools and metals, and many other supplies on the procurement list of the Air Corps.

All instructions, regulations and correspondence necessary for the proper execution of Supply activities are coordinated under the supervision of the Chief of the Supply Branch. He is in charge of the investigation of any serious difficulties encountered in the discharge of supply duties, and he recommends the remedial action that may be required. He supervises the supply activities of the depots, studies established practices and existing methods of issue and storage, with a view toward obtaining the maximum efficiency of the depot.

Many other details come under the supervision of the Chief of the Supply Branch and his assistants—such work as the maintenance of consolidated property records of all items and commod-

ities on the storage and issue list of the Air Corps, the disposition of any surplus or excess property in accordance with law and regulations, and the accomplishment of other work which is demanded by the necessity for close cooperation between Supply and the rest of the General Staff.

Field Service Important

Other branches of the Field Service Section are charged with the maintenance of Air Corps equipment and supplies; assignment of nomenclature to Air Corps articles; classification of supplies and equipment for storage and issue; initiation of engineering studies for the investigation of failures and defects in material or equipment, and the preparation of reports, required by higher authority, regarding remedial action necessary.

The Field Service Section also prepares tables of basic allowances, tables of allowances, weight and bulk tables, and similar data; prepares other data pertaining to war plans and special projects; prepares, stores and issues Technical Orders, instruction books and manuals; prepares annual budgets and administers funds made available to the Field Service Section; designs Air Corps technical buildings and reviews projects for repairs and alterations; maintains records of all aircraft, engines and equipment, showing the location and condition of the equipment and the flying time of every airplane and engine.

An extensive organization of main branches and units—some 30 branches and units in all—is needed to carry out the complete program of the Field Service Section. The main branches, in addition to Supply, are those in charge of maintenance, publications, communications, and armament.

Another important staff duty of the Air Service Command is discharged by its training and operations division, the organization which trains military and civilian personnel, prepares tables of organization for ASC service units, supervises the movement of service troops and the attachment of units for tactical operations.

Every facility is being used for the training of military and civilian personnel for service in overseas depots, continental air depots and sub-depots. With large numbers of Air Depot Groups being activated for the handling of second echelon maintenance wherever needed, civilian aviation schools are training military personnel in mechanical branches, under contract, and civilian specialists are working with Training and Operations in compiling instructional material and guides for the personnel of these groups.

Training is given in both classroom work and practical on-the-job experience, under the supervision of competent instructors. The Air Service Command maintains a system of promoting all workers who go through the training courses successfully.

Air shipment of supplies and assemblies needed by outlying stations are made by the 50th Transport Wing Headquarters, located at Wright Field. Activated in January, 1941, the Wing is responsible for the scheduling and operation of all inter-depot air freight movements. The Wing also furnishes transport airplanes and transport pilots to function with the training and activity of parachute troops and air-borne infantry.

Most of the inter-depot shipments are made up of new engines, propellers, and government-furnished equipment. In other shipments there are overhauled engines and supplies and reparable assemblies, transported from outlying stations to the repair depots.

There are nine squadrons in the 50th Transport Wing, all assigned to various depots. On the basis of miles flown and traffic moved, the 50th Transport Wing would rank fifth on the list of commercial airlines in this country.

All this effort—the efficient work of Engineering, Supply, Field Service, Training and Operations, Personnel, the 50th Transport Wing, and all the offices and units of the Air Service Command—adds up to the achievement of that one fundamental objective expressed in the slogan, "We Keep 'Em Flying."

The importance of this objective can not be over-emphasized in the present struggle. In the detailed work and routine of the various subdivisions of the Air Service Command the main objective must never be forgotten. Every unit, every individual is working together toward the achievement of one goal; and all, working together, will make a major contribution to winning the final victory.

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Erik H. Nelson, pioneer Army Air Corps long-distance flyer and aircraft engine expert, who resigned from the Army in 1928 after a decade of service, during which he participated in a series of trail-blazing long-distance flights, climaxed by the Round the World Flight in 1924, returned to active duty with the Army Air Forces. He was commissioned a lieutenant-colonel and assigned to the Inspection Division.

Mae West is a Life-Saver

TO THE RAF

WHEN screen actress Mae West heard recently that the Royal Air Force had named its life-saving jackets after her, she immediately wrote "the boys" a letter of gratitude for being chosen for such a "swell honour".

The "Mae Wests" are life-saving jackets used by the Coastal Patrol and other RAF crews in hops over water. They are similar to the U.S. Air Forces' life preserver, which is strapped on the flyer so it fits like a vest—with two inflatable compartments covering the chest. The jackets, which fill with carbon dioxide gas when a lever is pulled, have saved many lives by keeping aircrews afloat after forced landings in the sea.

Mae found out about the nick-name given the jackets when she read a newspaper item suggesting the name "Mae West" might soon get in the dictionary. In reply Mae whipped off a letter to the boys of the RAF. According to *Tee Emm*, a service publication of the British Air Ministry, her letter reads as follows:

DEAR BOYS OF THE RAF:

I have just seen that the RAF flyers have a life-saving jacket they call a "Mae West," because it bulges in all the "right places." Well, I consider it a swell honour to have such great guys wrapped up in you, know what I mean?

Yes, it's kind of a nice thought to be flying all over with brave men...even if I'm only there by proxy in the form of a life-saving jacket, or a life-saving jacket in my form.

I always thought that the best way to hold a man was in your arms--but I guess when you're up in the air a plane is safer. You've got to keep everything under control.

Yeah, the jacket idea is all right, and I can't imagine anything better than to bring you boys of the RAF soft and happy landings. But what I'd like to know about that life-saving jacket is--has it got dangerous curves and soft shapely shoulders?

You've heard of Helen of Troy, the dame with the face that launched a thousand ships...why not a shape that will stop thousands of tanks?

If I do get in the dictionary--where you say you want to put me--how will they describe me? As a warm and clinging life-saving garment worn by aviators? Or an aviator's jacket that supplies the woman's touch while the boys are flying around nights? How would you describe me, boys?

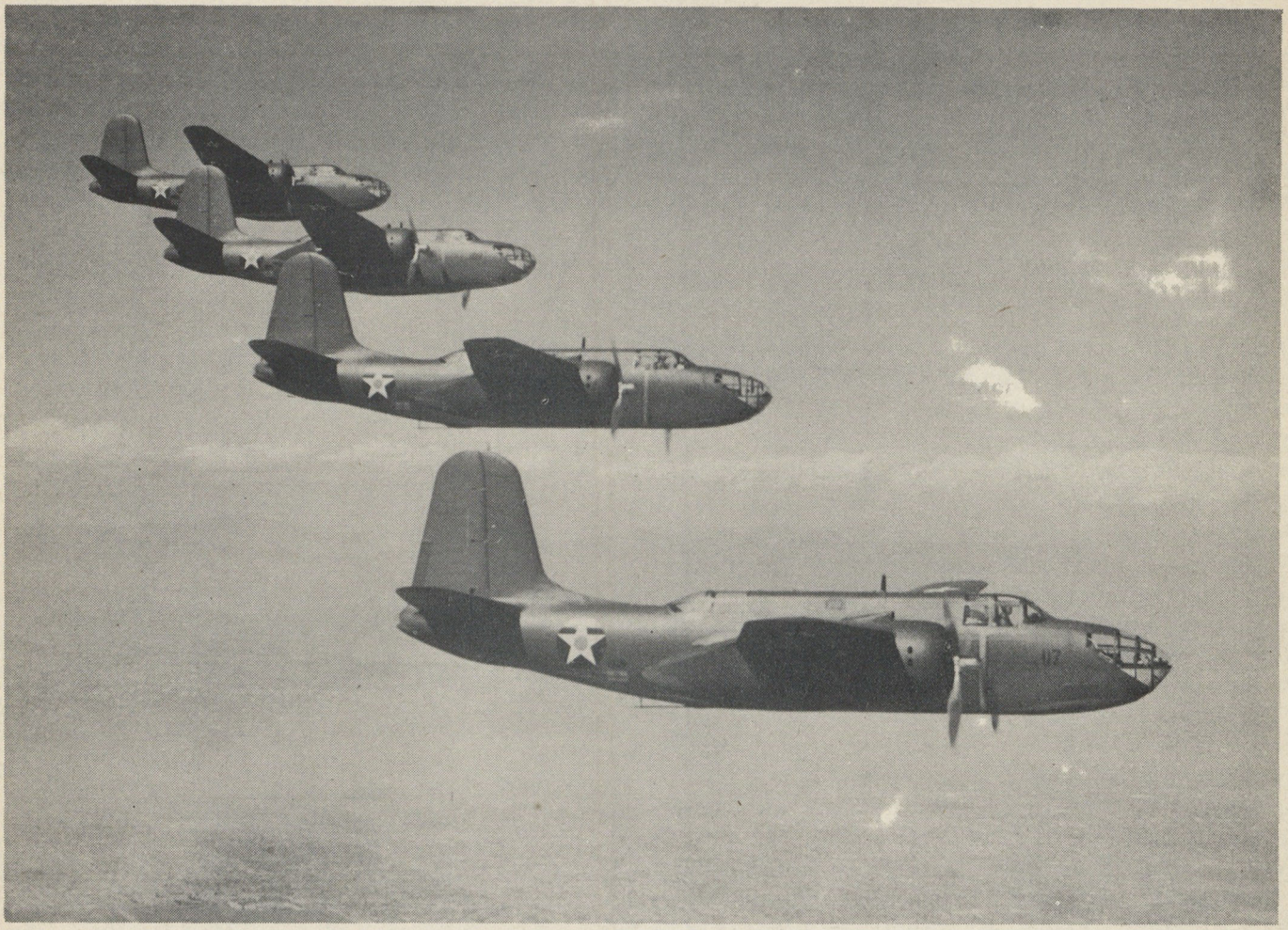
I've been in Who's Who, and I know what's what, but it'll be the first time I ever made the dictionary.

Sin-sationally,

Mae West

Unwelcome Guests

They Catch 'Em With Their Flaps Down



ONE of the most successful fighter tactics of the air war to date has been the pursuit ship patrol over enemy bomber bases. The Germans and British have developed this tactic of "intrusion" to a high degree as a night fighter operation to attack long range night bombers returning to their bases after a foray over enemy territory and the Japanese have used it as a daylight maneuver to catch Allied heavy, high altitude bombers under unfavorable conditions during the "let down" to their fields.

When the fighter patrol attacks returning bombers in the vicinity of their bases the aggressor has several advantages. The bombers usually have an extremely limited amount of fuel left after completing their mission and their defensive maneuvering is limited accordingly. Crews of returning bombers are usually fatigued and not as alert as they approach their base and the all important element of surprise is usually found aiding the pursuits.

At night the element of surprise is even greater and the hunting consequently better. In addition to the bombers shot down by the fighters' guns, there are often crashes caused by destruction of field lights, failure of bomber pilots to lower landing gear during the confusion of the surprise attack and bombers running out of gas during prolonged defensive maneuvers.

Both the English and the Germans favor a single, twin-engined night fighter for the attack on any given bomber base. The Germans use the Messerschmitt 110 and the English the American-built Havoc or DB-7 (American model A-20 series.) Both planes carry light bomb loads in addition to heavy armament.

The Havoc is an all metal monoplane powered by twin Wright Cyclone engines. It was originally built for the American Army Air Forces as the A-20 light attack bomber. The British ordered them in quantity during the early days of the war for the same use and dubbed them Bostons. When the heavy German day bombing attacks were shifted to a nocturnal schedule after the Battle

Over Britain, the Boston's were equipped as night fighters and called Havocs.

They carry a crew of three or four and are equipped with heavy armament, light bomb load and exhaust screens. For night operations the plane is painted dull black. In addition to their use as "intruders" the Havocs have been successful in knocking down night bombers over England. As the A-20 series they are still used by the AAF.

Patrol German Bases

Here is how the Havocs make life miserable for German night bomber crews. A lone Havoc patrols over each German bomber base from which night attacks are launched against England. They cruise around and above the flak range of air base defenses with motors throttled to conserve fuel. When German bombers return to land the Havocs open throttles and dive to the attack. Fatigue from the flak-filled trip over England and surprise frequently cause German pilots to land in a hurry with their wheels up or over or undershoot, piling up the bomber even if the Havoc's guns fail to damage the ship.

If the German guns his engines and tries to run, the Havoc closes the range and engages him until he lights out for another field. The Havoc then lets him go knowing that another Havoc waits over every field the bomber can make with the limited fuel left after a round trip to England. After several unsuccessful stabs at Havoc-infested fields, German bombers sometimes run out of fuel and crash in darkness.

"Just a piece of cake," is the way one Havoc pilot describes the operations. "We shoot at everything we can see, frequently getting two or three. The Jerries sometimes get so jumpy they start firing at each other."

Another pilot reported:

"When we approached an enemy airdrome in France we spotted eight aircraft circling around. We joined the circle and opened fire on one from about 30 yards. We hit his fuselage and saw sparks streaking from an engine. We gave him four more bursts in the port engine and he blew up. We recognized him as a Heinkel 111. in the brilliant orange flash just before he disintegrated. The other aircraft dispersed so we climbed into a cloud, bombed the airport and came home."

When the possibilities of machine gunning enemy planes are exhausted the Havocs drop their bombs on the airport aiming particularly at lighting installations. The object is to keep the field dark as long as possible and thereby prevent the bombers from landing while they exhaust their fuel.

A sergeant pilot reported on this type of action:

"We had just about given up sighting the Hun. There seemed to be no aircraft in the sky. So we made a careful run in over the airdrome and dropped our bombs from 4,000 feet.

"Great fires sprang to life below. Our gunner was studying them through the lower hatch when, looking up, he saw a Nazi bomber smack on our tail its, outline etched distinctly in the glow from the fires below. It was only 50 yards away and he let it have a burst full in the nose. The Hun returned our fire but his tracers passed below our tail. Then he dived and the gunner fired straight into his cabin. He crashed directly below, exploded and burst into flames. We could see the fires for 50 miles on the way home."

Smash 'Em On Ground

How the German bombers are smashed on the ground was described by a member of another Havoc crew.

"Our objective was an airdrome in Holland, well back from the coast. We reached it at 7,000 feet. The ground lights flashed on and two enemy aircraft landed. We were too high to attack. The lights went off and we waited. Five minutes later the lights came on again and an aircraft took off. Another was well along the runway when we came over him. We dropped our bombs in his path. His lights slewed up perpendicularly into the sky and he burst into flames."

A good night's work over enemy territory illustrating the versatility of the Havoc as an "intruder" is described in the following Pilot's report.

"We were assigned to patrol a Nazi airdrome in Holland. We broke out of scattered clouds over the airdrome to find the beacon flashing steadily. At 5,000 feet we saw a red cartridge coming up and the ground lights and flare path immediately lit up. When we got a little lower we could see the enemy aircraft getting ready to land and others circling to follow him in with their navigation lights on.

"One aircraft landed and taxied to a dispersal point before we could reach him. We got onto the next one at 500 feet. We could see our tracer go into him from 50 yards. His lights went out and he plunged straight down. While we were dealing with him with our forward guns, the

(Continued on Page 20)

Making America's Sky Warriors

By Maj. Gen. Barton K. Yount

Commanding General, Flying Training Command

THE course of events in Europe and more recently in the Pacific area has demonstrated conclusively that air power is apt to be the deciding factor in modern warfare. This year and next will bring on the great crisis. America must gain air supremacy now. The urgency of the need is a tremendous challenge to our rapidly expanding aircraft industry to strain every effort to produce the 60,000 military aircraft required by our Army and Navy during 1942. It is no less a challenge to our Air Forces to provide a huge pool of highly trained airmen to man these planes, as well as a vast army of technically trained maintenance and service crews.

To meet this challenge the Army Air Forces have recently set up a Flying Training Command to centralize the tremendous task of providing the flying personnel required for the expanded air program—a program superimposed on plans already expanded several times at a breath taking pace. To take our new warplanes into the air, a constant stream of bombardiers, navigators, pilots, and aerial gunners must also flow from our training centers.

Bottlenecks Are Eliminated

The Flying Training Command was created to bring all of the training centers under one unified control, eliminate bottlenecks, speed up the program, and add new facilities so that an ever enlarging supply of competent personnel may be sent to our combat commands. This must be done with all possible speed in order to make up American Air Forces wherever needed in the rapidly expanding world conflict.

At the present time the Flying Training Command is housed on the fifth floor of the Maritime Building, Washington, and the place is humming with activity. New sets of figures are being worked out to step into line with the total flying personnel required to meet the present goal of an Air Forces of a million men and with the possibility that this number may eventually reach two million. Figures are being coordinated with aircraft procurement schedules to ensure the proper proportions of combat pilots for fighter planes, two-engine and four-engine bombers, bombardiers, navigators and gunners—all to synchronize with the delivery of the planes. Plans are being set up for operational training in which pilots will receive additional training and members of combat crews will learn to work together as a highly efficient teams.

Training courses are being revised to include the latest tactical lessons learned the hard way in the actual crucible of war in the air, including an increased emphasis on dive bombing, the use of aerial torpedoes and the employment of gliders. In cooperation with other divisions of the Air Forces, new sites, schools and necessary facilities are being arranged which eventually will more than double the present program.

Emphasis On Quality

Despite the unprecedented increase in our pilot training program—from about 500 per year in 1938 to 30,000 per year in 1942, plus substantial numbers from England for the RAF and smaller groups from Latin American countries and from China—we have kept our emphasis on quality. The acid test is combat against enemy air forces, and even in the short period since the active entrance of the United States into the conflict, American airmen have come through with flying colors, often against overwhelming odds. In many cases they have shot down hostile planes and reached objectives with their bombs on the very first trip aloft in enemy skies.

To enlarge the pool of available pilots the War Department has asked the Civil Aeronautics Administration to concentrate all CAA Pilot training in an all-out total war program. First priority in the training facilities of the CAA is to be given to the pilot training of students who can meet the revised requirements for appointment as Aviation Cadets in the Army Air Forces, and who are members of the Air Section of the enlisted Reserve Corps. After that the flight training is to be limited to students who, while unable to meet the requirements for appointment as Aviation Cadets, are otherwise qualified to pursue a course of flight training looking to the issuance of flying instructors'

licenses under regulations of the CAA, and who undertake in writing to contribute future effort in a field of aeronautics adapted to serve the national interest, directly or indirectly.

