AIR TRAILS

Pictorial

A STREET & SMITH PUBLICATION

NOVEMBER
1942

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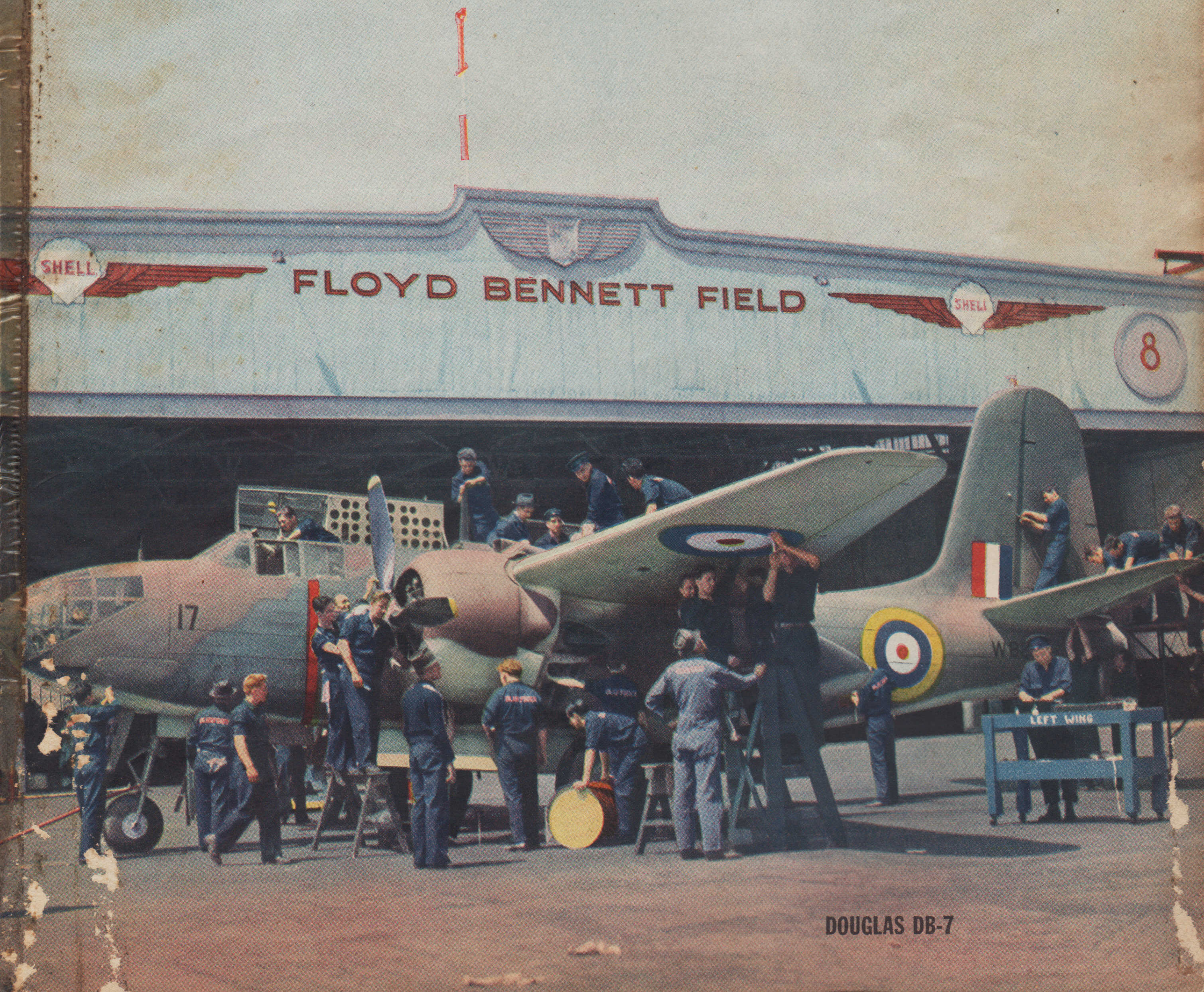

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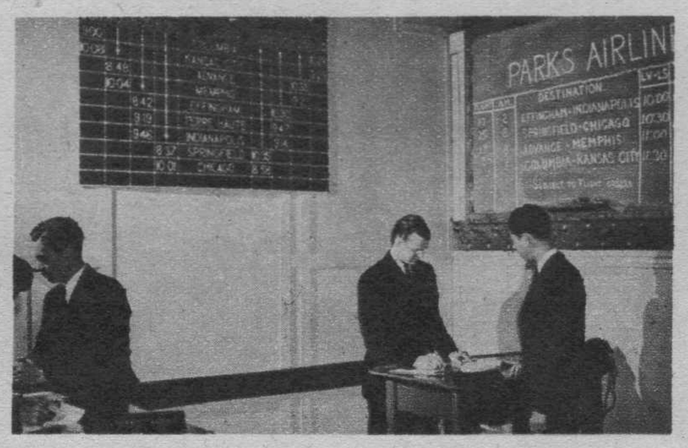

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POLLY SMITH PHOTOGRAPH

Aviation is the career which young men can follow with confidence. It is the lighthouse of the future . . . the beacon which will guide the world safely toward security after the war.

AIR TRAILS *Pictorial*

A STREET & SMITH PUBLICATION

NOVEMBER, 1942 VOLUME XIX NO. 2

20 CENTS PER COPY $2.00 PER YEAR

CONTENTS

FULL-COLOR COVER PHOTO OF DOUGLAS DB-7 BY RUDY ARNOLD

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Printed in U. S. A.

Trained MINDS AND HANDS

MUST LAUNCH 185,000 WARPLANES

The aviation industry is mustering every facility of the world's greatest industrial civilization to fulfill President Roosevelt's far-sighted demand for 185,000 fighting planes. Because the demand exceeds the supply of skilled aircraftsmen, many inadequately trained men are finding single-phase jobs through cheap "quickie" courses. BUT—the vital supervisory positions can only be held by men with the thorough long range training to reach any objective to which they may be assigned . . . the men who have chosen aviation as a career—not an expedient. They are the only men of this huge production army who are indispensable to America's war effort and who will continue to be indispensable when the aircraft industry steps down from war to peace schedules.

The executives who have made aviation THEIR career know the value of each man is governed by two factors: his intelligent sincerity in selecting aviation as his life work, and THE ABILITY AND EXPERIENCE OF THOSE WHO TRAIN HIM FOR THAT CAREER. They know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fill the industry's exacting requirements.

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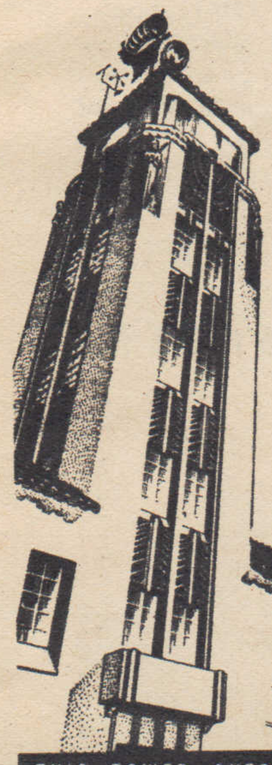
Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training, which pointedly indicates the high standing Curtiss-Wright Tec has attained in the aircraft industry since its establishment in 1929.

It is imperative that before you invest in a course of career training you determine what the returns will be on your investment . . . for your choice of a school in which to take your training will determine how much money you will make all the rest of your life.

Curtiss-Wright Tec's career training is carefully designed to do just one thing:—TO MAKE MONEY FOR YOU, so upon graduation you can be independent and self-supporting for life. Our thousands of successful graduates have proven that Curtiss-Wright Tec training gets results and always pays, since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

This school has never guaranteed positions for its graduates, but practically every graduate has obtained immediate employment and is advancing rapidly. The demand for our graduates far exceeds the supply, and we honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation.

WARNING!—"Don't miss the boat." The greatest opportunity in your lifetime exists today! There never was such an opportunity in aviation for you; there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. DON'T FOLLOW—LEAD! Send in your enrollment before you "miss the boat."



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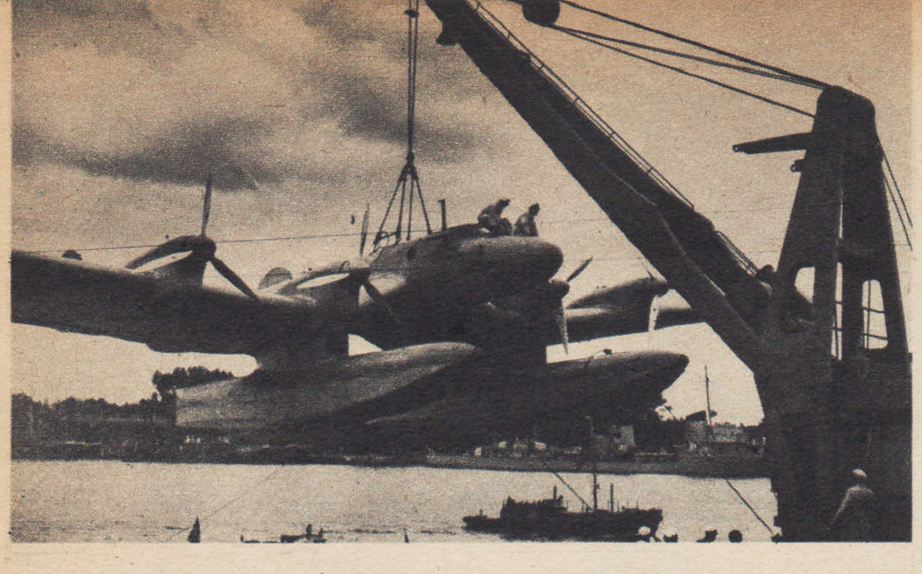
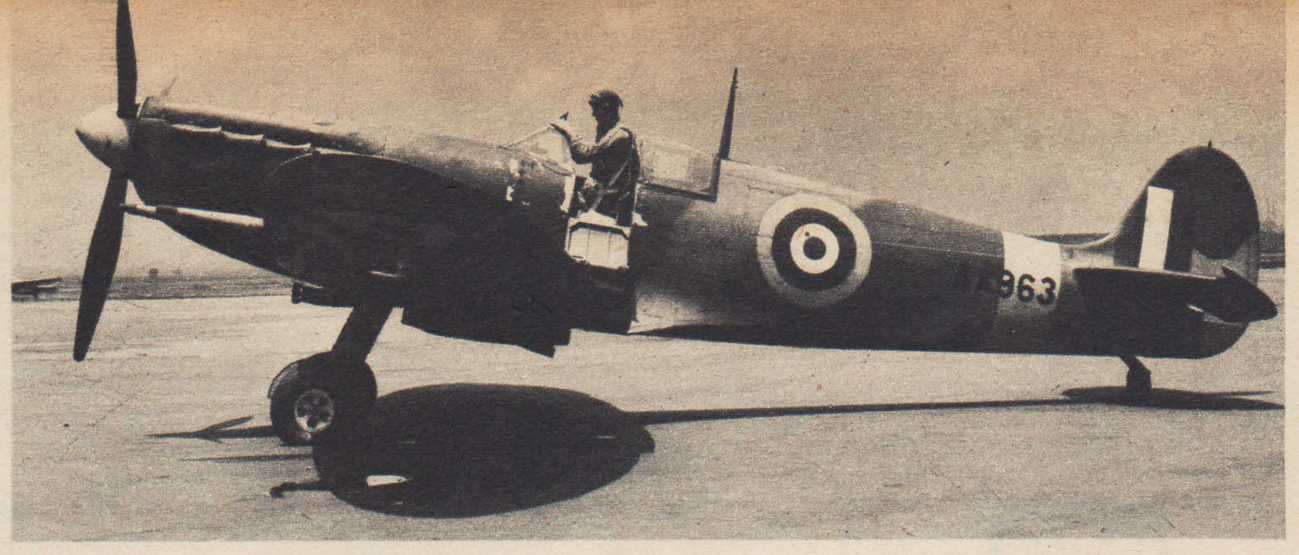
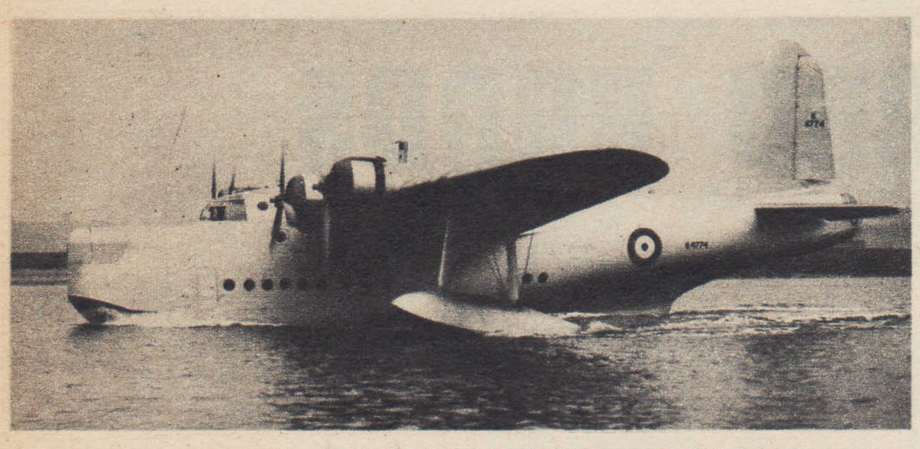


Blohm and Voss, who made the Nordmeer and Nordwind, are big shipbuilders in Hamburg. Besides aircraft, they build submarines.