This means that a total of more than 500 CAA Pilot Training units in all parts of the country are now being definitely harnessed to our war effort. It is expected the CAA elementary flying training will be given to some 45,000 students this year, and that a large proportion of these will be carried on through the secondary stage, with considerable numbers taking cross-country, instrument and instructor flight training. To aid the constantly enlarging activities of the Air Force Ferrying Command, a special course will be given to approximately 1,000 pilots for this important field.

Even more striking than the zooming figures and activity in the pilot training is the strong emphasis we are placing on the other key members of the modern aircrew—the bombardier and the navigator. As recently as 1940 our facilities for this type of training were extremely limited, but now we are prepared to turn out these specialized flying officers in great numbers.

Need More Crews

In the same way, we are giving considerably more attention to the training of pilots for four-engine bombers. Within the past year or two the Air Forces' championing of the long-range multi-engine heavy bomber has been amply vindicated as a strategic weapon of the utmost value. The newest versions of our Boeing B-17 and Consolidated B-24, backbone of America's "heavy bomber program," already doubled twice and recently doubled again, will require an increasing flow of pilots and combat crews working together as a team, and the Flying Training Command is giving this a high priority rating in its present schedule.

American air power is already beginning to influence the fighting on several fronts in the world-wide battle for freedom, and there have been many thrilling examples of how effective our flying training has been and how good our planes are in comparison with the best the enemy has to offer. Straining every effort, and all pulling together, we can look forward to the time, not so far off, when the air-fighting strength of our nation will be such in both quality and quantity, that the starred red, white and blue wing insignia of America's air might will be a sign of supremacy—a symbol of terror to our enemies and of victory to ourselves and our allies.

Their Flaps Are Down

(Continued from Page 18)

rear gunner hit another with the top gun. Climbing we saw a third plane coming toward us and got in several good bursts as he passed below.

"We got some altitude by then and saw another below and off to the port. We dived on him and gave it to him with our front guns. Another was just beyond so we continued our dive and sent him down from 500 feet. We had only begun to shoot at a sixth when the rear gunner called and asked us to lift the nose a bit. We did and he fired astern directly into the nose of Number 7. Number 7 went into a vertical dive at 600 feet and by the time he crashed we were a good four miles past the landing field.

"During this engagement only three enemy aircraft were seen to land intact and taxi off. We still had our bombs so we climbed a bit and dropped them at the point where the aircraft were seen to taxi off. The bombs burst on huts and buildings and started quite a fire. We went home without incident except for a few seconds in an enemy searchlight."

Another Havoc pilot reported an engagement with a Junker 88 over France:

"Our target was a French airdrome from which the Hun had been sending over bombers. We crossed the Somme and found the field without difficulty. As we circled down the ground lights flashed on and we saw a JU 88 gathering speed for a takeoff. His navigation lights went off as soon as he left the ground but we had him well spotted. We closed in behind him to a hundred yards and let him have three good bursts.

"His port engine and fuselage immediately caught fire and he made a steep diving turn to the starboard. Our rear gunner then caught the starboard engine and he crashed in flames 200 yards behind the airdrome boundary fence. Climbing to 3,000 feet we could see the German explode. Then we dropped our bombs and came home to breakfast."

The President has signed a bill granting a $150 uniform allowance to officers commissioned below the rank of major on or subsequent to September 26, 1941 and all members of the Officers Reserve Corps commissioned prior to September 26, 1941 who have been called to active duty and have served three months. All reserve officers who have previously received a uniform allowance will have the amount of that allowance deducted from the new $150 allowance.

The Australian Front

By Oliver H. Townsend

FLYERS and ground crews of the Army Air Forces assigned to Australia should feel more at home on this "down under" continent than in any other foreign country in the world—with the possible exception of Canada.

Big (almost as large as the United States), occidental (95 per cent of its people are of British extraction), progressive (electricity, automobiles, large modern cities), Australia combines most of the best characteristics of the United States and Great Britain.

The seven million people of Australia are friendly and have a free and easy spirit which makes them well-liked by Americans, and vice versa. Most of them are city-dwellers—over half crowd into the six big state capitals of Sydney, Melbourne, Adelaide, Brisbane, Perth and Hobart.

The standard of living is almost as high as that in the United States, and the cost slightly lower. The monetary system is British, and is based on the pound sterling. A recent ruling permits the free use of American money in Australia on a basis of about $4 to the pound.

Large amounts of American cigarettes are consumed annually, and millions of feet of American motion picture film are exhibited. U.S. cigarettes in peacetime ordinarily sell for about 25 to 28 cents per pack. Recently all stocks of cigarettes—along with stocks of tea—were impounded for the exclusive use of the armed forces.

Food in Australia is much like it is in this country—except for being a bit more on the "meaty" side. Vegetables don't play the prominent role on menus that Americans have become accustomed to. One of the favorite dishes is mutton.

Australians are very sports conscious. Many of their tennis stars and rugby, soccer and cricket teams have won international fame. Sports heroes have a national reputation which exceeds that of movie stars and statesmen. There is plenty of room for swimming at the hundreds of miles of fine beaches which ring the continent.

Being below the equator, the seasons in Australia are exactly reversed from those in the United States. Right now summer is ending and fall is coming on. Winter begins in June, spring in September and summer in December.

The best way to get an idea of the climate of this antipodes continent is to turn it figuratively up-side-down and place it in the northern part of the western hemisphere in the vicinity of the United States.

When this is done it is found that the southeastern part of the continent, containing the big cities and most of the people, falls in the neighborhood of Virginia. Perth, biggest city on the west coast, is situated on about the same latitude as San Diego, California. Port Darwin, gateway to the Orient and only settlement of any size on the north coast, falls as far south as Nicaragua—and is just as tropical.

Most Australians cluster in the southeastern part of their country, and for a very good reason. This is "white man's country". Here the temperature dips down to top-coat level in the winter and, doesn't blow the top out of the thermometer in the summertime. This is rare, for Australia is much closer to the equator than the United States, and snowfall is unknown except on the highest mountain peaks.

Interior Is Deserted

"Out west", around Perth, there is another section of territory with a white man's climate. Here, 1,500 miles across deserted wastelands from Adelaide, closest southeastern city, is Australia's California, where about a million people live.

The populated regions of Australia are all within several hundred miles of the coastline.

The interior is little more than one vast desert where the traveler can go for hundreds of miles without seeing a human settlement.

Isolated in the tropical heat of the north coast, on a peninsula jutting northward into the Netherlands East Indies, is Port Darwin, military center and one of the chief targets of the Japanese.

In normal times Port Darwin is a sleepy seaport with a population of little more than 2,000, composed chiefly of Chinese, Malays, Japanese and native blacks. At the beginning of the war, however, this population had been increased by British and Australian defense workers to about 7,000.

The accent is on the Orient in Darwin. Chinese merchants peddle their wares in native costume, and incense and Oriental music mix with American jazz in the waterfront taverns. The best communications in peacetime were with Singapore, Java, Hong Kong and India—not with other parts of Australia.

Darwin Is Tropical

In appearance Darwin is like an early American mining town. The sidewalks are roofed, there are few trees, and the ramshackle houses are rarely more than one story high. The city itself sits on a 60-foot bluff overlooking one of the best harbors in the Pacific. In the bamboo forests behind Darwin crocodiles slide through muddy rivers, and native aborigines hack out a primitive existence. Most of the better homes, erected on the outskirts, are built on high ironwood stilts to keep out the white ants and termites.

Only 12 degrees below the equator, Darwin is hot. Just before the summer rains come the temperature averages 100 degrees and the humidity runs between 80 and 90. Tropical white clothing is worn almost exclusively, and the houses are little more than large verandas with enclosed dressing rooms.

Darwin is the capital of Australia's Northern Territory, a vast expanse of wasteland twice as big as Texas—and with a population of but slightly more than 10,000. Communications in this sparsely-settled region have been poor. Darwin has not been connected with other northern coastal towns by roads or railroads. The only link with the rest of the continent has been a railroad broken by a 620-mile stretch of highway, running to Adelaide, on the south coast. Isolated by land, Darwin has developed into an important air terminal between Australia and Asia.

Isolated as it is, an invasion force taking Darwin still has well over a thousand miles to go by boat or across the trackless wastes of the interior before it can reach the southeastern region—the real prize.

Center of this southeastern region, and economic and industrial capital of Australia, is Sydney. Its population of over a million and a quarter people makes it the third city of the British Empire—after London and Calcutta. Somewhat resembling San Francisco in appearance, Sydney has probably the finest harbor in the world—large enough to shelter every ship in all the world's fleets. Known as Australia's Paris, Sydney is the entertainment capital of the South Pacific, and the political capital of the State of New South Wales.

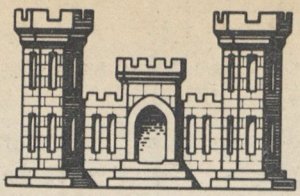
Second city of Australia is Melbourne, capital of the State of Victoria, 500 miles southwest of Sydney on the southern coast. Melbourne, with over a million people, is the seventh largest city in the British Empire. Other big cities are Brisbane, half-way up the eastern coast, and capital of Queensland, with 326,000 people; Adelaide, capital of South Australia, with 322,000 population; and Perth, capital of Western Australia, with 224,800 people.

Aviation-Minded

The great distances of the Australian continent have been a natural invitation for the development of commercial aviation. Civil aviation was first started there by Army pilots returning from the air fronts of the World War. Two of the most famous of these flyers were Keith and Ross Smith who flew all the way home from Europe in November, 1919, spending 124 hours in the air.

Planes have played an important part in the development of Australia. Not only do they provide quick service between the big cities, but they are also the only connection isolated villages of the interior have with the world.

Aside from being bumpy, the air over Australia is some of the best in the world for flying, because of the absence of fog and scarcity of heavy cloud formations. With more than 20,000 miles of airlines, and with more than nine million miles flown annually, Australians are among the most airminded people in the world. They realize the dangers of attack by air, and the values of an aerial defense. "Keeping 'em flying" over Australia is one of the most satisfying assignments to which American air and ground crews can be assigned.



Engineers With the Army Air Forces

By Brig. Gen. Stuart C. Godfrey

Chief of Engineers, Army Air Forces

IN each campaign of this war the importance of airdromes has been freshly demonstrated. In the Japanese penetrations of the Philippines, Malaya and the Dutch East Indies, airfields have been the first objects of attack and later the stepping stones by which Japanese aviation was able to give effective support to the advance of land and sea forces.

The German Luftwaffe failed in its attempt to destroy the RAF largely because engineers had provided England with a wealth of camouflaged, easily repaired and widely dispersed landing fields which offered a hopelessly decentralized target and enabled the RAF to keep its fighters in the air almost continuously. On the other hand, observe what happened to the RAF when it lacked airdromes in Greece and Crete.

Even before these lessons were made clear to all the world our Army Air Forces had allotted an important place to aviation engineers—a new type of unit consisting of engineer troops specially trained and equipped to build and hold advanced combat airdromes in all types of theaters of operations.

Our Engineers Active

As General Arnold recently pointed out, our training of "theater of operations" engineer troops for combat duty with the Air Forces was greatly accelerated during the pre-war period by employment of the aviation engineers in the construction of huge air bases in Iceland, Greenland, Alaska and the Caribbean. These aviation engineers "set the teeth in our hemisphere defense that will force an enemy to run into our fist instead of our chin," according to General Arnold. Meanwhile, the domestic program of airport construction proceeded apace under the direction of the Corps of Engineers.

The building of many new permanent airdromes in the United States and its overseas possessions and bases is an important activity of the Corps of Engineers, acting through its Division and District Engineers. In war, however, a different type of airfield construction must be visualized. This may involve the emergency expansion of existing air bases by the provision of auxiliary airfields, smaller and better concealed. Again, it may be pioneer work in some new and distant theater.

In any event, there will be a vital need for engineer troop units with the Army Air Forces. The need has become far more extensive and more specialized than in the days of World War I. The former small grass plot has been replaced by an extensive tract of land, cleared of obstacles and with all-weather use facilitated in many cases by paved runways. For this work, troops with special equipment and special training are needed. Moreover, an air force, like a field army or an armored force, needs its own engineers—troops who have trained with it intimately, who speak its language and understand its needs.

These engineers with an air force must be trained and equipped to construct rapidly advanced military airdromes, or to improve existing ones. They must be skilled in the camouflage of airfields and the construction of defensive works. They must be organized and prepared to repair instantly fields damaged by enemy bombing. Finally, with their trained riflemen and machine gunners, they must be prepared to take an active part in the defense of airdromes.

The first troop unit formed for special work with the Army Air Forces was the 21st Engineer Aviation Regiment, organized at Langley Field, Va., in June, 1940.

This unit has been the parent organization of the bulk of existing aviation engineer units. The manifold activities of this regiment have included work of construction on their own barracks and grounds, experimental work on runways including steel landing mats, and the development of techniques for camouflaging airdromes. The regiment has furnished the personnel and equipment for two sizable detachments to carry out important task force missions.

Since then a score or more of separate aviation battalions have been or are being activated. Many more are planned.

First Unit Formed

To visualize a military airdrome in war, we need to differentiate it sharply from the usual commercial airport or permanent peacetime Air

Corps station. The latter offers a conspicuous and vulnerable target to enemy bombers. By great effort it can be rendered less conspicuous. But preferably an air force will operate from smaller auxiliary fields. Such fields lend themselves better to camouflage. Planes on the field, instead of being huddled on a parking apron, are dispersed in pens around the periphery of the field or in adjacent fields, made accessible by a taxi-track. Servicing installations are simpler and are also dispersed and concealed.

In connection with such airfields, the tasks for aviation engineers may be described as follows:

Improvement or provision of advanced airdromes, together with all appurtenances such as runways, landing strips, shelters, airplane parking areas, internal routes of communication, water supply, lighting, and other utilities.

Improvement or provision of routes of communication to such airdromes.

Provisions for gas-proofing and bomb-proofing essential parts of such installations.

Camouflage of advanced airdromes and other Air Forces installations.

Assistance in the anti-mechanized defense of advanced airdromes by construction and defense of road blocks, and by combat against raids delivered by ground forces.

Assistance in the defense of advanced airdromes against air attack.

Maintenance and repair of airdromes, especially after damage by enemy bombers.

Engineers Must Fight

It is seen that these tasks require that aviation engineers be both technical specialists and combat soldiers. Airports are usually located well behind the front line, and the combat function will be the exception rather than the rule. But in the future, no airport in a theater of operations will be entirely secure against either a raid by armored forces, or the increasing threat of vertical envelopment. Engineers, with trained riflemen and machine gunners, thus constitute an important element of defense. Events overseas have proved that good riflemen are particularly valuable in dealing with parachute troops, so vulnerable during their initial landing. Aviation engineer units also have some armored scout cars, both 50 and 30 cal. machine guns, and 37 mm. anti-tank guns.

The aviation engineer regiment consists of a regimental headquarters, headquarters and service company, and three battalions. Since there will often be occasion when an entire regiment will not be needed in one locality, the bulk of units organized to date have been engineer aviation battalions (separate). Experience in Europe indicates that to build one airfield in reasonable time, perhaps in six weeks under favorable conditions, a unit of the size of a battalion is needed. The organization and equipment of the battalion have been carefully designed to provide a balanced force capable of independent work.

Equipment Complete

No pains have been spared to make the equipment for aviation engineer units as complete and adequate as possible, without at the same time over-burdening the troops. Thus, general-purpose construction equipment was preferred to more efficient, but specialized machines. Even so, the separate aviation battalion has no less than 220 pieces of heavy equipment, and 146 vehicles. This heavy equipment includes such items as diesel tractors with bulldozers, carry-all scrapers, auto-graders, gasoline shovels, rollers of several types, concrete mixers, air compressors, trencher, well drill, and the like, with numerous trucks and trailers. Moreover, sets of additional special equipment—additional asphalting and concreting equipment, rock crushers, draglines, pumps, floodlights, and the like—are provided in storage for use if and when needed, as in case of overseas task forces.

A special unit, known as a headquarters company, is provided for assignment to an air force to assist in providing for the special engineering and camouflage functions of several engineer aviation battalions. Supply functions for the Air Forces are provided for by including an engineer supply platoon with each Air Base Squadron; this platoon also has a small utility section.

A new type unit is the engineer aviation topographic company, which is designed to work with the Air Corps photographic and mapping squadrons in the field preparation and reproduction of special aeronautical charts and target maps.

No Peacetime Construction

It should be borne in mind that aviation engineer units are not intended for peacetime construction, and have no role in the maintenance of airports in time of peace. This does not mean that for training these units can not and should not be used on definite construction tasks, but it is not intended that they supplant

the existing agencies, either for construction or maintenance in the zone of the interior. Even in a theater of operations, it is not contemplated that all airport construction shall necessarily be performed by aviation engineers. The latter are intended primarily for "pioneer" work on the more advanced airdromes, where speed is essential and the utilization of existing facilities or improvisation of new ones is indicated. The more permanent base airdromes in rear areas, built more deliberately and with great refinement, are likely to be the work of engineer general service regiments. These latter units, given some special equipment and training, should be able to include airport construction among their many tasks.

Many Engineers Needed

No definite rule can be given as to the number of engineer troops that may be needed with an Air Force, though it is noteworthy that the British Expeditionary Force contained no less than 60,000 engineers, one-fifth its total strength. The large program of airfield construction in France was doubtless largely responsible for this high percentage. As indicated above, an aviation battalion can construct expeditiously one advanced airdrome. It can maintain and repair, under favorable conditions, perhaps as many as nine. A rough rule for an air task force, therefore, would indicate one battalion or equivalent for every new airfield desired for immediate construction, with additional battalions for the maintenance and extension of existing fields.

In their important role of assistance in airdrome defense, aviation engineers at an air base naturally come under the command of the officer charged with the defense of the base, and operate similarly as in other defensive combat missions. Engineer troops stationed at an airdrome with the primary mission of maintaining the field in flying condition will have ample opportunity to strengthen the defensive works—pillboxes, emplacements. road blocks, mine fields, and the like.