Even the trim Spitfire is manufactured by a firm which originally made boats. Supermarine, Southampton, shipbuilders, turned to large flying boats, eventually built Supermarine racers.



Short contracted with a shipbuilder in Belfast to build Sunderlands. Many workers at Short, Rochester, came from shipbuilding families.

Shipbuilders *Can* Make Planes

Is a shipbuilder like Mr. Kaiser qualified to tackle airplanes? Take a look at the record in Europe—and be surprised.

CAN Henry J. Kaiser, the West coast shipbuilder, carry through his project of building huge cargo flying ships? Mr. Kaiser says yes, while his many opponents say no. One of the reasons advanced by those opponents has to do with Mr. Kaiser's lack of knowledge and experience in this field. Testifying before the Senate Military Affairs Committee, a certain aviation official who opposed Mr. Kaiser's scheme backed up his opposition by saying with the confidence of one who knows, "There's a hell of a difference between building ships and flying boats." In the lounge of one of Washington's big hotels recently I heard a man proclaim in a loud voice: "I tell you it can't be done! How can a shipbuilder expect to build airplanes? It's just plain hooey."

Is it? Mr. Kaiser doesn't think so. He says that the average shipyard is seventy-five percent ready to produce sky freighters. He believes his experience in shipbuilding is an asset.

Let us take a look at aeronautics in Europe and see if shipbuilders have ever built airplanes, and if so, with what success. *(Turn to page 69)*

1933 Short boat, six engines, 120-foot span, weighed 70,000 pounds. It was built on ways, launched like ship, as were Empire boats—the civil version of the Sunderland.

BY A SPECIAL CORRESPONDENT

The Instructor Fights on *EVERY* front

WHAT red blooded American wouldn't like to be twins when it comes to fighting the Axis? Well, sir, there's one fellow in this fracas who's more than twins. He's the Primary Flight Instructor who multiplies his military effectiveness by the number of aviation cadets he can train. *Through them he fights on every front.*

One of the war's most vital jobs is to properly train combat flight personnel. Pilots can be made or broken in the first 60 hours of training. And the responsibility is largely the Flight Instructor's. Above all, he must inspire confidence.

The confidence inspired by the instructor may well spring from his faith in the organization that employs him. Ryan employees are justified in that faith.

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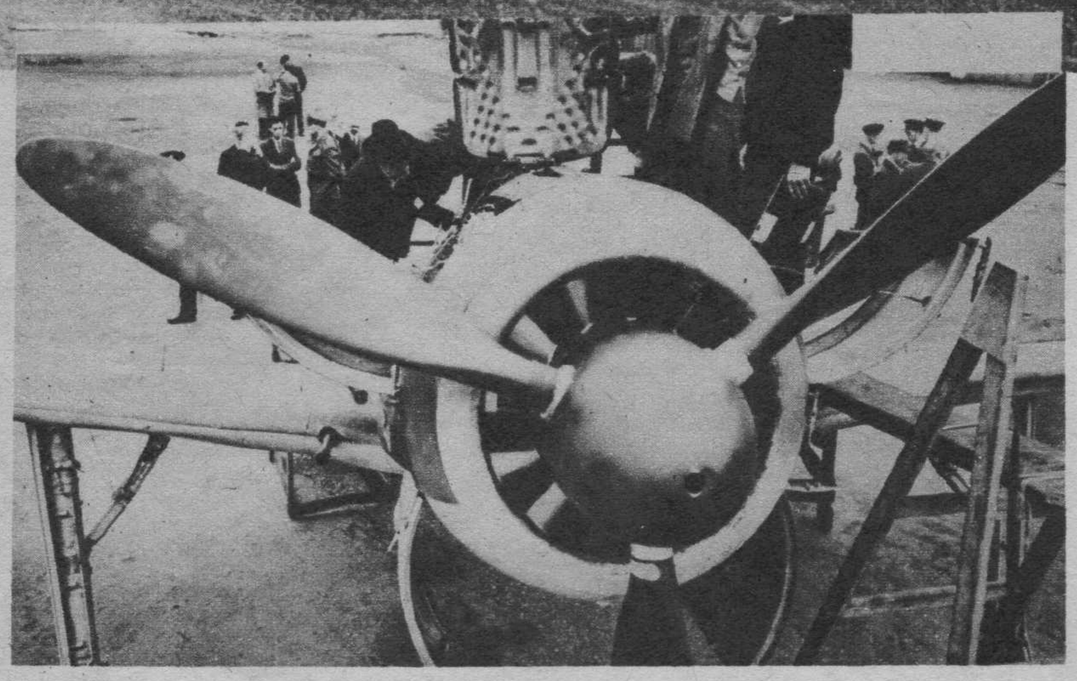
DEDICATED FOR THE DURATION TO THE EXCLUSIVE TRAINING OF ARMY PILOTS

Why The Focke-Wulf 190?

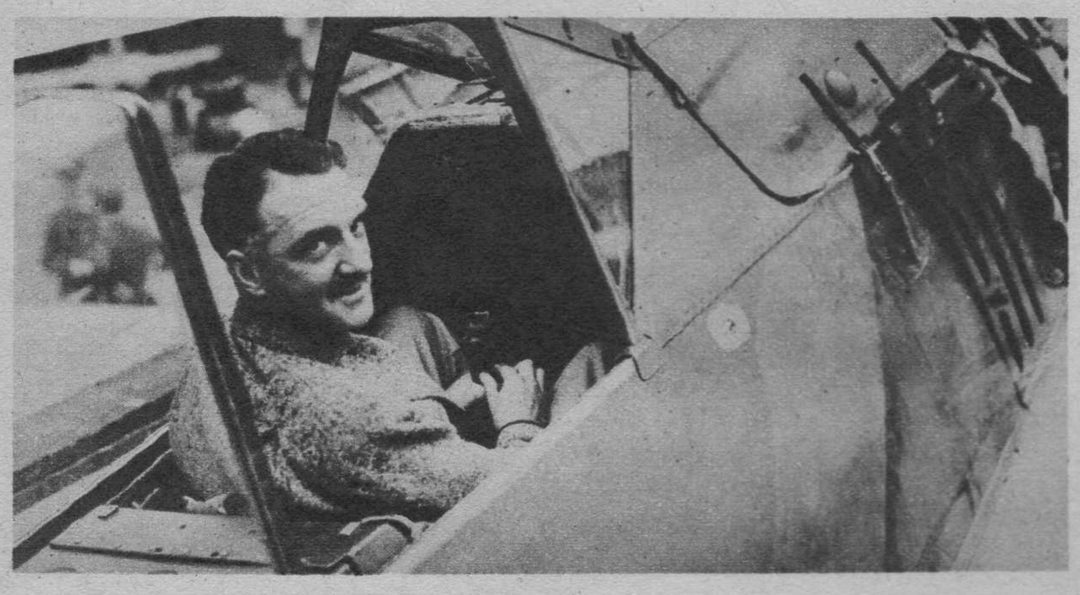
BY DAVID C. COOKE

Bearing a striking resemblance to a Vanguard, the 190 does 387 m. p. h. at 18,000.

Since the Nazis swear by liquid-cooled engines, the radial-powered 190 is a riddle with many interesting possible solutions.



Small, smooth cowl design is secret of the 190's good turn of speed. Fan, behind propeller, helps keep engine cool at idling speeds when on the ground.



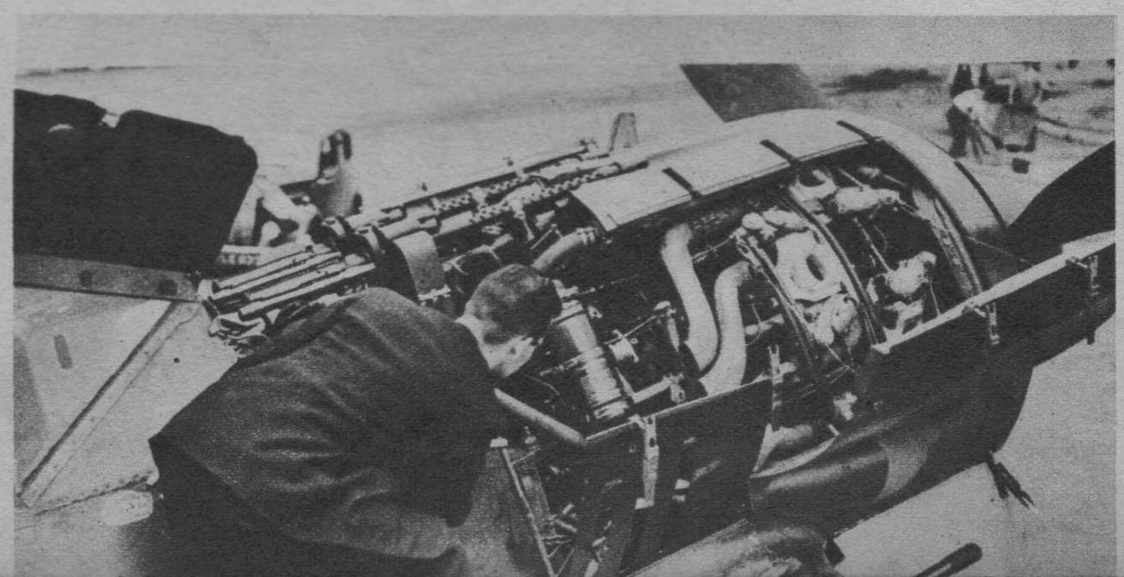
A British expert sits in the cockpit of the captured 190, forced down in a fight over England. Air cooling will help in the bitter Russian winter. Below—Pilots, engineers and official with bag having a look-see. Note RAF cockade.

EVEN though some details of the German single-seat Focke-Wulf Fw. 190 fighter were known to the Allied world as early as October of 1941, it came as somewhat of an unexpected shock to aviation experts in general when the plane was at last reported in action on various fronts with what the Germans called "brilliant successes." It came as a shock because of the air-cooled radial engine used for power, for in Germany's entire modern air-combat history, none of her single-seat fighting machines have been fitted with anything except liquid-cooled in-line engines.

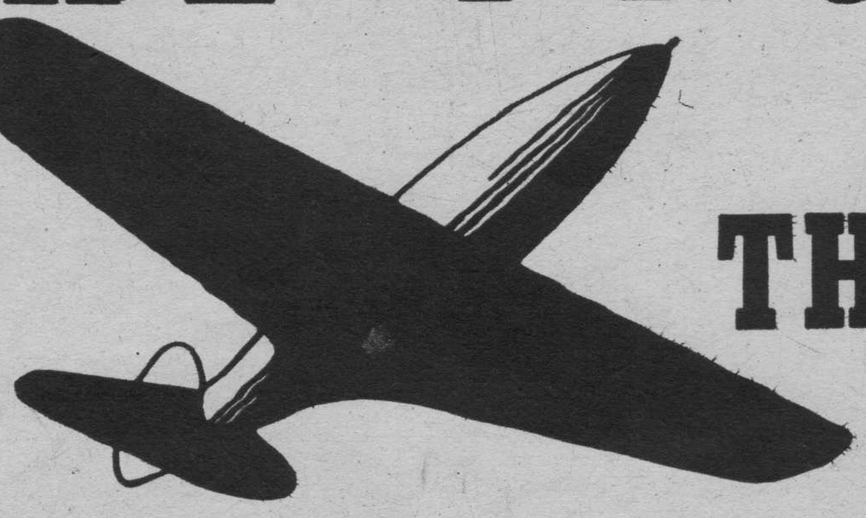
But regardless of this complete about-face of policy, especially pronounced because the Nazis have long been ardent advocates of liquid-cooled in-line engines, the air-cooled change-over was clearly indicated as being necessary from last winter's performances in the arctic cold of Russia. Too, the development of this power plant points to only one thing: that the Germans have no optimistic views of clearing up the Russian threat this fall, that they expect to entrench themselves for at least one more winter.