The training of aviation engineer units is planned to prepare them for the tasks outlined above. The basic training of recruits is given at the Engineer Replacement Training Centers, and is the same well-rounded training that all engineer soldiers receive.

Troop units are not, in general employed in the air base construction program being executed by District Engineers. But in many cases they have undertaken some definite tasks in this program, such as the construction of soil cement and asphalt parking aprons and roads. During the past few months they have performed emergency construction work in connection with the dispersal and protection of airplanes, by means of taxi-tracks, hard standings, and revetment pens. They have assisted in the development of steel landing mats, and of the best techniques for airdrome camouflage. They have constructed experimental runways, using various types of construction.

A major activity of Air Force Engineers and their regional assistants has been an engineering survey of existing airports and potential airport sites, with a view to providing facilities for the possible concentration of the Air Force Combat Command in any desired theater of operations in the United States.

In training for airdrome construction, the objective of speed is constantly sought for. The construction of an airport in China, with runway designed to take Flying Fortresses, required 100,000 Chinese with hand tools to complete the task in 12 weeks. A battalion of aviation engineers, with modern equipment, would undertake to cut this time in half.

AN IDEA FROM A BEER CAN

INSPIRED by the simple act of opening a can of beer, a compact lightweight lightening hole flanging machine has been perfected to replace the previously unwieldy metal dies which weighed from 50 to 80 pounds.

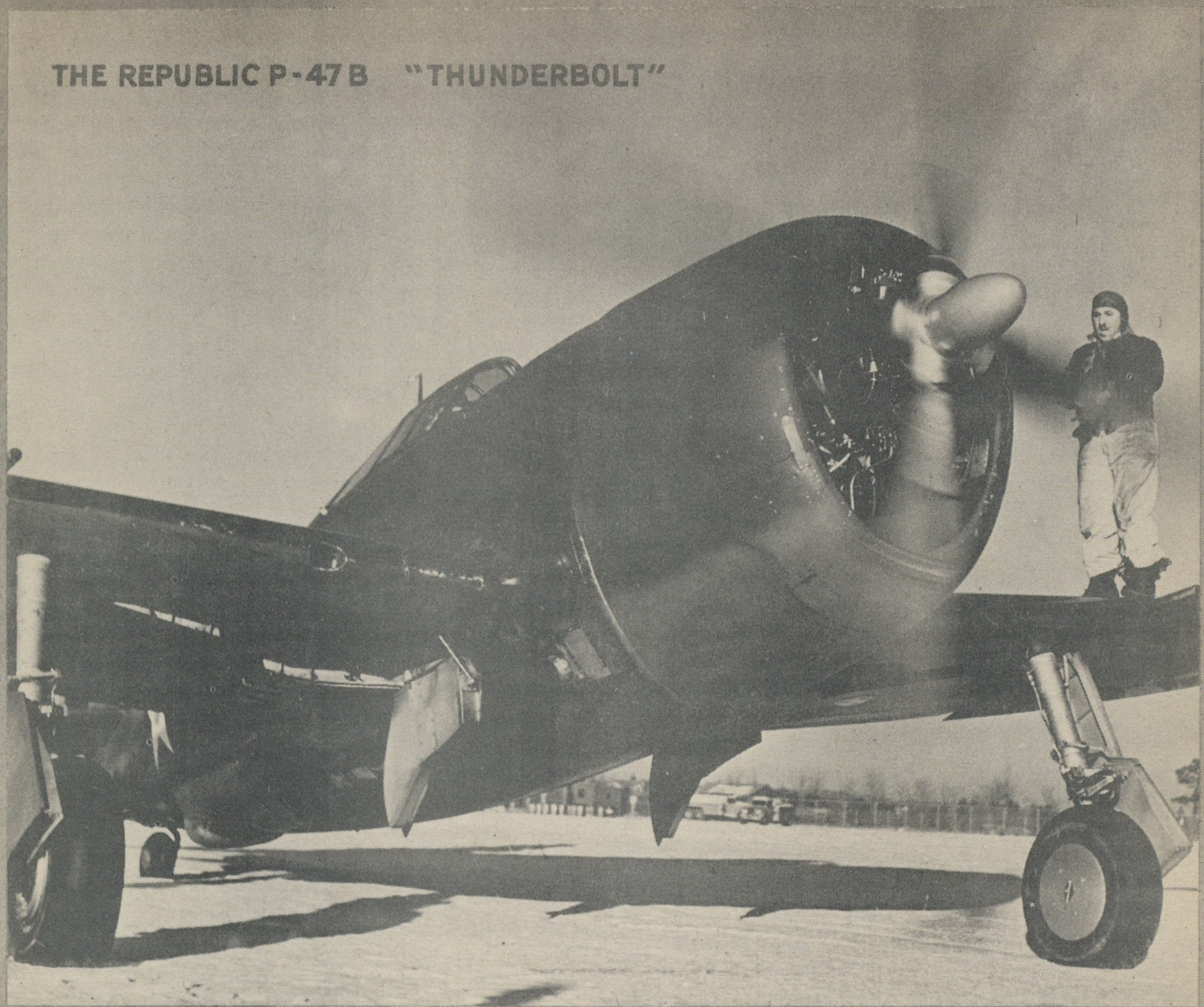
With this discovery, the transporting of heavy metal dies into the field is said to be unnecessary and the use of machine work for dies no longer needed.

Weighing only two pounds, with an over-all length of 12 inches, the machine is especially valuable for field operations. It works very effectively on lightening holes ranging in size from two and one half to six inches.

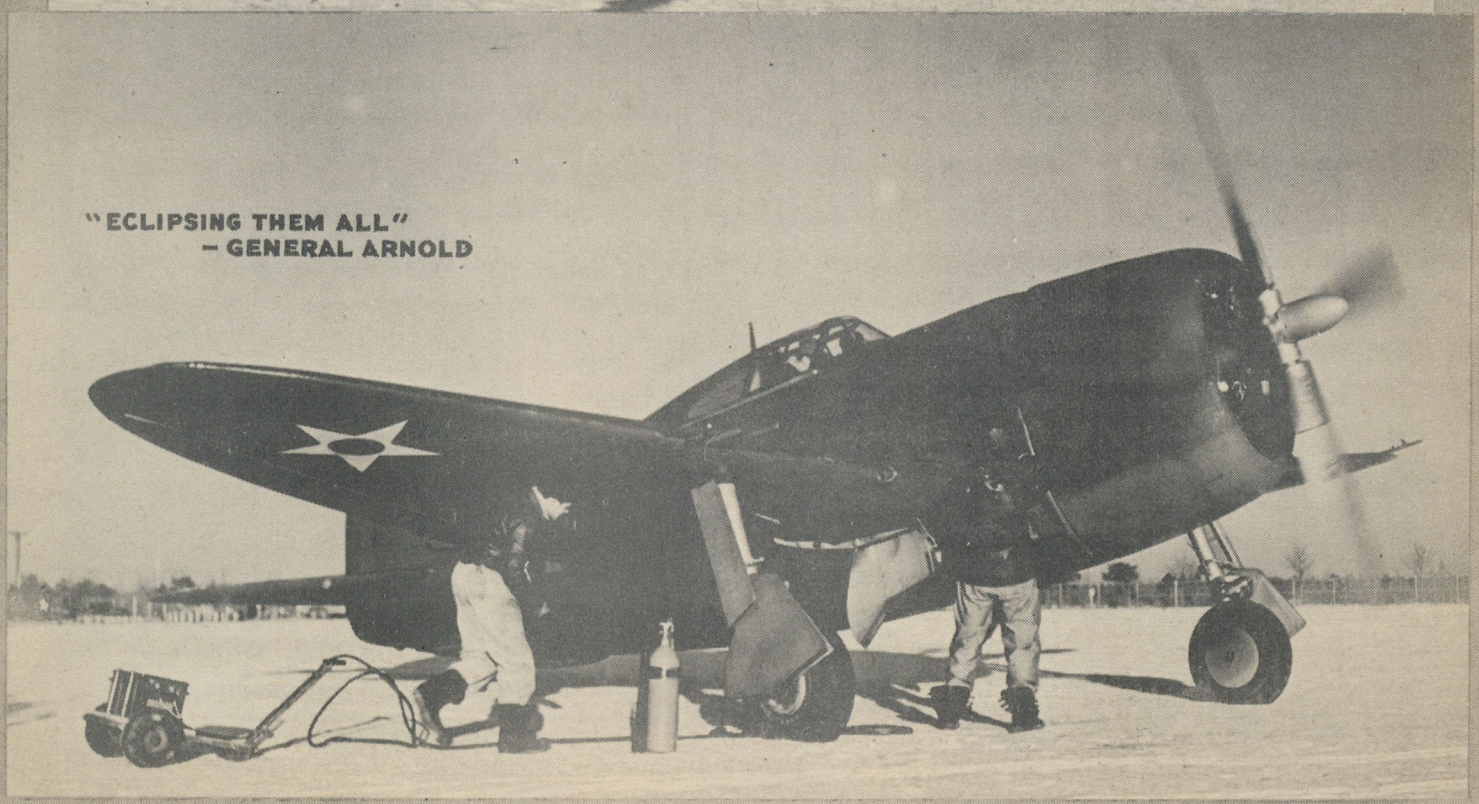
The idea originated with Captain William H. Barrett, engineering officer of the 2nd Air Depot Group, Sacramento Air Depot, McClellan Field, Calif. It was perfected by Sergeant Julius F. Merkel, who in civilian life was a designer with the Sperry Gyroscope Company.

The CAPABILITIES of our BOMBARDIERS MUST be commensurate with the inherent capabilities of their instruments.

THE REPUBLIC P-47 B "THUNDERBOLT"

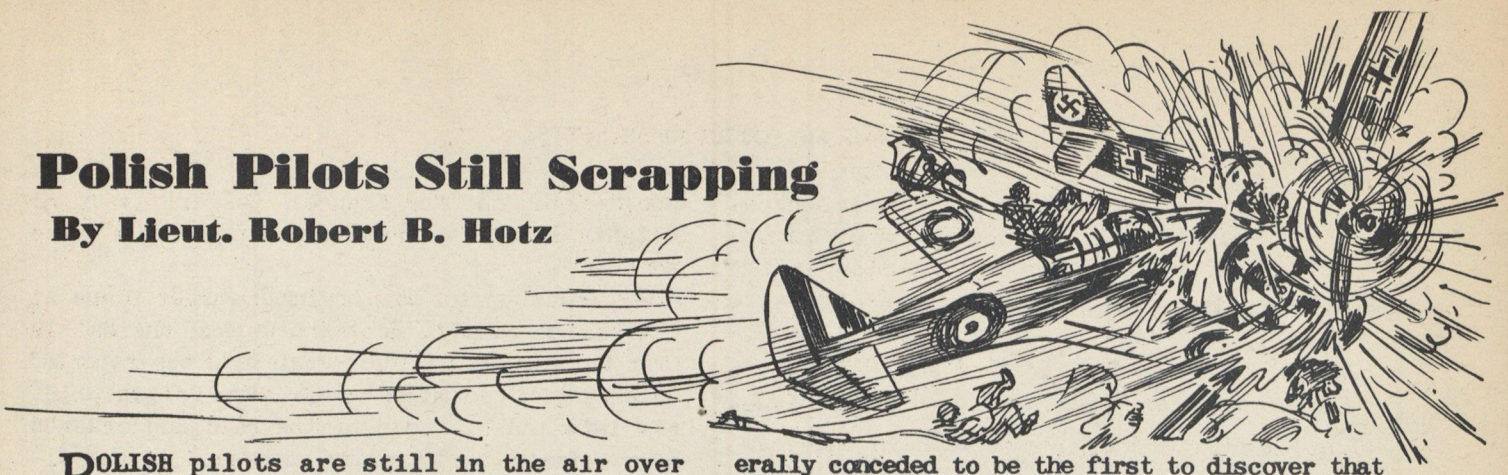


"ECLIPSING THEM ALL."
– GENERAL ARNOLD



Polish Pilots Still Scrapping

By Lieut. Robert B. Hotz



POLISH pilots are still in the air over Europe. More than two and a half years after their country was conquered and their air force destroyed by the German Luftwaffe, Polish airmen are still knocking Nazi planes out of Continental skies.

The Poles now wear RAF uniforms and fly ships of British and American manufacture. This is the third uniform they have worn and the third type of ship they have flown against the Germans. Some of the Poles are among the most experienced combat pilots in Europe—veterans of three major air campaigns. Others have only recently learned to fly on foreign soil after fighting in the defeated ground armies of Poland and France. But all of them are among the most efficient, dogged and ruthless pilots arrayed against the Axis.

The Poles' efficiency as combat pilots comes primarily from their grim concentration on a single purpose—the destruction of German men and materiel. These Polish pilots have lost everything but their lives and have tasted bitter defeat twice but they refuse to stop fighting. They live only for revenge and are willing to go to any ends to achieve it. This attitude plus their natural skill makes them deadly in battle.

Pole Wants Dessert

A Polish fighter pilot expressed this attitude well in describing his battle with a pair of Junker 88's.

"I went after the left hand machine, forgetting everything else in the world. I thought only that I would have the left hand machine for dessert".

"They will do anything," said one AAF observer describing the Poles in the RAF. "The Poles have the best squadrons over there. They get excited a lot and sometimes land with their wheels up but when they fight they really get into it. If they run out of ammo, they often ram a German plane and then bail out."

Other American observers and British officers credit the Poles with several innovations in RAF tactics as a result of their daring and disregard for their own safety. The Poles are generally conceded to be the first to discover that the huge German day bomber formations could be scattered by head-on attacks at the formation leaders. This tactic was instrumental in enabling RAF fighters to break up German daylight attacks during the Battle of Britain and reap a heavy toll of disorganized stragglers.

Solved 109 Problem

The Poles are also credited with solving the problem of the new Messerschmitt 109 armor. For several days after the new model appeared RAF fighters were unable to find a vulnerable spot at conventional range although they were able to squirt it with a variety of ammo. The Poles closed the range to 50 feet and then let fly with all their guns. The 109's simply disintegrated, showering the pursuing Poles with debris. Several Poles had to bail out when their planes were damaged by the 109's debris but the RAF learned how to eliminate the new models.

The Polish air force of 1939 consisted of about 2,000 planes, more than half of them obsolete. In addition to a variety of old foreign models, the Poles had several modern types produced in Polish aircraft factories at Warsaw, Lublin, Biala and Podlaski. These included about 400 twin engined Los bombers and small quantities of the P-7 and P-11 single seater pursuits, the Karas observation plane and light bomber and the speedy Wilk attack bomber.

The infant Polish aircraft industry was booming and new plants were being planned for the Vistula-San River industrial district when war came on Sept. 1, 1939. One of the first targets of the German bombers were the aircraft works and fields at Warsaw. The factories and military airdromes were attacked at 7:30 a.m. on Sept. 1 and within two weeks the Polish aircraft industry was destroyed and the air force strangled by the Luftwaffe's bombs.

Most of the Polish planes were destroyed on the ground. Losses in the air were not excessive despite the heavy odds against attackers of Stuka swarms, and big formations of Messerschmitts, Heinkels and Dorniers. Polish light attack bombers concentrated on smashing the German Panzer fingers stretched far in advance

of the main armies and official German sources credit Los and Wilk bomber formations with holding up armored divisions for as long as 24 hours. Polish pursuits were also effective while they lasted.

But the Polish air force was unable to exist under the pressure of an estimated 2,000 planes of all types used by the Germans in this campaign. Every Polish air field and supply base was hammered incessantly by the Luftwaffe. In addition to the destruction of planes on the ground, Polish pilots were faced with the destruction of huge fuel and ammunition supplies and the devastation of their bases. The effectiveness of the Polish air force was actually eliminated principally through destruction of its bases and supplies although annihilation in the air would have been inevitable had the battle continued. This was evidenced by the number of Polish pilots who flew their planes to France and Balkan countries because there were no more places for them to set down, refuel and rearm in Poland.

Most of the Polish pilots who escaped to France and the Balkans joined the French Armee de l'Air in France and Syria. On January 4, 1940, General Waldislaw Sikorski, premier of the Polish government in exile, and Guy La Chambre, French air minister, signed a pact recreating the Polish air force and officially attaching its autonomous units to French forces on the Western Front and in the Near East.

Reputation For Audacity

Already the Poles were creating their reputation for audacity. They flew any French equipment they could get off the ground. They flew against German formations of superior numbers and equipment with a fine disregard for fuel, ammunition, territory and most of the other considerations of pilots who intend to return both themselves and their equipment to their base after combat. Polish pilots were among the most frequent casualties from stunting at low altitudes.

After the fall of France most of the remaining Poles in the Armee de l'Air escaped to England where they were incorporated into the RAF. Numbers of Polish ground soldiers who filtered into England were given flight training and attached to the Polish RAF squadrons. Many difficulties were experienced by the English in training Poles. All of the Poles were impatient to get another crack at the Germans and as soon as they were clear of their training airdromes they would light out for France. Gas for training flights had to be rationed to prevent these sorties.

One Polish pilot was towing a target plane at a training camp in Scotland during the Battle Over Britain when a big German raid was reported several hundred miles away. The Polish pilot was informed by radio of the raid and ordered down. Instead of landing he headed in the direction of the raiders. Three RAF pursuits went up and had to herd the Polish pilot to his base. His plane was an old biplane armed with a single 30 caliber machine gun.

Action In Libya

The Poles in training still regard a run over the invasion coast, bombing ports and machine gunning German troops wherever they can find them as the best sort of exercise and RAF training officials come to expect it whenever they allow Polish trainees to go up with live bombs and loaded guns.

The Polish air squadrons with the French in Syria flew to Palestine after the Fall of France and are now in action with British Imperial forces in Libya.

The Polish RAF squadrons in England are now fairly evenly divided between pursuits and bombers. They continue to play a lively role in the air war over the Continent and provide an excellent addition to RAF morale with their cheerful persistence in contributing to what they regard as the inevitable victory over Germany.