During the second phase of the Battle of Russia, when the defenders were on the offensive and the aggressors were digging in, German fighters were literally tied to the ground because of power-plant difficulties. That was why the Reds were able to report such sweeping successes in the northern districts; the majority of the *(Turn to page 58)*

Compact two-row 1,580 h. p. B. M. W. may be made by Gnome-Rhone in France. Has a total of six guns; two in fuselage and two in wing root are synchronized.



THE PROOF OF THE PUDDING!



Every day we receive requests from the Aviation Industry for men we have trained to do specific jobs.

This *proves* that the instruction provided at ROOSEVELT AVIATION SCHOOL meets all the requirements of the Industry.

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A. T. NOV., 1942

AN ANNOUNCEMENT FROM THE ARMY AIR FORCES TO MECHANICS AND RADIO MEN

FOR the first time since war began, experienced mechanics and radio men, 18 to 45, are being hand picked for enlistment in the Army Air Forces.

These men must be experienced in the use of hand tools — must be able to go right to work maintaining and repairing airplanes, engines, instruments, machine guns, radio equipment. They must be skilled mechanics, whatever their civilian trades, so that they can quickly get the "feel" of the job. They must be capable of becoming non-commissioned officer specialists.

If you have experience or training in any of these fields *you can now enlist directly in the Air Forces.* Here you'll have a chance to work with the finest equipment, on the newest and fastest planes, preparing yourself for a career in the limitless future of aviation. You'll get the world's best training — at good pay. And you'll be in line for rapid promotion. A man who rises to Master Sergeant in his first enlistment receives $138 a month, with board, housing, uniforms, medical care free, plus additional allowances if married.

This is your chance to serve your country where you're needed most. Sooner or later you'll say, "It's up to me." Why not NOW?

The nearest Army Recruiting and Induction Station will gladly give you full details, without obligation.

IMPORTANT: *To avoid interference with production, every enlistment must be cleared through local Selective Service Boards. Men in technical or key positions in War Production for the Army and Navy will not be cleared.*

U. S. ARMY

RECRUITING AND INDUCTION SERVICE

"KEEP'EM FLYING!"

Visit or write the nearest U. S. Army Recruiting Station or write to: "The Commanding General," of the Service Command nearest you:

First Service Command	Boston, Mass.
Second Service Command	Governors Island, N.Y.
Third Service Command	Baltimore, Md.
Fourth Service Command	Atlanta, Ga.
Fifth Service Command	Ft. Hayes, Columbus, O.
Sixth Service Command	Chicago, Ill.
Seventh Service Command	Omaha, Nebr.
Eighth Service Command	Fort Sam Houston, Tex.
Ninth Service Command	Fort Douglas, Utah

Or write to:

Enlisted Branch, Department W-1, A.G.O., Washington, D. C.

Slugger

Stamina to fight...to fight harder and longer...slugging out cannon shells, slamming out bullets. Power to fly...to fly higher and faster...screaming down out of the sun, slugging it out up where there's room to fight.

—That's what's in the 'planes America builds. They're sluggers with speed, cannon-carrying, armed to the wing tips.

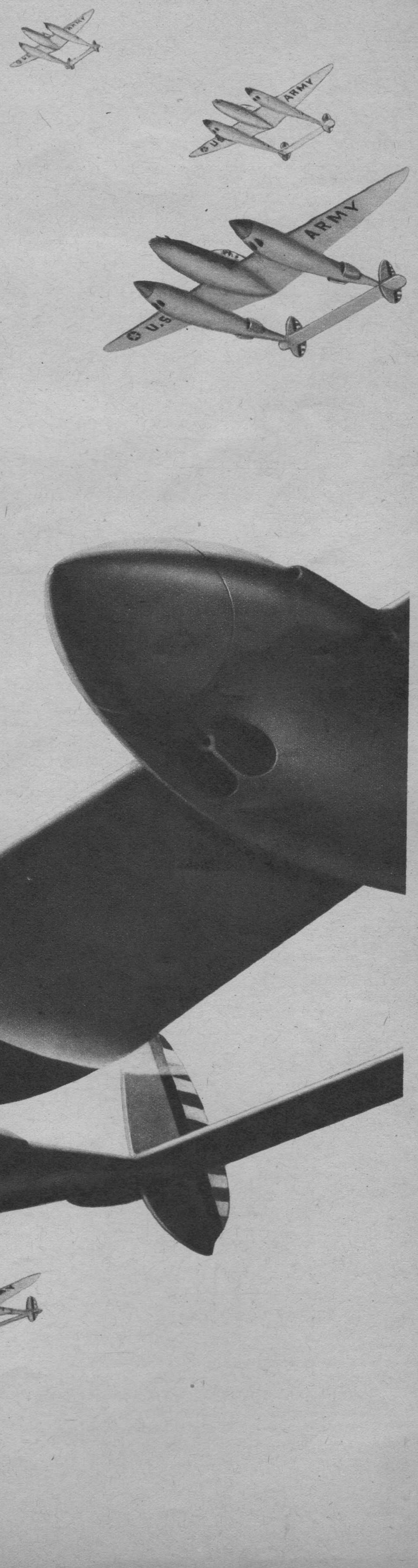
—That's what it takes to sweep the Axis from the skies: mighty fighter 'planes with a heavyweight's hitting power, the speed and shiftiness of a lightweight champ.

And Lockheed builds such a hard-hitting, cannon-carrying fighter...the P-38 Lightning interceptor pursuit. Planned for defense...to smash attackers...it now serves on the *offense* in the skies of America's fighting fronts. Lockheed Aircraft Corporation, Burbank, California.

for protection today, and progress tomorrow, look to

Lockheed

FOR LEADERSHIP



The Fighting

General de Gaulle's air arm is well-organized and far-flung. This inspiring account gives details of what it is doing, may do.

Cross of Lorraine, insigne of Fighting French, is centuries-old emblem of resistance to invaders. In Crusades, white stood for France, red for England. De Gaulle's tanks, from Lorraine, bore cross before the fall of France.