Here are excerpts from Polish fighter and bomber pilots' descriptions of actions in which they were involved. The fighter pilot had just left a hand of bridge at the call of "Flight Scramble" and was at 20,000 feet over the sea feeling that trouble lay ahead because the night before his Polish mechanic had dreamed of his aunt in faraway Poland, always an omen. His squadron sighted and attacked about 20 Junker 88's protected by a screen of Messerschmitt 109's.

Things Went Dark

"I looped the loop until things went a little dark before my eyes, opened throttle and found myself on the tail of a damaged JU. This time he was close. About 60 yards. I was troubled a bit by another JU which fired at me. I saw he was a poor marksman so I got my client in my sight and gave him a long burst into his engine over the fuselage until sparks flew. After a moment I saw he was on fire. He turned slowly

(Continued on Page 40)

AAF Hunting Subs

(Continued from Page 3)

direction. No one talks, a few smoke. The radio is cautiously silent. They settle down to monotonous cruising.

Finally a tanker is sighted and the plane circles several times in challenge. It dips lower, until the wing tip seems to skim the water, although the ship is a full 200 feet above the crest of the waves. The navigator leans forward and shouts "O.K., she's got it...British, but damn slow about it." They fly on, close enough to the water so parachutes are useless.

A freighter appears, northbound. They challenge, report and continue on. They spot the hulk of a tanker, passing close enough to get a friendly wave from the patrol ship crew on guard. The search goes on. There is little talk, only the drone of the motors.

Then the bombardier's hoarse voice calls on the intercom, "off to the right about a mile." The landing gear is lowered to reduce speed. All eyes are peeled for what might be a periscope and its betraying wake. The bomb bay doors are opened. The bombardier toys with the bomb release. They pass over the spot. Nothing there.

The direction is changed. One by one ships are discovered, routinely challenged and forgotten. Then, action at last. From the shore comes the message: "SOS...Investigate." Direction is changed to comply with the position given. Throttle open, the plane heads for the area. A rescue isn't possible, but they can guide ships to the scene, perhaps find the sub.

They sight something. The pilot changes course, heads for the spot. Down there eight men can be counted huddled on a raft that is bobbing in the choppy sea. The plane circles lower until the faces of the men can almost be seen. One man stands up and points. They head in that direction. In a brief moment they sight two dories, one with 14 and the other with 20 men aboard. Instantly word is flashed to the base: Ship submarined—two boats and a raft with 42 survivors—position. The navigator hands the pilot a slip of paper..."position checked."

The plane circles back and forth, crewmen alert for a conning tower or periscope, but constantly in sight of the survivors. For a half hour they fly around. A ship is sighted in the distance. The radio-man goes into action again as details are exchanged. The rescue ship picks up speed.

They head for home still hoping for a crack at that sub. Then the pilot and co-pilot stiffen up. The bombardier gets orders to open the bomb bay; the camera-man is warned. There is a speck out there, broadening into a horizontal object in the distance. It looks like a ship. No, a submarine. But it turns out to be only a Navy blimp lying so close to the water that it seems to be swimming along.

The blimp drops a flare, indicating a submarine below. The plane is banked sharply. The bombardier waits while the pilot lines up the plane on the flare and makes the "run." They fly over the flare. The bombs burst. The pilot kicks the plane around in a steep bank as they go back to inspect their handiwork. The flare is blasted to bits. Splotches of oil trail on the surface for about 150 feet.

Another flare, and again they dive at it. The pilot warns "Hold it or we'll bomb the tail right off the blimp." The bombardier grips the stick. He plays with the button...presses. It was a depth charge and they turn just in time to see the full spout. Another bomb is dropped, another and another, until no more are left. The sea is sprinkled with little patches of oil. Then, as they circle the blimp, another Army plane appears out of the North. Two destroyers are spied racing to the scene. The destroyers zig zag in. The water leaps high from their depth charges. The plane turns away. The crew settles back for the trip home.

NEW TECHNIQUES

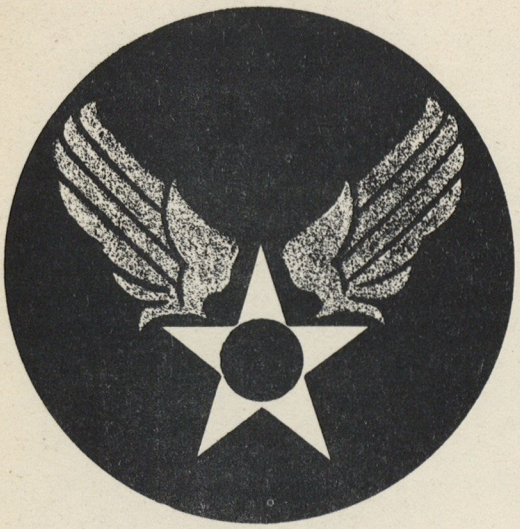
THREE new labor-saving devices of considerable value to the Air Force have been developed at Albrook Field, Canal Zone, under the supervision of Major W.W. Gross, Air Base Engineering officer.

One of the new developments is a portable balancing stand, enclosed by a screen to cut off drafts. This was developed by Major Gross and Technical Sergeant C.A. Patton.

Another new device, built by Corporal D.W. Henrichs, is a landing gear retracting strut packing nut wrench for use on all series Curtiss P-36 and P-40 airplanes. The purpose of the wrench is to eliminate the removal of the strut from the wing when it is necessary to make adjustments.

The third new development is a combination pump, tank and heating unit which performs the purpose called for in Technical Order Number 03-15-9—that of emersing oil temperature regulators in hot oil for prevention of corrosion and for removal of moisture at periods of inspection and repair. It was designed by Staff Sgt. Miranda.

Air Forces Adopt New Shoulder Patch



A distinctive shoulder patch has been adopted by the Army Air Forces and will be worn by AAF personnel everywhere.

Four colors are featured in the new patch: white star with red center, stylized gold wings, and a field of ultra marine blue.

New Air Forces patches will be available in quantity as soon as the Service of Supply can issue them and will replace unit patches now being worn in the AAF. Various units will be privileged to wear Distinctive Unit Insignias.

NAZI PARATROOPER

PISTOLS, sub-machine guns, knives, spikes, mortars, entrenching tools, field glasses, hand grenades, compasses, maps, Verey lights, hatchets and rations are all carried by the average German paratrooper, according to British observers. Many are also equipped with collapsible bicycles.

A German paratrooper usually carries a .32 Luger Pistol automatic magazine of nine cartridges and one spare magazine in the holster as well as a tiny, but very handy and easily operated sub-machine gun with a web magazine case holding three magazines of 30 rounds apiece and a magazine filler. Machine guns and mortars are dropped separately and are collected immediately, if fire is not too great, or after dark.

The sub-machine guns, deadly from 50 to 70 yards, have practically no stoppages and rattle away at a lively pace. Used as rifles with a skeleton folding butt extended, they are very accurate up to 200 yards.

Most German paratroopers carry field glasses. Many wear knee pads and boots with extra leather heels to break the shock of the fall.

Each has a large, single-bladed, stainless knife with a six inch marline spike attached. The paratrooper has about six blue pear-shaped grenades with screw tops which reportedly have not been very effective. Their compasses are cheap and inaccurate but each man is provided with an excellent map.

PRACTICE BOMBINGS SCORED BY MOVIES

SPECIAL moving picture equipment soon will be automatically scoring aerial bombardment practices at all bombardier training schools. The present observation crews and spotting towers that are tying up personnel and equipment a hundred or more miles away from training school headquarters, will be eliminated.

This new equipment has been developed by the camera unit of Wright Field's Armament Laboratory and already is in use at one bombardier training school. By increasing the accuracy of spotting bomb impacts, the new movie method will assist bombardiers to increase their effectiveness.

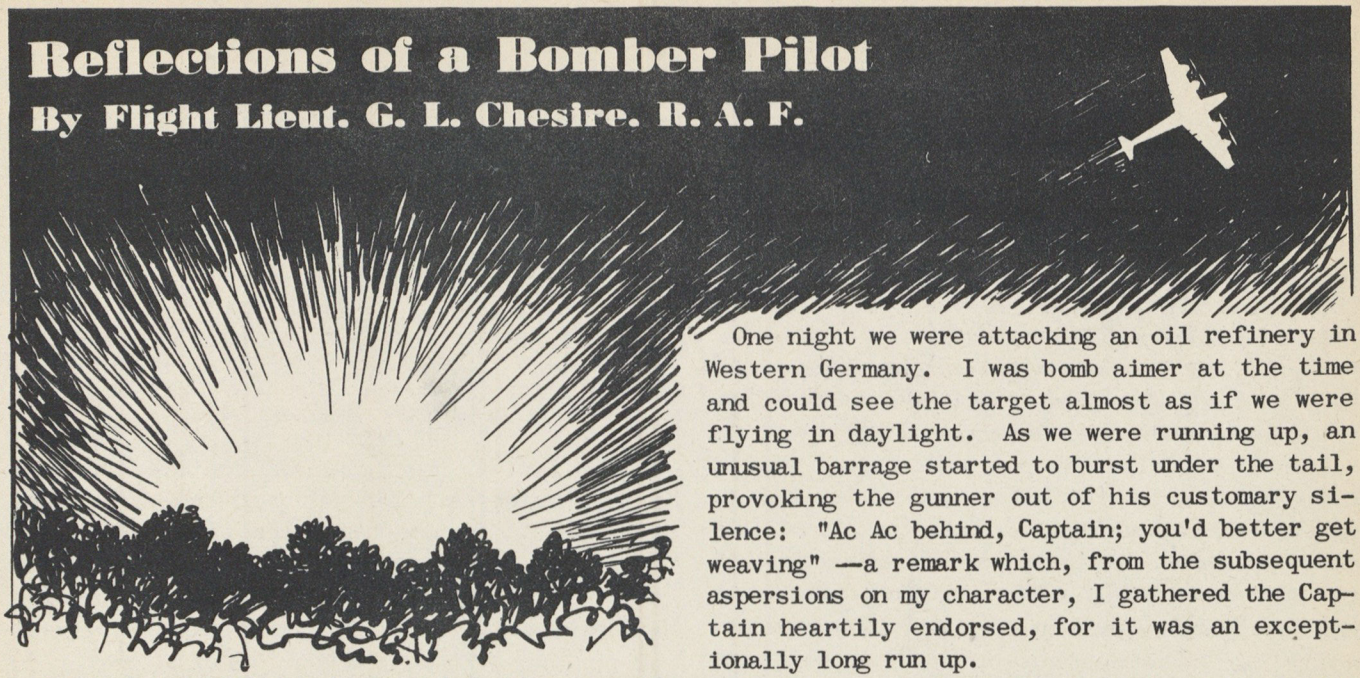
The current method of judging a bombardier's accuracy is to utilize radio communication between three scoring towers and the bombing plane; then, the spot of bomb impact is charted by "triangulation" observations from the several towers. Large ground crews and extensive equipment must be used to carry out bombing practices under these conditions.

With the newly developed projection lens, screen, projector and a standardized 35 mm. camera, need for the ground crews is eliminated.

The bombardier simply sights his target and releases his bomb; a camera automatically films the action and the bomb impact in relation to a distinctive ground target and marker (lights at night). Immediately, after the practice, the film is processed and, with a special projector, is shown in a scoring viewer that provides means for accurately locating the impact of the bomb and measuring within two feet the range, deflection and circular areas directly from the scoring grid in the viewer. Results of practice bombings can be recorded at altitudes of from 1,000 to 20,000 feet by using various lenses and screens.

Reflections of a Bomber Pilot

By Flight Lieut. G. L. Chesire. R. A. F.



I closed my eyes and saw a kaleidoscope of visions. Superimposed on these, like the flicker of a film, was a regular beat as the night rolling in from the East chased the sun over the Western horizon and then, to the sound of returning aircraft, gave way to the sun once more. In those few moments I saw the story of night bombing as it has appeared to me in the last eighteen months.

I saw the short nights of Summer, 1940, fade into winter: those fruitless journeys across England to France; take off at dusk and land at dawn, day after day and regular as clockwork—Abbeville, Poix, Auldnoye, Charleville: cross-roads, bridges, troop formations and then cross-roads again—journeys which were meant to hold up the German drive to Paris. I saw also Lofty sitting at the wheel, lean, strong and handsome and heard his voice: "I can't see a sausage." And the rear gunner, who rarely opened his mouth except to eat chocolate: "Are we over Germany?" "No." "Well you wouldn't be likely to see a sausage."

Then France fell and I experienced my first real sight of gunfire. The Happy Valley with its countless targets: sometimes Mannheim or Frankfurt or Emden or Kiel, but mostly the Happy Valley and always the Zuider Zee as a half-way house where we could fly round in peace until we found a pinpoint. They were easy, those trips. The weather was good and we flew low enough to be able to see the ground, for the Flak was nothing to worry about—mostly curtains of explosive tracer going to 8,000, sometimes 12,000 feet; red, green, orange and white; a beautiful sight, especially if you were two miles away and going in the opposite direction.

One night we were attacking an oil refinery in Western Germany. I was bomb aimer at the time and could see the target almost as if we were flying in daylight. As we were running up, an unusual barrage started to burst under the tail, provoking the gunner out of his customary silence: "Ac Ac behind, Captain; you'd better get weaving" —a remark which, from the subsequent aspersions on my character, I gathered the Captain heartily endorsed, for it was an exceptionally long run up.

However, at last the target came in the sights, and rather thankfully I let go. I leaned forward to see what damage the bombs were going to do, but what seemed like ages passed and still nothing happened. Eventually the target went out of sight, which it oughn't to do, so it was obvious something had gone wrong. And as I was thinking up something to say to the Captain—I had just noticed I had not levelled the sight—I saw the bombs burst five miles away in the middle of a wood, followed by the biggest and longest explosion I have ever seen. Ten weeks later I was reading the Telegraph. There was an article by a neutral correspondent describing the effect of British raids, and it said that on this particular night one of the aircraft had apparently missed the refinery, but had hit a secret ammunition factory concealed in a wood some five miles away.

Then as the nights grew longer, the story behind the images began to take shape. The German defences began to catch up the early lead which the Night Bombers had had, and for the first time we began to realize the true value of method and organization. Flak and searchlights appeared on the Zuider Zee: there were rumours of balloons and night fighters: the proficiency of German ground crews increased as steadily as did the number of their guns, so that evasive action over wider areas became an urgent necessity and radio direction finders suffered in consequence.

At the same time, navigation by wireless was made more difficult because of enemy interference. And there were cases of crews finding themselves over occupied territory when the radio put them over England. As a counter mea-

sure, our attacks became less stereotyped. Different routes were chosen to spread the defences; bombing heights varied also and people began to look on 12,000 feet as not abnormal. Furthermore, crews began to experiment with numerous tricks to confuse the defences. Some of them are still being used with success: others had to be abandoned rapidly.

One day we discovered the current German Air to Ground signals, one of which—a colour cartridge—was addressed to searchlights and said: "I am in trouble. Stop everything." On the Wednesday one crew tried it out rather diffidently, they found that the defences closed down as if by magic. On Friday the squadron set off in high spirits and fully equipped. Unfortunately it became evident from the immediate results that the Germans had in the meantime changed its meaning so that it now read: "I am an enemy aircraft; please fire on me." Crews began also to study the methods and difficulties of anti-aircraft defence and tried to devise means of giving the guns the least possible help. Occasionally letters would come round from Higher Authority with suggestions or orders to the same effect. One of them recommended the detailing of one aircraft to fly round the target at a low altitude so as to draw all the fire while the others bombed in peace—but this expedient was never adopted.

More Damage

None the less, as the weeks went by, more and more aircraft came back damaged. And then suddenly—as if we were not expecting it—winter had set in. First, winds and rain and mud. Mud was everywhere: often ankle deep, and with it came more and more Night Flying Tests and briefings and high teas, but fewer and fewer deliveries of bombs. Night after night we drove out the five odd miles to dispersal, walked out to the aircraft (the mud was too thick for the 'buses to drive into the field) climbed in: ran up the engines, then switched off and waited for the van to come round with the signal to carry on or break it up.

It was these periods, when we operated full time, that kept us going. Otherwise, they were tedious weeks. Searchlights and Ac Ac were getting worse month by month, but it was the weather on return to base and the cold that gave most trouble. One night the gauge showed -40° Centigrade. The perspex cracked, the Second Pilot collapsed in the front turret, looking just like a snow man. In some mysterious fashion, an inch of solid ice appeared on the navigation table. Mannheim was the target. We arrived on our estimated time of arrival at 15,000 feet, floundering through the tops of the clouds, and began to come down. At 12,000 feet the port engine cut, and at 10,000 the starboard began to cough and fire intermittently. We came out of cloud at 6,000 and the engines began to pick up. But there was a blinding snowstorm and visibility was nil, so we flew back under the clouds to Boulogne.

Fighters Best Defence

With the New Year came the most serious defence the Germans had yet produced—fighters. Previously, no one had taken the possibility seriously. But now more and more crews came back with stories of encounters and shadowings. Aircraft would be trailed sometimes for upwards of an hour, without a shot being fired. On other occasions, attacks would develop out of the blue and without warning.

A Squadron Leader in a Whitley was suddenly attacked by a Messerschmitt. It was a 110 and came almost head on, its first burst putting one engine out and making the turrets unserviceable. The intercomm. went dead and all the pilot could do was to keep in the air. The Messerschmitt seemed to know this, for he flew round in small circles, shooting as he pleased. But the Whitley was tough: so was the Squadron Leader. After a few minutes the German knocked his mainplane off on the Whitley's tail, and the Whitley managed to limp home.

The fighters, following the lead of the ground defences, resorted to all manner of tricks. They lit themselves up to act as decoys: they trailed lights behind them, and they fixed searchlights on their noses. This latter device was too much for the rear gunner: he broke silence for the third time and said: "Two searchlights taking off away to port, Captain." But in all fairness he was not the only one. Another gunner reported searchlights following him out to sea.

Yes, it is true these fighters came as a menace when they first appeared. But it was not long before the bombers had the upper hand once more. As the weeks went by, the toll of German night fighters rose higher and higher. It was with the vision of this and of countless of these fighters hesitating to attack and, when they did, breaking away at the first sight of return fire, that I woke up, wondering perhaps to what dizzy heights the eternal battle between ground defence and Night Bombers would reach by this time next year.