BY LUCIEN ZACHAROFF

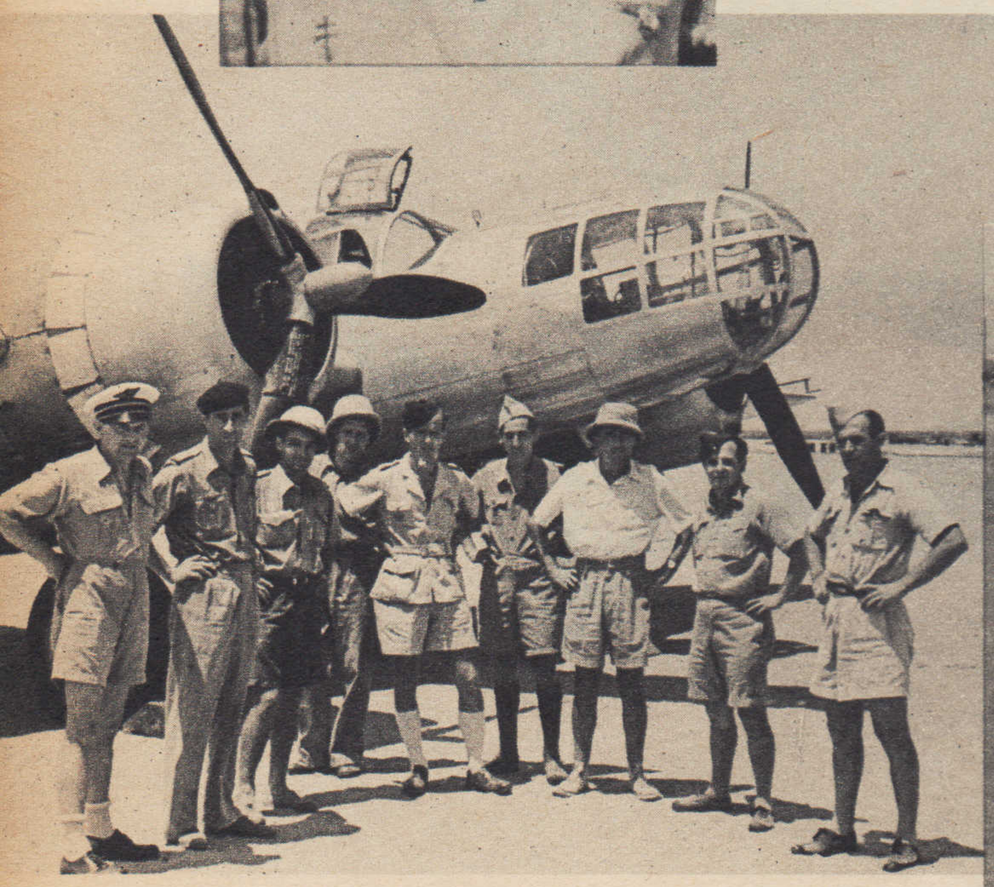
Chief of the Free French air fighters—Brigadier General Martial Valin.

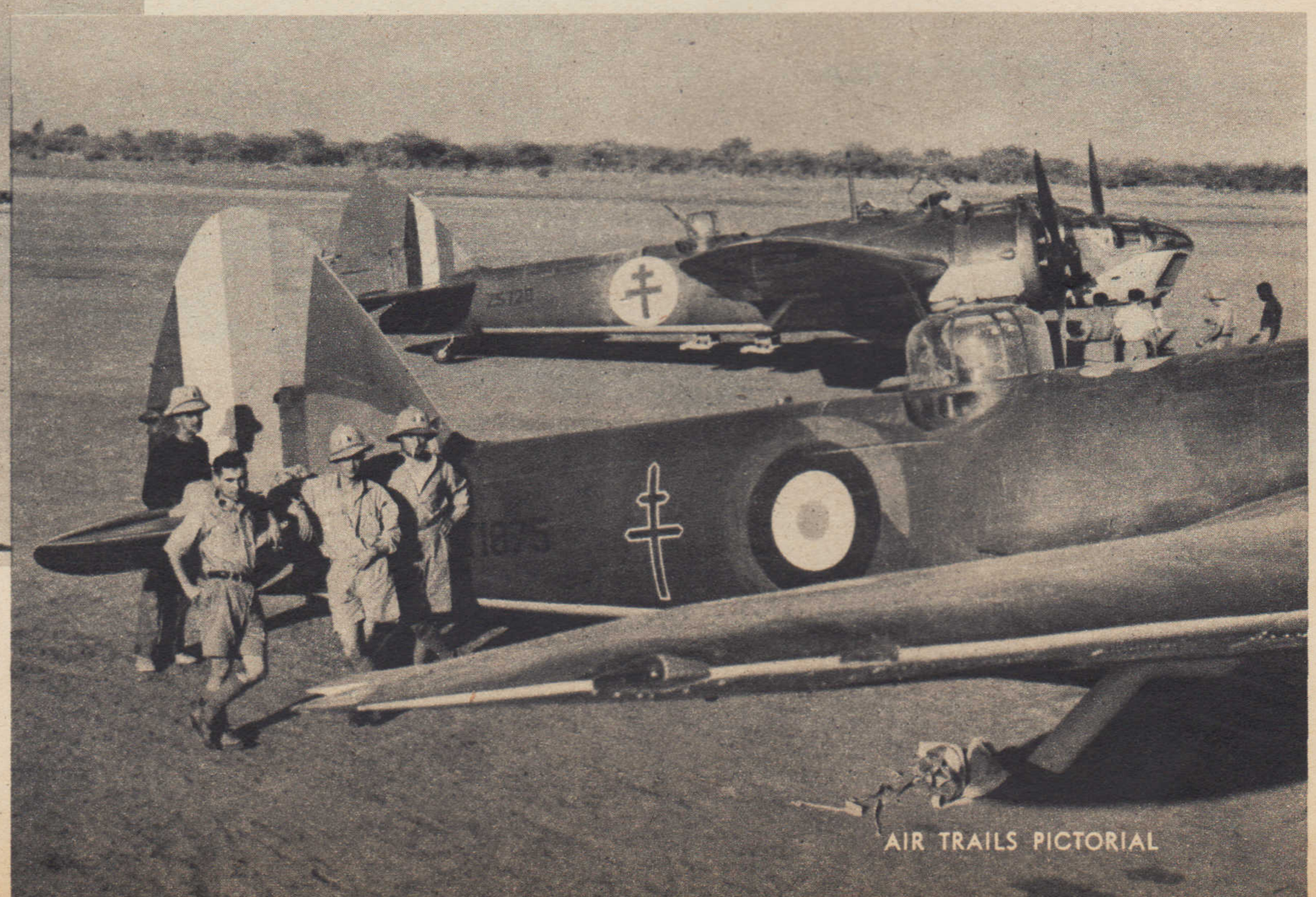
QUITE recently, a French noncommissioned officer who was working in Paris managed with one of his friends to climb into a twin-engined transport plane built for the Germans. It was no easy task to escape, as he had never flown a twin-engined machine. Before taking off, he bounced heavily. Had he failed, he would have been arrested and shot. Soon he arrived at the English coast. Knowing that his plane bore German identification markings, he did not want to run the risk of being brought down by the antiaircraft guns or by the British fighters. He therefore looked for a fairly hospitable stretch of beach and landed. I cannot say where, but I can reveal that the aircraft stopped only twenty yards from a mine field."