--From the Royal Air Force Journal

Fighting Filipinos of the Air

By Maj. Falk Harmel

FOR leading his squadron of native airmen in a successful engagement against Japanese invaders and personally shooting down three enemy planes, a little Filipino flyer named Captain Jesus Villamor late in December was awarded the Distinguished Flying Cross.

Again in February this Kelly Field graduate, weighing 116 pounds and standing only five feet four inches, was cited in a communique of General MacArthur, this time as the recipient of the Oak Leaf Cluster for repeated acts of extraordinary heroism.

The communique told how Captain Villamor met a formation of Japanese fighters while on a photographic mission over Cavite province escorted by several P-40s. The ensuing combat was described as one of the most spectacular of the Philippine campaign.

Despite the fact that he was flying a slow biplane trainer, Captain Villamor managed to elude the Japs and land his plane. His escorting comrades began a series of thrilling dogfights. All six Jap planes came to grief. Four were immediately shot down. The fifth was crippled, landed on an air field near Pilar and was riddled by artillery fire from American and Filipino troops. The sixth Jap ship fell out of control and crashed in the mountains of Bataan.

Although still in its infancy when the Japanese onslaught came, the Philippine Air Force has played a vital role in the Far Eastern war.

Only six years ago the Air Forces News Letter reported that one-third of the Filipino air force was rendered inactive when a student pilot cracked up a Stearman Trainer. Fortunately, the student pilot was only slightly injured and the ship was repairable, allowing the Filipino Air Force to regain its full strength of three planes.

Air Arm Organized

Two years before, in April 1934, the initial steps had been taken to organize the Philippine Army Air Corps. Major General B.J. Valdez, appointed Chief of the Philippine Constabulary, adopted a number of measures aimed at the complete rehabilitation of this organization, chief among them being the creation of an air arm.

General Valdez, Deputy Chief of Staff of the Philippine Army, delivered an address at the graduation exercises of the ninth class of the Philippine Army Flying School. Briefly outlining the history of this school, he said:

"I believed then, as I do now, that a well-organized air force constitutes not only an efficient mode of protection against foreign aggression, but also a valuable adjunct in the maintenance of peace and order."

In the spring of 1937, on the occasion of the visit to Mexico and the United States of the President of the Philippine Commonwealth, Manuel L. Quezon, accompanied by General MacArthur and General Valdez, the latter made an unofficial inspection of Kelly Field, Texas, and evinced great pleasure over again meeting one of his countrymen, Flying Cadet Villamor, then a student at the Advanced Flying School.

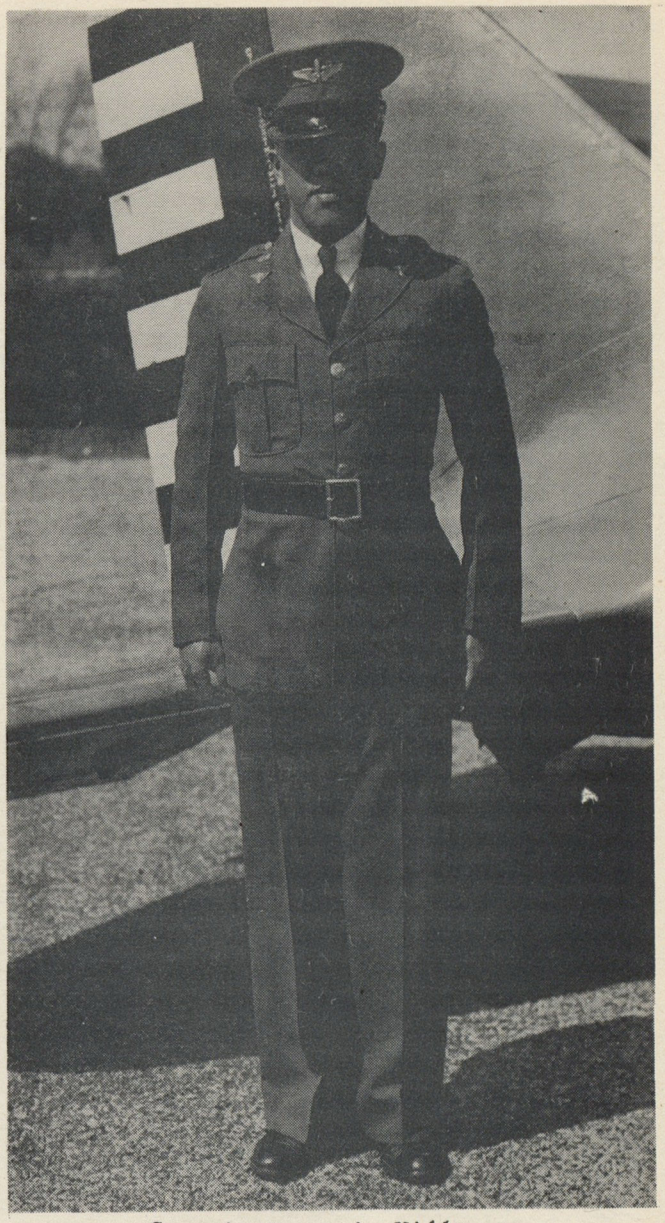
Captain Villamor's heroic exploits against the Japs is another testimonial to the efficient instruction methods at the Army Air Corps Training Center. The young Filipino, son of a justice of the Philippine Supreme Court and a graduate of the Philippine Military Academy at Baguio, was

detailed by the Philippine Government to undergo flying instruction at the Air Corps Training Center, and reported there in June, 1936. During his primary and basic phases of instruction at Randolph Field and his advanced instruction at Kelly Field, he made excellent progress. At Randolph Field his average in ground school subjects was 85 per cent and at Kelly Field it was 92.56 per cent. At both schools his flying rating was "B", indicating "Very Satisfactory" progress. He graduated on June 9, 1937, meanwhile being commissioned a third lieutenant in the Philippine Constabulary.

Having specialized in Pursuit Aviation at Kelly Field, he was for several months on temporary duty with the First Pursuit Group at Selfridge Field, Mich. He was then detailed to take the course in Aerial Photography at the Air Corps Technical School at Lowry Field, Denver, Colo. Here the young Filipino airman continued his fine scholastic record, and when he graduated in August, 1938, with the rating of "Excellent", the following notation appeared on his record card: "An above average student. He displayed great interest in all phases of the photographic course. He showed extraordinary manual dexterity in processing negatives, prints, laying of mosaics, etc. He will make an excellent photographic officer." When he left Lowry Field to return to his native country he had accumulated a total flying time of 475 hours.

Difficulties Met

As with a great number of new enterprises, the early career of the aviation arm of the Philippine Army was beset with many difficulties and disappointments. No qualified officer of the Philippine Constabulary being available to direct the organization of this newly authorized unit, the task was delegated to Captain Russell L. Maughan, Air Corps, then Aviation Adviser to the Governor General of the Philippines, and well known in aviation circles as the pilot who barely won out in a race against the sun when he flew an Army pursuit plane from the east to the west coast in the daylight hours of June 23, 1924. Captain (now Colonel) Maughan did not remain long on the Philippine assignment. He was nearing his fifth year in the Philippines—three more than the normal tour of duty, when in February, 1935, Captain Ivan L. Proctor took over the job. The latter had scarcely started on this assignment when he became ill and soon after died, following an operation. Other misfortunes followed.



Captain Jesus A. Villamor

Finally, through the valuable cooperation of General Douglas MacArthur, Military Adviser to the Philippine Commonwealth, the services of Lieut. William L. Lee, Air Corps, were obtained. This husky young officer took over in June, 1935, and brought new life and impetus to the Filipino air unit. Assisted by Lieut. Hugh A. Parker, he drew up flying rules and regulations and carefully selected flying students. Airplanes were purchased, and the most promising young officers of the Philippine Army were detailed to take the course at the Army Air Corps Training Center. Carefully selected enlisted men were sent to the Air Corps Technical School at Chanute Field, Ill., to receive instruction in aircraft mechanics and other trades allied to aviation. *(Continued on Page 38)*

Gliders Play Important Role in AAF War Plans

By Lewin B. Barringer

Ast. Director, Air Forces Glider Program

IN July 13th last the Air Corps accepted delivery of its first glider, a two-place, all-metal Schweizer. This historic event took place at the Warren Eaton Soaring Facilities, on Harris Hill near Elmira, N. Y. during the 12th annual National Soaring Contest. Its importance was emphasized by the presence of Major General H. H. Arnold, Chief of the Army Air Force who made a flight in this ship piloted by Major Fred R. Dent, Jr., first Air Force officer qualified as a glider pilot.

In the five months that have elapsed since then much has been done in this new branch of our aerial forces. Before going into it, let us stop a moment and analyze our reasons for including motorless heavier-than-air aircraft in our flying equipment. Military gliders as developed so far have two basic uses. First is the air transport of men, equipment and supplies from one location to another. Second is the surprise attack of enemy positions by air-borne shock troops.

The Germans have given us ample proof of the value of both of these uses. Gliders were first used successfully by them for attack during the invasion of Belgium in 1940. It now seems reasonable to suppose that this was Hitler's so-called "Secret Weapon" as troops landed in gliders were instrumental in capturing key forts and bridges. It was not until the air invasion of Crete in May, however, that world attention was focused on this new weapon which was here first used in numbers. Since then we have heard of the Germans using gliders against the Russians on the shores of the Black Sea and currently against the British in Lybia. The last mentioned is the first report we have had of the use of gliders for transporting supplies.

In considering the reasons for using gliders for transport we come at once to the fundamental truth that you can tow more than you can lift. This is the basic economic reason for the use of locomotives plus cars, trucks plus trailers and tugs plus barges in surface transportation. To put it simply, in the present stage of advancement of aerial transport we are carrying our passengers and freight in the "locomotive." The first reason, then, for using transport gliders is economic. This immediately becomes obvious when we consider that the two engines of a transport plane towing three large gliders is doing a job now requiring eight engines. Added to this is the fact that the cost of the gliders will be very considerably less than that of the transport planes they will replace. Although it is still too early to know what they will exactly be, it has been estimated that the overall equipment costs for transporting by air a body

of men, such as a battalion, by transport planes and gliders will perhaps be only half that of doing the job with transport planes alone.

When used for surprise attack the glider can be a formidable weapon. Towed in numbers at night these ships can be released at high altitude many miles from their objective. They then glide rapidly down unseen and unheard, and land close to the objective in the first faint light of dawn. Out of each jumps a complete combat team such as a machine gun squad, fully equipped and ready for action.

German Types

The German gliders used in Crete were of 10-12 place capacity. They were high wing, cabin monoplanes with wing span of 80 feet and fuselage length of 50 feet. The semi-cantilever wings, braced by a single strut on each side, were of wood construction; the fuselage, of welded steel tubing. The entire ship was fabric covered. Apparently a two-wheeled landing gear was used for takeoff and then dropped in flight, the landing being made on the wooden skid. Those of us who in recent years have seen German sailplanes competing at our National Soaring Contests at Elmira are familiar with this operation on a smaller scale. It was tricky, to say the least. If the pilot dropped his wheels too low, they were apt to bounce up and damage the bottom of the fuselage. If dropped too high, there was danger of their bouncing into and injuring crew members or being smashed on impact.

Performance of these big German transport gliders is interesting. One to three of them were towed behind a single Junkers JU-52 at a speed between 100 and 120 mph. After release they probably glided, at a most efficient L/D ratio, at about 70 mph. Levelled off at about 50, they were landed at 35-40 mph. on beaches, roads, and in small fields.

Secret of a pilot's ability to land a large, heavily loaded glider in a small field is a combination of flaps and spoilers to give accurate control of glide path and speed. Added to this there is the characteristic of a glider in stopping very quickly, without danger of nosing over, when the stick is pushed full forward after landing. I once brought a single seater sailplane with 62-feet span to a dead stop in 40 feet after a landing made at over 60 mph. in a small field.

Since the Air Force began actively to initiate a glider program five months ago, real progress has been made in the procurement of equipment and the training of pilots. In the former category the Materiel Division created a Glider Unit in its Experimental Engineering Section at Wright Field. This organization has carried on the development of several designs of 8 and 15 place gliders. The Navy is building 12 and 24-place gliders to be used by the Marine Corps. Construction of the Army ships is well under way and the first static test and flight test transport gliders have been delivered.

A program of flight testing with the small two-place training gliders has also been going on at Wright Field for some months. Some of the items tested have been types, sizes and lengths of towlines, various combinations for multiple towing, intercommunication between gliders and towplane and so on.

The most interesting experiment made recently was the picking up of a glider, resting stationary on the ground, by an airplane passing overhead at close to 100 mph. The basic device that made this experiment successful was a winch drum, equipped with a brake, in the airplane. This drum reeled out sufficient line to ease the acceleration of the glider. Once in the air and up to towing speed the glider was reeled in to the proper towing interval by a small electric motor driving the winch. The importance of this development is that it may solve the problem of launching a train of transport gliders. It will conceivably be possible to pick up several gliders out of a field too small for the safe takeoff of the airplane alone.

Tests At Wright Field

At Wright Field for these tests are several Schweizer shoulder-wing training gliders, Frankfort high-wing trainers, a German "Minimoa" shoulder-wing, high performance sailplane, and a Polish "Orlik" sailplane of similar design. The two latter ships are used chiefly for analysis of design and construction. An O-49 has been used for towing and has proven to be an ideal towplane for the training gliders.

Training of Air Force pilots who will act as instructors, supervisors, and test pilots in the expanded program, has been carried on by the Elmira Area Soaring Corporation at Elmira, N. Y. and the Frankfort-Lewis School of Soaring at Joliet, Illinois. Only one class of six officers were trained at Joliet as the volume of training necessary was then not yet large enough to justify two schools.

Marine Corps pilots have been trained at Joliet. The Air Corps training was discontinued at Elmira due to winter weather conditions. It

is proceeding at an expanding pace, at the Twenty-Nine Palms Air Academy located at Twenty-Nine Palms in the California desert.

The primary training course lasts four weeks. The 30 hours of flight training given includes auto, auto-pulley, winch and airplane towing. Several hours of double towing (two gliders behind one towplane) give the pilots practice in towed formation flying. Enough soaring flight is done to make the pilots thoroughly proficient in handling the gliders and to instill in them real enthusiasm for this type of flying. This last consideration has already proven valuable. After all, it is logical that a man's interest in and initiative for any activity will be considerably increased if he gets a real kick out of it. A pilot has to be either singularly lacking in imagination or painfully blase not to get a whale of a kick out of soaring flight.

Planning Advanced School

Tentative future plans call for the establishment of an advanced school for glider training. Here graduates of the primary courses will receive instruction in flying the large, troop-carrying gliders. Their background of flying the training gliders will then stand them in good stead, but these big ships will feel quite different. With their great size, weight, higher wing loadings, etc., these gliders will certainly not be sailplanes in any sense of the word. In fact, as one engineer stated the other day, they really should not be considered as gliders, but as transport airplanes with remote power plants.

Much thought has been given to the piloting background and experience necessary for pilots of the transport gliders. Due to the consideration of the size of these ships and the fact that they will be towed in formation at night, thought that a pilot should have at least the minimum airplane training of the Air Corps primary schools or CPT course before entering a glider school.

Second To None

At the closing banquet of the 12th annual National Soaring Contest at Elmira, N. Y. last July, General Arnold said that we would have a glider force second to none. World events since then have shown his wisdom in adding this new type of aircraft to our Air Force. The progress we have made so far makes us confident that his statement will come true in the not-too-distant future.

GUNTER'S 'ASSEMBLY LINE'

A Detroit "assembly line system" has been installed at Gunter Field, Ala., to speed up aircraft inspections and to train enlisted men to be skilled mechanics.

Hangars are divided into eight equal parts, each part being called a station. Four stations in each half of the hangar constitute a line. A sub-station or wash rack located outside of the hangar forms the beginning of each line.

An airplane sent to the Maintenance Hangar is taken first to the sub-station for a general check-up which includes oil pump drainage, screen cleaning, gas tank inspection, and engine spraying and cleaning. All discrepancies are noted on a blank form by the Hangar Inspector and the plane is moved to Station One.

Wheels, landing gear, brakes, tail wheel, instruments, skin, structure, cockpit, propeller, and thrust bearings are inspected at this station. Station Two checks cables, ignition system, flight controls, hydraulic system, values, electrical system, and fuel and oil systems. At Station Three the propeller is painted and restenciled, the radio installed, and the plane vacuum cleaned. All discrepancies found by the Technical Inspectors are corrected at Station Four, the plane is recowled and preflighted, and then returned to its Squadron.

At the Maintenance Hangar Office a complete record is kept of the time on each airplane on the field. This record shows such data as airplane field number, serial number, time on the plane, engine model, serial number and time, propeller time, last depot inspection report, time towards a 50 or 100 hour inspection and whether the plane is or is not in commission. By means of this record, the Officer in Charge determines which airplanes are to be called in for either a 50 or 100 hour inspection.

The Post Engineering Officer and his assistants are in charge of the Maintenance Hangar, and the Hangar Chief, the Hangar Inspector, and the Line Chief are non-commissioned officers.

The War Department has instructed civilians not to call Interceptor Command Headquarters for information about reports of pending air raids. This restriction has been instituted because of the necessity for keeping all agencies of the Interceptor Commands free to repel attacks. Under War Department instructions, Interceptor Commanders have the sole responsibility for ordering all air defense measures.

Filipino Air Force

(Continued from Page 34)

At General MacArthur's request, the War Department approved a one-year extension of Lieut. Lee's tour of duty. In the following year another request was made for a one-year extension of duty for the young Chief of the Philippine Army Air Corps because of his "outstanding fitness for the duties he is performing and his intimate experience with the Philippine Army." This was denied on the grounds that additional flying instructors at the U. S. Army Air Corps Training Center was urgently needed.

Lieut. Parker, during his service as flying instructor at the Philippine Army Flying School, flew over 1,000 hours. Before he returned to the States in November, 1937, he was presented the Distinguished Service Star of the Philippines by President Quezon, with the following citation:

"For outstanding service to the Commonwealth of the Philippines in a position of major responsibility, there is hereby presented to First Lieutenant Hugh A. Parker, Air Corps, United States Army, the Distinguished Service Star of the Philippines. As Plans and Training Officer of the Air Corps Training Center, Philippine Army, and individual instructor of flying cadets, his services have been characterized by unusual efficiency and professional skill, unflagging enthusiasm, and outstanding results. His work has required incessant devotion to duty, a readiness and capacity to comprehend the particular requirements of Filipino students, and an ability to adjust technical instruction so as to overcome unusual difficulties. His accomplishment and examples have been an inspiration to every member of the Air Corps of the Philippine Army and a source of satisfaction to the Chief of the Air Corps, the Chief of Staff, the Military Adviser, and the Commonwealth Government."

Work Continued

The work so brilliantly started by Lieuts. Lee and Parker was carried on with no less successful results by Captains Alden R. Crawford, Mark K. Lewis and Lieut. Charles H. Anderson, assisted by an able staff of Philippine Army Officers. Captain Crawford was the Acting Chief of the Bureau of Aeronautics; Captain Lewis, Acting Chief of the Philippine Army Air Corps; and Lieut. Anderson, Operations Officer and Chief Flying Instructor of the Philippine Army.

Limited by the number of airplanes and flying instructors, only three classes of 25 students each were conducted annually at the Philippine Army Flying School. Usually, about forty per cent of these students completed the course. The first class was graduated on October 30, 1937, and the commencement exercises were an outstanding event. The guest of honor, President Quezon, delivered the principal address. Ranking U. S. Army officers present were Generals MacArthur, Lucius R. Holbrook, John H. Hughes and Evan H. Humphrey. High ranking officers of the Philippine Army were also present. It was at this function that Lieut. Parker received his decoration from the Philippine Commonwealth.

Captain Crawford left the Islands in December, 1939; Captain Lewis in July, 1939, and Lieut. Anderson in the spring of 1940. The latter was decorated with the Distinguished Service Star of the Philippine Commonwealth.

Cited By MacArthur

Approving the request of Captain Lewis to attend the Air Corps Tactical School at Maxwell Field, Ala., General MacArthur stated: "Captain Lewis is on duty with the Commonwealth Government, acting as Chief of the Philippine Air Corps, in which capacity he has shown great ability. He has successfully furthered the development of the Philippine Army Flying School, has perfected plans for and is directing the expansion of the Air Corps and has exhibited marked qualities of initiative, leadership and judgment." A most promising career in the Air Corps for Captain Lewis ended when he crashed at Biggs Field, El Paso, Texas, on December 9, 1941.

From the latest information available, a message from General MacArthur, sent last November, Lieut. Colonel Charles Backes, Air Corps, has been Acting Chief of the Philippine Army Air Corps for more than two years. At that time he had already served four years in the Philippines and his tour had been extended another year, but it was proposed to order him back to the United States for a period of four months for reasons of health and in order to permit him to visit Air Corps installations and familiarize himself with current developments.

The properly EQUIPPED and MANNED bombardment airplane is a PRECISION instrument.

Barksdale - Never A Dull Moment

***By* Lieut. John H. Cheatwood**

Barksdale Field, La.

NO other air field has experienced more completely than Barksdale Field, La., the rapidly changing phases of activity that have been part of the growth and development of the Army Air Forces.

Pursuit base, GHQ Wing Headquarters, Air Force Combat Command base, advanced Pilot School, Bombardier School, Navigation School and Third Air Force base—Barksdale has been all of these.

From an obscure beginning with about 10 instructors and as many airplanes, 12 schools have developed out of Barksdale, each school equipped with experienced instructors. Staff schools within the Southeast, Gulf Coast, and West Coast Air Corps Training Centers have all received personnel from Barksdale.

Barksdale's varied career began in 1932 when it was established as the home of the 20th Pursuit Group. In 1935 the Third Attack Group was added and the field became the headquarters of the Third Wing of the new GHQ Air Force. This lasted until October, 1940, when the Air Corps recognized Barksdale's value to the expanding training program and made it a Specialized Flying School.

On February 6, 1942, when the Barksdale school was moved to another location, the field returned to the Combat Command, where it remained until the Command was abolished by the Air Forces reorganization which went into effect March 9. Barksdale is now one of the most important bases of the Third Air Force.

Much of Barksdale's most interesting history was crowded into the years when it was an advanced Specialized Flying School. This school was incorporated into the Southeast Air Corps Training Center and comprised not one but four schools in its original operational plan. These schools were Advanced Flying School (TE) (Pilots), Advanced Flying School (TE) (Bombardier), Advanced Flying School (TE) (Navigation), and the Advanced Flying School (SE) (Pilots). A brief resume of the functioning of the various schools follows.

Advanced Flying School (TE) (Navigation)

First of the four schools to receive students was the Navigation School. The first class, SE 41-A, was received in November, 1940. In its eight months course, this school graduated 52 navigators. At the beginning, very few airplanes were available, and those on hand were the obsolescent B-10 and B-12 types and some B-18 types. In the later stages, however, Beechcraft AT-7's were made available in sufficient numbers and training was improved. During all but the last few weeks of training, flying instructors served as pilots for navigation missions in addition to their other duties.

Advanced Flying School (SE) (Pilots)

Two classes of single-engine pilots were received while the school was located at Barksdale Field. They received training on AT-6, AT-12, P-36 and P-35 types. One class of 37 was graduated while the remaining students, instructor personnel and the various line squadrons were transferred with the school to Craig Field, Selma, Ala., when that school was activated.

Advanced Flying School (TE) (Bombardier)

The Bombardier School, second of its kind to be activated, was patterned somewhat after the school then operating at Lowry Field, Denver, Colo. The two major differences were the necessity for operating on bombing ranges located very near the landing area of Barksdale Field and the necessity for utilizing the same equipment and pilots that were employed by the Two-Engine School. The first difficulty was solved by using single traffic pattern and the second by training two-engine pilots and bombardier students together. This last was done by using student pilots for the Two-Engine Pilots School as co-pilots on bombing missions, while students of the Bombardier School were receiving training. Later, however, pilots were specifically assigned to duty with the Bombardier School.

Advanced Flying School (TE) (Pilots)

Last to leave Barksdale Field was the Advanced Flying School. (TE) (Pilots). In one year this school graduated several hundred two-engine pilots. Some of these graduates were sent to temporary duty with the Air Corps Ferrying Command and have since been assigned to duty with the Air Force Combat Command. Some others have been retained as instructors with the various train-

ing centers. The remainder were sent to bombardment units and the Air Force Combat Command. Instruction was begun with B-10, B-12, and a few B-18 type airplanes but later the school furnished AT-7, AT-8 and the Lockheed-Hudson types.

At the time these schools were founded, very little had been done in the field of specialized student training since the four-section plan of operation was discontinued. New operational plans had to be formulated. New ground school curricula had to be written. Men not qualified in specific phases of instruction had to be trained. New squadrons had to be formed and trained to maintain the equipment to be used.

Plans of operation of each school were worked out individually by school staffs. Some degree of flexibility was allowed so that schedules would not conflict with other training. As soon as schools were operating smoothly the training of key personnel or cadres for other schools was undertaken.

The problem of Ground School curricula was a major one, due to the fact that many courses taught were completely new. Instructors were assigned the various subjects for the multiple purpose of making detailed studies of all data available, incorporating these texts, and then conducting classes. Since there were no special Ground School instructors available, these duties were fulfilled by flying instructors, bombardier instructors, and navigator instructors during their time on the ground. In many cases it was necessary to exchange instructors between schools when these instructors were qualified in highly technical subjects given by two or more schools.

Coordination between flying and ground instructions was obtained by a system of half-days. In the Two-Engine Pilots School, for example, the lower class was assigned a period for flying and a period for ground school while the upper half was assigned the reverse. Similar systems were employed by other schools.

In order to insure proper maintenance for 24-hour-a-day flying schedules, several new squadrons were activated. These men were specifically trained for maintaining the type of aircraft used in the schools to which they were assigned. This system proved very efficient. The average percentage of airplanes of all types in commission daily was approximately 70 per cent during this period.

From the beginning at the Specialized Flying School 12 individual schools have sprung into being, and now, some of these have begun to subdivide.

Poles Still Flying

(Continued from Page 28)

as though in oil and went down into the sea.

"Then I saw a machine that had been damaged and was smoking and another tearing away for all he was worth. I went after him and approached him from the rear and above, pressed the button and something began banging into my fuselage from below. It was as if a bucket of hot water had been poured down my neck. I don't remember breaking off to the right. I managed to look and see if my legs were still whole and then four MEs flashed by me. I don't know which of them hit me but I was mad with all four of them. Without warning my machine suddenly caught fire."

The Polish pilot was knocked unconscious trying to bail out and when he came to he was burning in his spinning ship. He finally kicked his way out and bailed out but was severly burned about the face and spent weeks in a hospital. He concludes: "Now I'm flying again."

The Polish bomber pilot flew a Wellington to bomb Essen in the German Ruhr valley. His squadron reached their target, bombed it from low altitude and then headed for home in the light of the fires they set.

Ran Into Flak

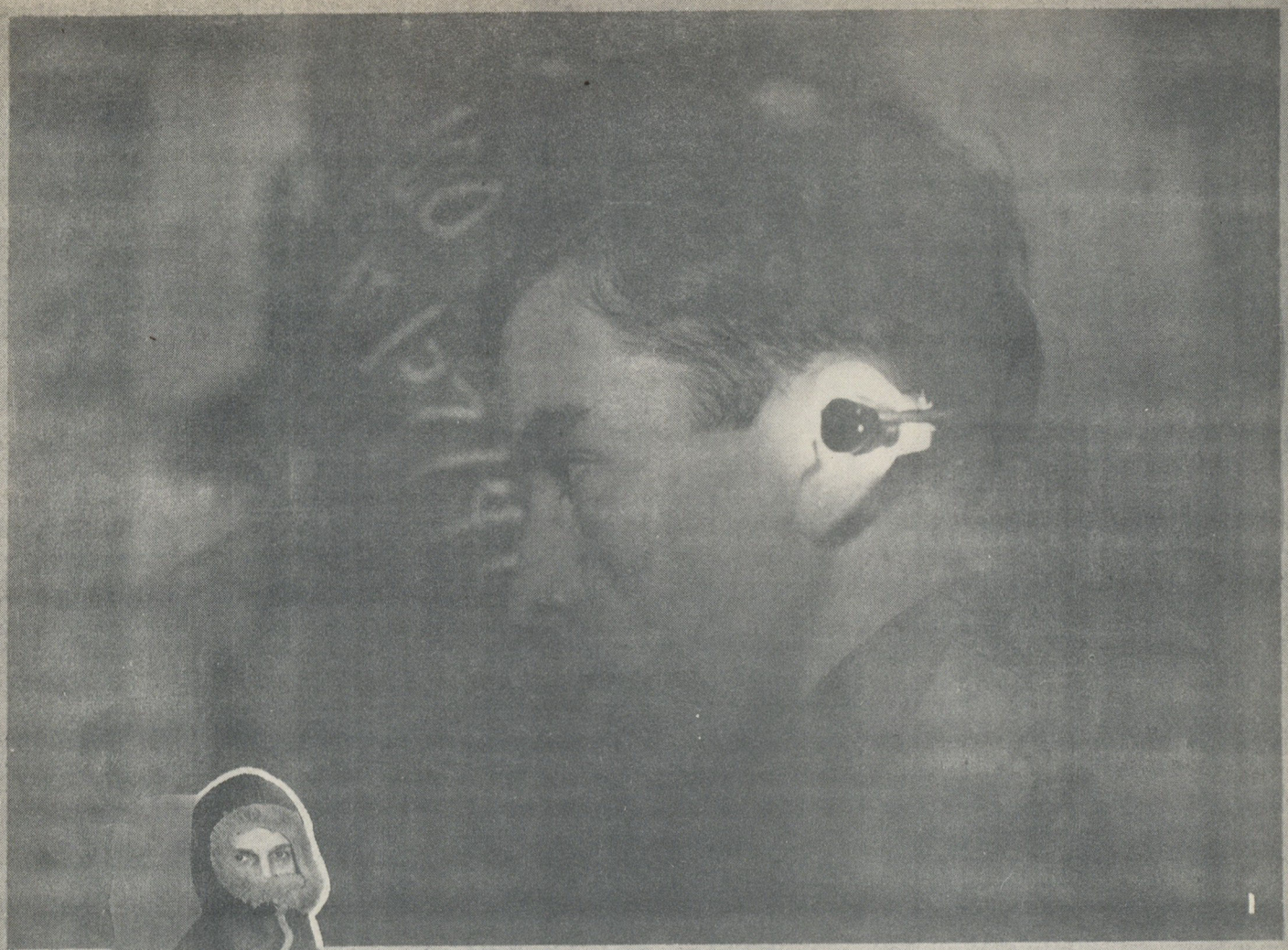
"Shortly after leaving the target we ran into a storm of flak. It was so close we could hear the bursts plainly over the engine roar. Our Welling started to bounce violently. We went into violent jinking (weaving and zig zag tactics) and climbed and dived as fast as possible to throw the bummers off. But it was no good. We counted 12 salvos of from 20 to 30 rounds apiece. Things got rapidly worse until we could hardly control at all. Ailerons had no effect, the rudder almost none, except that the airplane responded exactly in reverse. We side slipped from one side to another and things looked bad. Finally we got her on an even keel although we were still weaving.

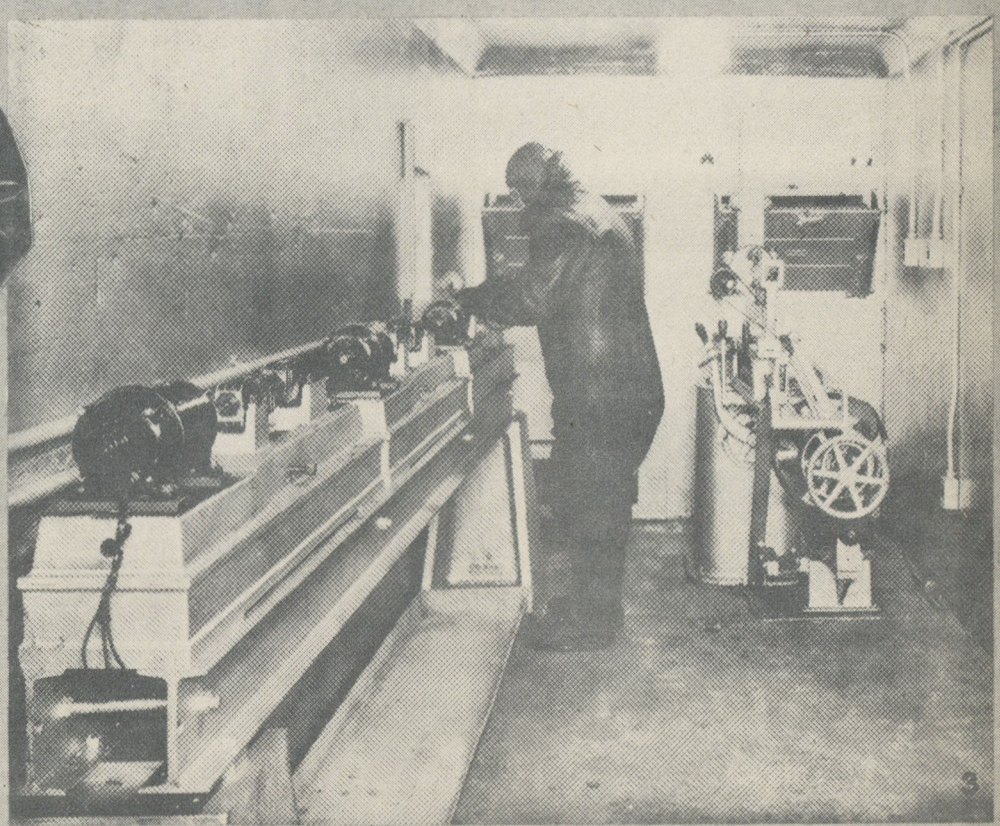
"When we reached the English coast I suggested that the crew leave the building. The crew said if I was going to stay that was good enough for them so they stayed, getting back into the tail. We found our base, came in to land, but when I put the flaps down they only went part way. Just as we touched the ground there was a terrific cracking noise. The starboard wing went, ripping down all the fuel lines into the engine. We made it though and nobody was hurt."

Up, Up, Up—

HIGH ALTITUDE FLYING

"THE SKY IS NO LONGER THE LIMIT"





1. OXIMETER RECORDS EFFECT OF ALTITUDE ON BLOOD CONTENT
2. STRATOSPHERE FLYING SUIT -- WARMER THAN ESKIMO FURS
3. SUB-ZERO TESTING OF AIRCRAFT MATERIALS

Man in the Stratosphere

By Col. David N. W. Grant

Air Surgeon, Army Air Forces

IT is an accepted principle that the most important instrument in an airplane is the pilot. Not only must great care go into his selection and in training him as an engineer but it is equally important that he keep abreast with the most recent advances in aviation physiology and medicine. This must be done if he is to qualify for flying to the great heights and at the high speeds of which the most recent aircraft are capable.

From the human point of view the principal hazards of high altitude flight may be listed as follows:

(1) Deficiency of oxygen
(2) Decrease in atmospheric pressure resulting in
  (a) Expansion of gases in the alimentary canal
  (b) Escape of gaseous nitrogen in the form of bubbles within the tissues
(3) Increase in atmospheric pressure requiring admission of air to the sinuses and middle ear
(4) High acceleration:
  (a) Intermittent - contributing in some cases to air-sickness
  (b) Continuous - contributing in some cases to blacking out
(5) Cold
(6) Fear
(7) Fatigue

The deficiency of oxygen, to which anyone is subject who goes to high altitudes without an oxygen supply, was the earliest recognized hazard of high altitudes. In the World War the capacity to endure anoxia was rated as one of the essential features of selection of flight personnel. While it remains an important characteristic it is no longer recognized as the sole limiting factor for personnel in high altitude flight. Present oxygen equipment, if properly used, insures a fully adequate oxygen supply except under the most extreme conditions, and it is now realized that the jobs of the pilot and of his crew present other hazards that are at least as critical as his oxygen supply.