This story has been told by General Martial Valin, who commands the fightingest of the Fighting French, their air force. A forceful radio speaker and writer on aviation subjects, he never gets tired of recounting the hairbreadth escapes and combat achievements of his bright young men.

Bright they must be to a superlative degree, for only the utmost ingenuity and an all-conquering will to continue the struggle after the collapse of France enabled them to reassemble outside their invaded and betrayed country. Recall the first French airman to be decorated by the English, with the British Empire Medal: Corporal M. H. du Fretay, aged twenty, who escaped from occupied France in a plane he had secretly built himself in a barn!

Since the Franco-German armistice, the Fighting French air force has fought on the home front in England, over Europe, in North Africa, Equatorial Africa, and East Africa. General Valin's contingents are still equally vigorous in the battle of the Atlantic and over the western





Proving that there are Frenchmen in France who will die for her are these escaped French bombardiers in the desert with a Martin fighter-bomber, probably flown out of France. Over 2,000 escaped zealots are under Valin. Right—At least two Blenheim squadrons went to Africa.

French Air Force

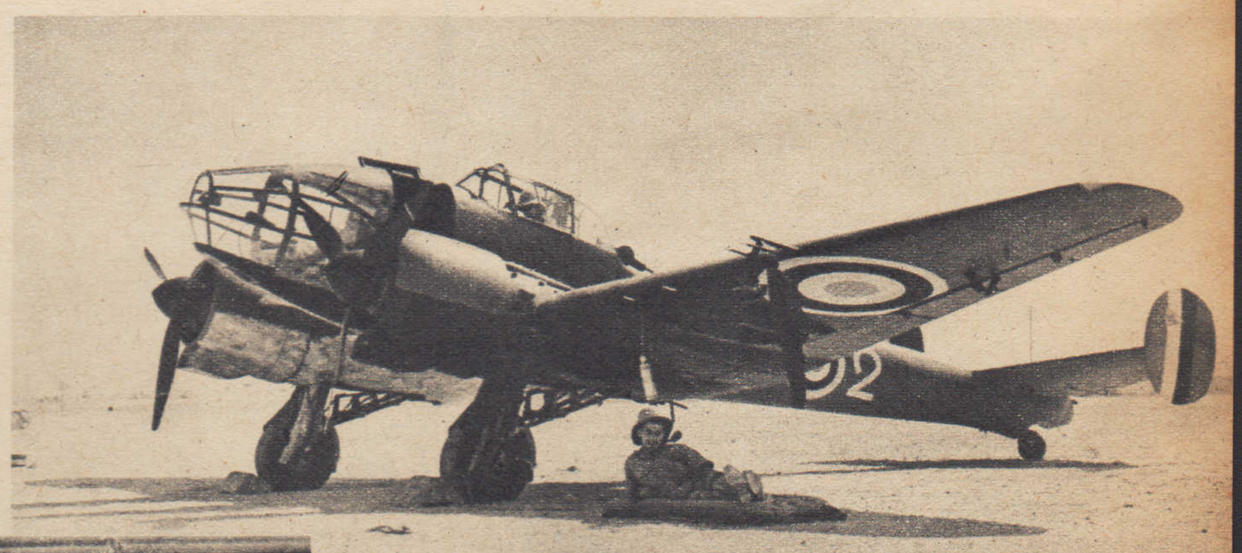
desert. There also exists a Fighting French parachute corps. And on May 27, 1942, a decree issued by General de Gaulle's government in London and signed by Admiral Auboyreau established the Fighting French naval air arm. This is in charge of the commander of naval aviation, who is directly under the chief of the Fighting French naval forces.