One of the principal purposes of the Air Corps indoctrination program now getting underway is to demonstrate to the young pilot or crew member that his mental functioning falls below par when he goes to 15,000 feet without oxygen, that he is likely to faint if he goes above 20,000 feet without oxygen and that when he goes above 40,000 feet, even with pure oxygen, he is in a precarious state. For an adequate oxygen uptake the lungs require, even with pure oxygen, a density of more than one-fifth that of air at ground level. This critical limit is passed at 39,000 feet and from there on the hazard of anoxia increases rapidly. A man is in as great danger at 42,000 feet breathing pure oxygen as at 18,000 feet breathing atmospheric air. It is difficult to convince young pilots of this truth except by actual demonstration in a chamber. They forget the fallacy of the old tradition that if a man lifts and carries a growing calf each day he will eventually be able to lift and carry the adult bull. It is equally certain that, on the one hand, a day will come when he cannot lift the young bull as it is on the other hand that, even when breathing pure oxygen, he will lose consciousness as the altitude is increased much above 40,000 feet.

Special Mention

Those features of oxygen equipment and its use deserving special mention in this general survey are:

(1) The insidious effects of oxygen lack. The brain is affected first—resulting in loss of judgment, unwarranted self-confidence, loss of alertness, sleepiness and possible loss of consciousness. A man may go through this entire cycle and return to the ground without having realized his precarious state. Those who accomplish successful combats above 20,000 feet without oxygen are apt to boast of their accomplishment and so to encourage such foolhardiness in others. Those who fail in attempting to repeat the performance don't live to tell the tale. The moral is—depend on the altimeter, not on your symptoms, to determine when oxygen is to be used. A reasonable, conservative rule regarding

oxygen usage is that given in T.O. No. 03-50A-1 as follows: "Except in urgent, unforeseen emergencies, all personnel will use oxygen at all times while participating in flight above 15,000 feet. Oxygen will also be used when remaining at an altitude below 15,000 feet but in excess of 12,000 feet for periods of two hours or longer duration and when participating in flights below 12,000 feet but at or in excess of 10,000 feet for periods of six hours or longer duration".

(2) The relation of cold to oxygen use. Oxygen lack aggravates the effects of cold and favors frost-bite. Also, once a man has become cold his oxygen requirement is increased because of shivering. Oxygen should be used as liberally as the supply permits when cold begins to penetrate.

(3) The relation of work to oxygen use. Work is accomplished by oxidation of body fuels and in emergencies a gunner or other crew member may require for short periods four or five times as much oxygen as usual. The present oxygen equipment renders such work hazardous unless the oxygen regulator is opened to capacity. Even then there may be an oxygen deficiency above 30,000 feet. Above 35,000 feet work should not be attempted except in extreme emergencies.

(4) The question is frequently raised, "Does breathing pure oxygen have harmful effects?" The answer for personnel of the Air Forces is, "No". Extensive experimentation and observation have erased all doubts as to the harmful effects of oxygen.

(5) Another common question is, "Does exposure to oxygen lack from service flying have permanent harmful effects?" The answer again is in the negative, provided that accidents due to inefficiency while anoxic do not occur. Oxygen lack sufficiently severe and prolonged to result in brain damage might be encountered by flight personnel only in rare emergency provided T.O. No. 03-50A-1 is followed. As the first evidence on this question we have the records of the historic flight made in 1875 by three French balloonists. They reached 28,800 feet without oxygen equipment. Two died, presumably of oxygen lack, while the third, Tissandier, survived without apparent harm.

Recent direct experimentation on animals and accumulated observations on men substantiate this point.

(6) A quotation from a German manual for flying personnel is to the point—"The efficient use of the oxygen apparatus insures mental superiority over the enemy".

The second hazard listed above is the effect of decreasing pressure. The body contains air partly trapped within it, in the ear, in the sinuses, in the alimentary canal. As the pressure decreases during ascent to high altitudes these gases expand and unless they escape they cause pain. Escape through the Eustachian tubes of the ear and from the sinuses causes no difficulty in the healthy man in ascent.

Expansion of gases in the stomach and intestines is one of the commonest of discomforts. Body movements that favor the passing of this gas are usually effective. Foods known by experience to be gas-forming should be avoided. The discomfort of expanding gas is aggravated by the fact that such gas bubbles will expand much more in the body, where they are surrounded by wet tissues, than dry gas in a balloon. Whereas, dry gas will expand to five times its volume at 39,000 feet, gas in the presence of excess water will expand to about eight times its initial volume.

Decreasing the pressure on the body not only affects gas bubbles already present in the body but it permits the free nitrogen in body fluids to escape from solution and form bubbles. This nitrogen is present because the entire body is in equilibrium with atmospheric nitrogen at ground level. When the pressure decreases as one ascends this nitrogen tends to escape. The bubbles thus formed rarely cause trouble at 25,000 feet. At 30,000 feet some subjects have trouble after two or three hours. At 35,000 feet some have trouble after one hour and at 40,000 feet trouble may come within 15 minutes. However, many young men can "take" four hours at 35,000 feet or one hour at 40,000 feet.

These "troubles" may take the form of joint pain, of throat irritation or of itching skin. Joint pains may be mild and disappear or they may become severe enough to cause a virtual paralysis of the member affected or even fainting. Throat pains and itching skin, once developed, are almost certain to grow worse as judged by chamber tests.

One Cure

There is only one cure and that is descent until the pain is alleviated or disappears. Usually the man recovers entirely before he is half-way down to ground level.

Laboratory experiments indicate that exercise for one-half hour while breathing oxygen gives considerable protection against this hazard. It remains to determine the usefulness of this procedure under practical conditions.

On descent from high altitudes air must re-

enter the middle ear and the bony sinuses. Clearing the ears by swallowing, by blowing the nose, etc. is a technique nearly all can learn with practice. Except in emergencies, flights to high altitudes should not be attempted when one has a cold. Stubborn infections of the ear or sinuses may result.

Clearing the ears does not necessarily grow more difficult with increasing rates of descent. If a man has no difficulty in clearing his ears coming down at 5,000 feet per minute he can probably do as well at 25,000 feet per minute.

High accelerative forces whether of the intermittent type, as in rough air, or of the more sustained type, as in pull-outs, and other maneuvers, constitute one of the acute hazards to which flight personnel is subjected. The first form is of less concern to the pilot than to his crew. While the pilot either overcomes air—sickness or quits, the members of his crew may continue to experience it. This seems to be particularly true of the tail gunner where riding is roughest. Fortunately air-sickness rarely if ever has permanently ill-effects. Unfortunately there is no assured preventative nor can we escape the fact that a gunner in the process of vomiting is for the time being out of action.

The effects of high sustained accelerative forces as in pull-outs, have been described in a recent Technical Order, together with the accepted method for increasing one's tolerance of "G". This need not be repeated here, other than to refer to the figure, showing the crouching posture that has been taught the German pilots for some years. This posture is believed to increase one's tolerance by about 1 "G".

Cold Is A Hazard

The hazard of cold is not merely the pain experienced and the danger of frost-bite. The principal handicap is the reduced level of bodily functions, both mental and physical. Fingers are numbed and operations are clumsily carried out, if they can be carried out at all. The physical misery dulls one's awareness of other dangers. The oxygen system must supply more oxygen and may freeze in the process of doing so. Added clothing greatly interferes with the bodily movements requisite for routine operations, and also renders more difficult parachute escape. Finally goggles and windows become frosted; in order to clear the windows it may be necessary to open them and thus lower the temperature even more.

Protection against the hazard of cold is an engineering problem that is on the way to solution. Clothing should be loose-fitting and dry. Rapid ascents in the tropics are more difficult than in temperate zones because, if adequate protective clothing is donned before the flight, the wearer may be soaked with perspiration before he leaves the ground. Electrically heated suits seem better adapted to tropical and temperate zones than to the arctic zone. If the wearer of such a suit must bail out, he cannot long survive arctic cold.

As emphasized before, the use of oxygen helps to protect against cold. Hot drinks during flight also help some. Alcohol makes one feel better because it dilates skin capillaries and favors transfer of body heat to the skin. The resulting temporary sensation of warmth may have disastrous results since it is accomplished by lowering body temperature. Alcohol also tends to inhibit shivering and so to increase still further the danger of continued exposure to cold. Alcohol should be looked upon as a restorative for the man who has been rescued from cold. It should not be made available to the man who is expected to undergo a long exposure to cold.

No Escape From Fear

The hazard from which there can be no escape is fear. Fear may arise from any one of the hazards previously mentioned or from a combination of them.

It is the job of the flight surgeon, responsible for selection of aviation cadets, to eliminate those most likely to be eliminated because of chronic fear, but the fear hazard is a mental state from which none of us is wholly protected. Repeated exposure to all the other stresses entailed in flight may be well endured in the absence of any strong element of fear. It is this psychological factor of pronounced fear that seems chiefly responsible for the cumulative fatigue occasionally experienced by war-time pilots.

In summary it may be said that the hazards encountered by flying personnel are now well recognized through recent advances in aviation medicine and relatively efficient means have been discovered and developed for meeting them. This has been possible through the team work of engineers, flight surgeons, physiologists, psychologists, and other scientific groups. The effectiveness of these contributions, however, finally depends on the cooperation of the air crews.

Torpedoes Get Wings

(Continued from Page 12)

elon with ample space between planes to allow for a breakway turn in either direction once the torpedo is dropped. The wide spacing has the added advantage of stringing out the targets and diluting the defenders' fire. The attack is generally delivered from forward of the beam so that ships present their largest target bulk and at the same time add a vector of their own speed to that of the torpedo thus cutting down the time available for the ship to dodge.

Double Attack

Another form of attack that can be extremely effective, provided that it is made in force, is one delivered from a semi-circle of planes spread across the bow and to both beams of the enemy ship. The torpedoes then speed in from all angles so that avoiding them is almost an impossible task. The quintessence of success, however, in a torpedo plane attack is a double attack in which two flights approach from both port and starboard bows spaced ninety degrees or more apart and perfectly synchronized to arrive at the target about a minute apart. The Torpedo has more speed than its targets but can sometimes be avoided by a quick-thinking skipper who will generally swing his ship to a course opposite and parallel to the course of the torpedo. In so doing he presents the least possible target bulk and is in a position to dodge the torpedo by a slight touch of the helm.

But if the ship being attacked swings parallel to the first torpedo attack he is in no position to dodge the second attack delivered from the opposite bow. The second batch of torpedoes approach him at right angles to his course to which he is pinned by the approach of the first batch. Whichever way he turns he finds himself in a sea full of TNT anxious to fulfill its purpose.

A big help to any torpedo plane attack but of particular benefit to the echelon attack from forward of the beam, is a smoke screen laid down close to the ship to be attacked. The attacking planes can then come in behind the screen rising occasionally above it for observation, burst through the screen, drop and hightail for protection. Of course the question arises "Who will bell the cat?" for a smoker is a prime target, although he does have the advantage of speed and a high rate of change of bearing. A smoke screen is also a fine barrage target for flak fire and pilots may count on heavy fire at the screen.

OXIMETER AIDS TESTS

A new device called an Oximeter is being used as a "watch dog" in high altitude chamber tests. Through an illuminated "ear-ring," the Oximeter provides instant readings without delaying the experiments.

Previous to the development of the Oximeter, the amount of oxygen in the bloodstream of a man in the altitude chamber was recorded by securing a sample of the subject's blood by means of a needle and syringe. Operated outside of the altitude chamber, the Oximeter does away with this laborious process and permits the tests to continue without interruptions.

The ear unit of the Oximeter is clamped on the lobe of the subject's ear so that the light from the lamp shines through the lobe into a photocell on the other side. The Oximeter capitalizes on the fact that the blood changes as its oxygen content changes. Normally saturated it is bright red, but as more oxygen is lost it shades off to deep purple. Purple passes less light than red,so any change in the oxygen content of the blood alters the intensity of the light which shines through the ear lobe.

The Oximeter was originated by Dr. Glenn A. Millikan, consultant and lecturer in bio-physics at the University of Pennsylvania.

FREE LEGAL CLINIC

A legal aid clinic—believed to be the first of its kind at any U.S. Army post—was inaugurated at Lowry Field, Denver, Col., to provide enlisted personnel with necessary legal help.

The clinic offers legal advice to Army personnel and secures competent legal aid for them in matters of family relationship, guardianship, homes and personal possessions, wages and other income, installment purchases, taxes and other debts, wills and insurance policies, welfare laws and civil service, accidents, and rights under the Soldiers and Sailors Relief Act.

If the case warrants, a member of the Denver Bar Association is called in for help. Then, if an attorney is needed, the association supplies its services free of charge to enlisted men. The Army is assuming no responsibility for any of the cases handled.

To reduce average bombing errors by ONE-HALF is equivalent to multiplying the effectiveness of a bombardment force by FOUR.

War Is Climbing

By Capt. Nathaniel F. Silsbee

WAR is moving up into the higher levels, and the see-saw between high flying bombing planes, higher flying fighters to knock them out of the sky, then new techniques to get the bombers up even higher, goes on at a furious pace. Put differently, every new offensive weapon brings an almost immediate reaction in the field of defense.

For some years science, recently prodded by Mars in no uncertain terms, has been attempting to prepare both men and machines to fly into the substratosphere, which extends from 5 to 8 miles (or more) above the earth's surface. At the outbreak of this war a high ranking British official stated that the nation which first perfected superbombers for stratosphere operations would win. Later in this article we shall see what is being done along this line by ourselves, as well as by the British and the Germans.

It should be realized, however, that owing to weather conditions, particularly over continental Europe, there will still be plenty of bombing in the 10,000 to 25,000 altitude range, as well as dive bombing and the fast low flying bombing tactics as developed, for example by the British using modified Hurricane IIc fighters and the Russians with new heavily armored bomber-fighters. These activities are not within the scope of this article.

Difficulties Involved

First of all, then, let us look at some of the technical difficulties involved in getting planes and pilots to fly "upstairs."

The first job is to get the bomber and its load up there. This has been made possible by such engineering gadgets as supercharged engines, constant-speed propellers, and high-lift wings. The theory of the supercharger is fairly simple. The gasoline in an airplane engine burns oxygen from the air. The higher the altitude the less oxygen there is in the air, therefore the higher the engine goes the less efficient it is. Engines, at higher altitudes, become short-winded, like the traveler climbing Pike's Peak.

Take, for example, a Pratt & Whitney Twin Wasp, which develops 1,200 h.p. for take-off. At 20,000 feet, without supercharging, it would be turning up hardly more than 500 h.p. and at 25,000 just over 250 h.p. Not so good if speed is to be maintained. However, with the supercharger, extra air is pumped into the carburetor, and that does the trick.

Turbo-Supercharger Ingenious

The built-in blower type of supercharger is usually operated in two gears, going into "high" as the higher altitudes are reached. A recent development in which this country appears to have a jump on the rest of the world is the turbo-supercharger. With this ingenious device, the engine's exhaust gases are utilized by directing them through a small turbine compressor. This rotates a blower which sends the "thickened" air on to the carburetor.

On the occasion of the Wright Lecture at the Institute of the Aeronautical Sciences, December 17, 1941, the Collier Trophy for the year's outstanding contribution to aeronautical science was jointly awarded to Dr. Sanford A. Moss, of the General Electric Research Laboratories, inventor of the turbo-supercharger, and to the U. S. Army Air Corps for practical application of the device to high altitude flight.

Another problem is to get the propeller to take larger bites of air at the higher altitudes. This means that the blades must be able to turn in the hub to allow change of pitch—low pitch to allow the heavy bombing plane to get off the ground, and high pitch in the substratosphere to secure bigger bites of the rarefied atmosphere.

These are mechanical solutions to the problem. Another angle brings us into aerodynamics. It takes a lot of lifting surface to get a fully loaded B-17 (around 25 tons) up to 35,000 feet. One reason why foreign heavy bombers have been slow, and therefore highly vulnerable to fast well-armed fighting planes, is that to produce sufficient lift the wings have had to be large, and that means plenty of drag. This problem is being tackled by foreign research organizations, and one excellent solution in this country has been found in the Davis wing, with its sensa-

tionally high lift-drag ratio. The use of this airfoil on our B-24 Consolidated heavy bomber (Liberator to the British) has spelled outstanding performance for this ship.

The Human Element

So much for the Machine. How about the pilot and the other members of the combat crew? It is generally agreed that most pilots and flight-crew personnel can function normally up to around 15,000 feet for a short period. Beyond this level oxygen deficiency begins to produce certain dangerous symptoms—such as an unusual buoyancy or possibly irritability, loss of memory, lack of judgment, delay in reaction, etc. Hence oxygen masks are a prime essential, or better still—as they provide the answer to the intense cold as well as the lack of oxygen—pressurized cabins, of which more presently. The latest types of oxygen masks include—besides the oxygen tubes—radio microphones, special cold-resistant lining and double-lens goggles to prevent fogging and frost formation around the pilot's eyes through the air leaks. It may be recalled that this happened to Major Schroeder in 1920 in one of history's most remarkable flights, when a world's altitude record of 33,113 feet was achieved.

Another headache for the high flyer is aeroembolism, an ailment somewhat similar to the "bends" sea-divers experience after rising to the surface of the water too quickly. This is caused, not by oxygen or lack of it, but by nitrogen. At altitudes above 30,000 feet man's blood, organs and tissues give off their nitrogen in the form of bubbles. This trouble is more apt to affect pilots of fighter or interceptor planes because of the very rapid rate of climb of this type of ship.

In consultation with the Mayo Clinic, an interesting experiment was performed last spring. Milo Burcham, Lockheed test pilot, during the altitude tests of the twin-engined P-38 interceptor, "air conditioned" himself before stepping into the plane. Donning an oxygen mask he rapidly pedaled a gymnasium-type bicycle for half an hour. This worked off enough of the nitrogen bubbles, but he had to complete his high altitude test flight in the P-38 breathing pure oxygen, but no air, which contains nitrogen. The proof of the pudding—no aeroembolism.

This, of course, is only a partial solution to the problem, as such procedure would not be possible in the case of high flying defense operations, owing to lack of time. The case for pressurized cabins was stated by Dr. Carl Schmidt, of the University of Pennsylvania, at a recent meeting of the Institute of the Aeronautical Sciences. He warned that as regards speed, rate of climb and ceiling, the performance of military aircraft already available to the contending air armies is more than their human occupants can fully utilize unless special measures are taken to compensate for some of the physiological strains.

Dr. Schmidt said that "the closest approach now available to a solution of these problems is the closed-cabin airplane in which the air or oxygen is compressed sufficiently to prevent any oxygen-lack, and aviators' "bends", and also heated sufficiently to minimize the deleterious effects of cold. . . .But blackouts, due to centrifugal force, which is brought to play whenever the direction of a rapidly moving plane is suddenly changed, remain an unsolved problem."

D. W. Tomlinson, Vice President in charge of Engineering, of Transcontinental and Western Air, Inc., is more familiar with high altitude flying than any other man in the world. He anticipates that before the end of World War II stratobombers capable of 24 hours' continuous flight may be showering enemy territory with bombs from altitudes seven or eight miles above the earth. He says "Up is as high as we can make it. The sky has no limit."

For a couple of decades after World War I not much was done in the way of substratosphere flight from a military point of view. In November 1931, the Ninety-fourth Pursuit Squadron, Army Air Corps, made aviation history with a cross-country flight at an altitude of 20,000 feet from Selfridge Field, Michigan, to Bolling Field, Washington, D. C. in which all pilots used liquid oxygen. This was a forerunner of the modern high altitude combat flying which today is playing such a vital role in the fate of nations.

XC-35 A Pioneer

The first use of pressurized cabins for experimental flight above 30,000 feet came a few years later with the specially fitted Army Air Corps Lockheed XC-35 transport. It was in this plane that Mr. Tomlinson did much of his pioneer work "upstairs," in preparation for the Boeing Stratoliner--a commercial adaptation of the Air Corps B-17 Flying Fortress--with pressurized cabins for transcontinental passenger flights at 20,000 feet, atmospheric pressure being main-

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Cold Chamber Testing

Performance at New Heights

BEHIND the story of sensational performance at high altitude is a long process of low temperature testing in which materials and working parts of the airplane are scientifically punished in cold chambers before they are used in a warplane designed to operate in the murderous cold and low pressures of the stratosphere.

Present progress in the conquest of the bleak upper regions would be fatally retarded if the Army Air Forces did not have cold chambers with very special types of refrigeration at Wright Field, Dayton, Ohio, but depended solely upon high altitude flight testing.

Air Corps turbo-superchargers, engines, fuel systems, instruments, guns, oxygen masks and regulators, cameras and hydraulic systems function at greater altitude today than is relished by enemy air forces.

The cold chamber, as a contributing factor, was first enlisted in Air Corps research and development at McCook Field in 1922; 20 are in use at Wright Field today.

Temperature Changes Cause Trouble

Airplanes of the Army Air Forces are engineered for the temperature extremes which will be encountered in operations from either tropical or arctic bases. The stratosphere, where temperature stabilizes at a median -67° C., and where the next mission may lead, is not many minutes' flight above any airdrome, wherever located.

Radical changes in temperature can produce malfunctioning. Two of the most common changes caused by cold are lubrication troubles and unequal contractions of dissimilar materials. Gyro instrument oil, for instance, turns to cup grease at -50° C. Tolerances of working parts are often wrecked by the contraction-expansion difference in materials. Some plastics and synthetic rubbers turn brittle. Paints and platings may crack and peel off.

The cold chambers in which these troublesome failures are isolated and remedied vary in design and capacity. For prolonged tests of large equipment, and when test engineers work inside, refrigeration of large chambers is obtained with carbon dioxide gas, ammonia or freon, a non-toxic gas. Smaller chambers, chilled by a fan blowing over a charge of dry-ice, have proved satisfactory for the quick testing of many small articles.

To secure basic data, the Materials Laboratory at Wright Field has for many years used a cold chamber with a capacity of 800 cubic feet which can maintain a temperature of -40° C. for three or four months without difficulty.

Air Corps engineers and those in industry are supplied with handbook data based on low temperature tests--for hardness, fatigue, impact, tension and torsion strengths--of the metals, alloys, plastics, rubber, lubricants and other materials used in the manufacturing of planes.

When asked how it feels to be exposed to -40° for four or five hours at a stretch, a veteran testing engineer said that no undue discomfort is felt, unless you have poor circulation--if your heavy boots, suit, helmet, gloves and face mask fit with the proper looseness; if you keep busy moving around; and if you don't take the heavy garments off after you come out until all feeling of cold has gone.

Functional cold testing of equipment, prior to the crucial high altitude flight testing, is conducted in cold chambers of the experimental laboratory in which the development project is assigned.

In the Power Plant Laboratory, a big refrigeration bunker supplies the chilled air for aircraft engines being tested under altitude conditions, and services a good-sized cold chamber which has been used through the years in such projects as: checking methods of de-icing carburetion systems; eliminating types of leakproof fuel tanks and hose which grew brittle in cold; comparative tests of oils and warm-up periods; priming techniques; development of engine starters, of remote fuel pump drives, accessory power plants; and other similar projects.

Equipment Lab Uses Chamber

The Equipment Laboratory is a heavy user of cold chambers due to the large number of projects distributed in its several units.

In the instrument and navigation unit alone

several are used to check the changes made to preserve accuracy in higher altitudes of instruments with delicate springs, diaphragms, gaskets and turbines. No less exacting are the low temperature tests of electrical systems and the equipment developed by that unit.

For physiological and chemical studies, the Aero Medical Research Unit has a new low-pressure, low-temperature chamber in which -55° C. can be maintained. Exclusive of the air-lock, it can comfortably accommodate six men. As an aid to the advancement of aviation medicine, this unique chamber is ideal for measuring physical reactions to exposure in cold and low pressure simultaneously, for observing physiological changes in flight personnel while using oxygen, and for studies of fatigue and aeroembolism; and the effect of altitude on the sick, wounded, and on chemicals and medicines during transport by plane have been investigated.

In the vital tests of oxygen supplies, masks and regulators in conjunction with development of new equipment, cold chambers are used to determine service life, freezing characteristics, the maximum allowable moisture content for oxygen, the efficiency of oxygen driers, and the operation of respiratory valves at low temperature.

Clothing Gets "Winterized"

All new types of heavy flying equipment are subjected to cold chamber tests by the Parachute Unit, including gloves, boots, suits, helmets, as well as sleeping bags and electrically heated suits.

(At Ladd Field, Alaska, winterizing programs take advantage in winter of an outside temperature that frequently drops to -55° F. New types of fuel-servicing trucks, tractors, snow plows, crawler-wheel trailers, and various large maintenance and salvaging articles are subjected to every kind of cold test.)

So that guns will function wherever the airplane goes, the Armament Laboratory attacks its low temperature problems of lubrication, of tolerances and prevention of condensation, in a cold chamber. Hydraulically operated units, and gun chargers, valves, breechblocks, bombsights and accessories need to function without freezing, jamming or failure.

To bring aerial photography to its present performance at high altitudes, cold chambers were used by the Photographic Laboratory to weed out some camera motors, shutters, film and lens which functioned well in intermediate altitudes but not in the stratosphere.

War Climbs High

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tained at about the 8,000 foot level.

After the Luftwaffe's failure to clear the R. A. F. from the skies by mass daylight bombing raids in August and September 1940 they began coming over in small groups at much higher levels. One airplane used in this way was an adaptation of the Messerschmitt Me-110 twin-engine convoy fighter as a light bomber with an effective ceiling of over 30,000 feet. The Spitfire Mark I and Hurricane Mark I fighters, which, with their higher speed and heavier fire-power, did such devastating work in the mid-altitude range of 12,000 to 20,000 feet, lost a great deal of their effectiveness at the 30,000 foot level. Later models increased the ceiling and the race for higher altitudes in the fighter class was in full swing.

The latest Messerschmitt single engine fighter, the Me-109F, is reported to have a ceiling of over 38,000 feet, with the Spitfire Mark V and Hurricane Mark III and the newer Typhoon (by the makers of the Hurricane) in the same general vicinity or higher. The Materiel Division at Wright Field has been attacking the problems of high altitude flying from many angles, and in the fighter plane class has a ship which should hold its own with the best of them—the Republic P-43 with turbo-supercharger, now in production and in operation by our Combat Command. A larger, much more powerful advanced version, the P-47B, is well along, and has been announced as going into large scale production within a few months.

Bombers "Up There" Too

In the bombardment field the Air Corps has pioneered with the long range 4-engine Boeing. This airplane has carried strategic bombing (three to four tons of bombs to objectives over 1,500 miles away) to the substratosphere levels above 35,000 feet. As the Fortress Mark I, the R. A. F. Bomber Command has been enthusiastic about its performance and is looking forward to the newer models, the B-17E's, now coming into production. The newest British heavy duty bombers, the 4-engine Short Stirling and Handley-Page Halifax, while in the same league as our B-17 as to range and bomb load, definitely do not have as high a ceiling, and this is also true of the German 4-engine Focke-Wulf Kurier.

Victory usually goes to the plane "on top" and American research and engineering skill may be counted on to "Keep 'em flying higher."

Physical Training

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schools had been giving no physical training whatever, and others substituted drill and uncontrolled mass calisthenics for a progressive individual program.

The conferences were extremely productive. The first accomplishment was a determination of objectives. This was done by making a study of the various specialized types of jobs the Army Air Forces are called upon to do. Men who are going to be pilots need a different type of physical training from those who are going to be ground technicians. To date there have been two general programs set up: one for flyers and one for technicians. As time goes on a more complete breakdown will probably be made.

Much of what is the present Air Corps physical training program was developed at the Southeast Training Center under the direction of Ernest B. Smith. Mr. Smith, former Professor of Physical Education at Auburn University, Alabama, was the first physical director to be employed by the Air Forces. He hired a staff, held conferences and formulated many of the ideas which now serve as a basis for the entire system.

Once the first complete program had been devised and put into operation in the Southeast Center, the other flying training centers soon followed suit. Many of the ideas advanced in these other training centers have proved to be improvements over the original program, and in many instances have been incorporated in it. Coordinating efforts between flying training centers have so far been very successful, and the best of what has been developed in each section is being welded into an increasingly more uniform program that is getting superb results.

Coordinated though it is, the program is not run from Washington. Each flying training center—Southeast, Gulf Coast, West Coast—as well as the Technical Training Command, is responsible for its own system. Directives and instructions are issued from training center headquarters, and instructors are hired there.

Heading the program at the Gulf Coast Training Center is H.L. Berridge, former physical education instructor at the University of Texas. The West Coast program is being run by Douglas Dashiell, director of physical education at the University of Nevada, and the Air Corps Technical Training Command chief instructor is J.B. Miller, Director of Physical Education and Athletics at the University of Tulsa.

At the present time the Air Corps has a field staff of approximately 350 physical instructors and directors. This staff is responsible for the physical conditioning of all Air Corps cadets in a daily program lasting at least one hour.

When the Air Forces expand, a much larger staff of physical instructors is envisioned. At this stage we will have accomplished a program that should have been established in the period immediately following the World War. The experiences of the last war plainly indicated the needs for a program such as we are now carrying on.

In concrete results the efforts made by the men who have developed the Air Corps physical training program as it exists today have been very encouraging. Since the program was put into effect the number of cadets eliminated from pilot training in test classes has been reduced nine per cent, the average height has been increased .227 inches, and the average weight has increased 4.8 pounds. It is impossible to determine whether these improvements are due entirely to the establishment of the physical training program, but it is safe to assume that the program is at least partly responsible.

For many years our enemies in this war have recognized the value of physical training in preparation for aerial combat. Set against this in the present conflict is the fact that, primarily, our manpower is at least physically equal if not superior to that of our enemies.

Our task then is to press, in a comparatively short time, a program of air crew and ground crew physical training that will increase the importance of this factor, thus constituting a mighty contribution to our war effort. We have made a good beginning. And, judging from the results obtained so far, the program, in the end, will have more than justified its undertaking.

To meet an increasing demand for meteorologists in the Army Air Forces, training in that subject is being offered to a limited number of young men, not below 20 nor more than 26 years of age, who are in their senior year at a recognized college and who have satisfactorily completed thorough courses in higher mathematics. Universities designated as training centers for accepted students are the Massachusetts Institute of Technology, Cambridge, Mass.; California Institute of Technology, Cambridge, Mass.; New York University; Chicago University and University of California, Los Angeles.

HERE ARE THE GEORGES

Col. Harold Lee George

Brig. Gen. Harold H. George

Brig. Gen. Harold H. George, former commanding general of the Philippines Air Force, and Col. Harold L. George, Chief of the Air War Plans Division, Air Staff, are often confused. Such was the case in the *News Letter* when General George was inadvertently described as a heavy bombardment specialist.

General George is a veteran pursuit pilot, having won the Distinguished Service Cross in World War I for attacking a formation of four German Fokkers, destroying two and driving the others back to their own territory. He was recently promoted to brigadier general for "gallantry in action" with General MacArthur's forces in the Philippines. Colonel George is a veteran of heavy bombardment, having commanded the famous Second Bombardment Group at Langley Field and participated in the B-17 flights to South America. He was awarded the Distinguished Flying Cross for his work in these pioneer long distance flights with four-engined equipment.

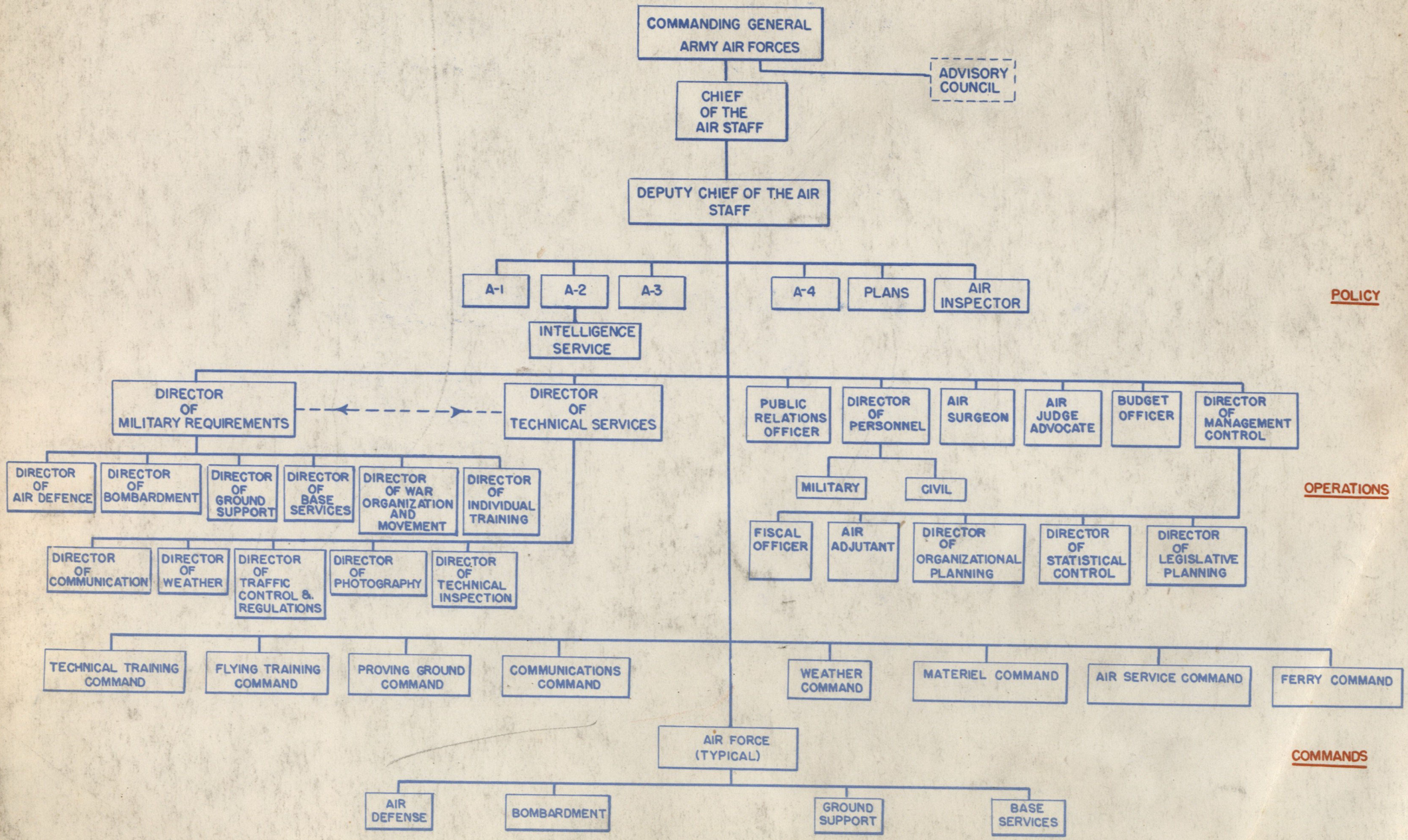
The Georges are not related although they were born within a year of each other. General George is a native of Lockport, N.Y. Colonel George was born in Somerville, Mass. General George took flight training with the Air Corps in 1917 after four years service in the Infantry. Colonel George came to the Air Corps in the same year after brief service in the Cavalry. Both served overseas during the World War, General George with the 185th and 139th Aero squadrons and Colonel George with the 163rd Day Bombardment Group. Both are graduates of the Command and General Staff school and have commanded tactical units of the old GHQ air force. General George commanded the 24th and 33rd Pursuit Squadrons, the 7th Observation Squadron and the 8th and 31st Pursuit Groups.

In addition to the Second Bombardment Group, Colonel George has commanded the 72nd and 96th Bombardment Squadrons and served as a bombardment and tactics instructor at the Air Corps Tactical School.

When Gen. Douglas MacArthur left the Philippines early in March, Gen. H.H. George was one of the staff officers who accompanied him to his new post of Allied Commander in Australia.

ORGANIZATION OF THE ARMY AIR FORCES

UNDER THE REORGANIZATION OF THE U.S. ARMY ORDERED BY THE PRESIDENT



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