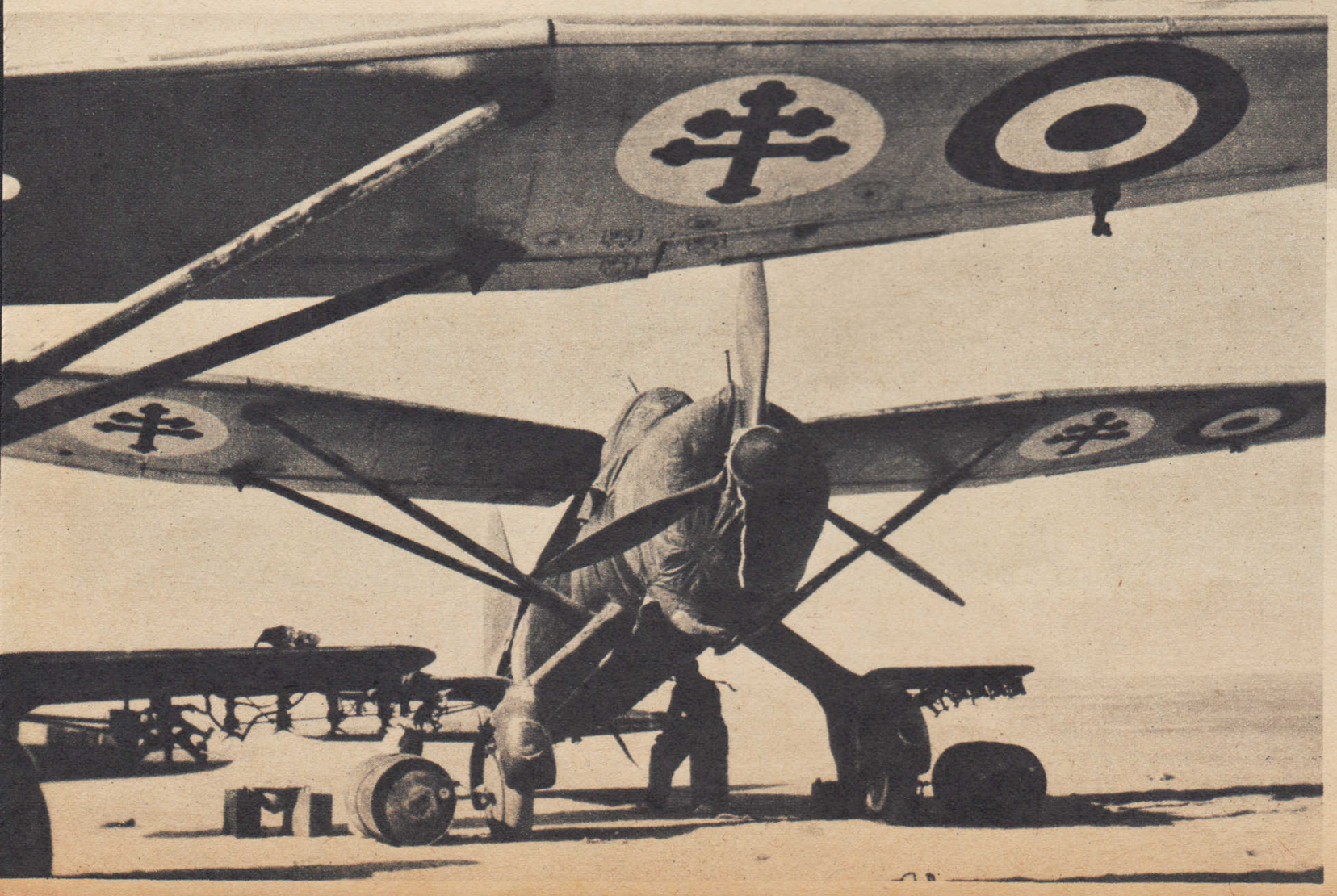
The better to see and appreciate the path that led to the creation and current most effective operations of General Valin's squadrons, we must briefly survey some of the tragic events that immediately preceded them. A combination of political, industrial and strategic blunders brought about the disintegration of the French air force when the Nazis invaded. A catastrophic economic policy of the French governments between 1920 and 1939 resulted in inadequate industrial capacity and output of aircraft when the crisis arose. Both the politicians and military bigwigs had underestimated the role of aviation in modern warfare. They prepared for a war of position or trench warfare of the 1914-1918 vintage and not for blitzkrieg. Parisian strategists were hesitant and unimaginative, while their adversaries in Berlin were bold and unhampered by outworn war doctrines. Handicapped by scarcity of aircraft to begin with, the French general staff never used more than sixty percent of the available machines. The paucity of planes and tanks, and particularly a failure to utilize them in co-ordination, played its fatal part. It was matched by the demoralization that had set in in French political circles.

But history will record that the courage and gallantry of French airmen was beyond reproach throughout that period of trial. Underequipped, outnumbered, treacherously directed, they achieved wonders in the air. Man for man, or even when outnumbered two to one, the French fliers again and again emerged victorious from severe engagements.

Actually, their morale and training had surpassed those of the German crews. Their materiel was not so bad, either. At the outbreak of the war they flew two excellent types of pursuit and *(Turn to page 44)*

A Frenchman, somewhere in England, and his Hurricane. Former Armee de l'Air pilots now fly Hurricane and Spitfire fighters on Channel sweeps.



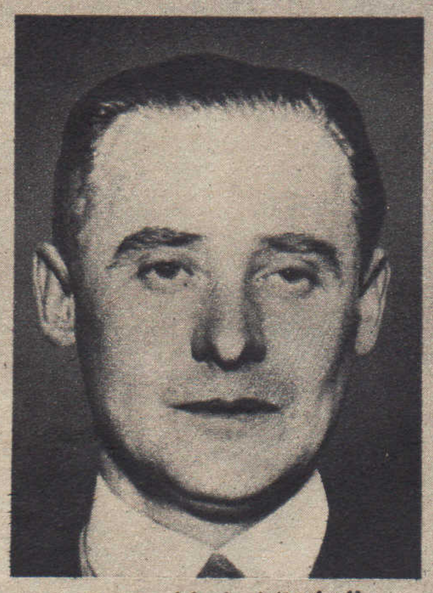


French crews flying French planes, like this Potez 63, joined fleet bombardment of Bardia, Fort Capuzzo. Using four French, one Italian ship, they've vital African air line.

Lysanders at Brazzaville in the heart of Africa. Fighting French, without manufacturing facilities, use everything from Spitfires to captured German airplanes. Note insigne.

BY KEITH AYLING

The Man Who Saved Britain



Reginald J. Mitchell

Creator of the Spitfire—which he never saw in action—Mitchell was one of the world's greatest designers. This is his extraordinary story.

AN airplane designer who was tops at his job from the day he first entered the industry, who was never too "successful" to learn from other people, who had the golden quality of listening attentively to others, however small or relatively unimportant their status in aviation, has left his mark indelibly on the scroll of military aviation.

Such was Reginald Mitchell, C. B. E., designer of the Spitfire.

I can see Reggie Mitchell now, broad shoulders, of medium height, sandy, going bald on top, a young man with the steady gray-blue eyes of a dreamer or perhaps a sea captain, and the almost boyish zest of an enthusiast showing always in his walk, his smile and his conversation. He was a man's man, but only to men who flew or who helped others to fly. Men without winged minds were not for him, unless they were the simple English country folk among whom he lived.

Although he designed them, airplanes always seemed wonderful things to Mitchell. He loved them as a sportsman loves horses. He appraised them, measured them with his engineering mind's eye, and he read the story of their speed and performance from their lines. He could estimate a plane's worth by merely looking at it.

One is ashamed, sometimes, to have met a genius and to have been unaware of his greatness. I feel that way about Reginald Mitchell—Reg to his friends—one of the men to whom England, America, Russia and the rest of the United Nations owe a great debt. I remembered this particularly when the news came over from England that boys of the U. S. army air forces had taken part in an RAF fighter sweep in the latest model Spitfires, fitted with a new Rolls-Royce motor, and such a formidable armament that they have proven the master of the Focke-Wulf 190s, Germany's latest air-cooled fighter. What a tribute to a designer! After four years of war, four hectic years during which the best aëronautical brains of the world have been trying to design a faster and more deadly fighter, a ship he put on paper nearly eight years ago is still king of the skies at any height.

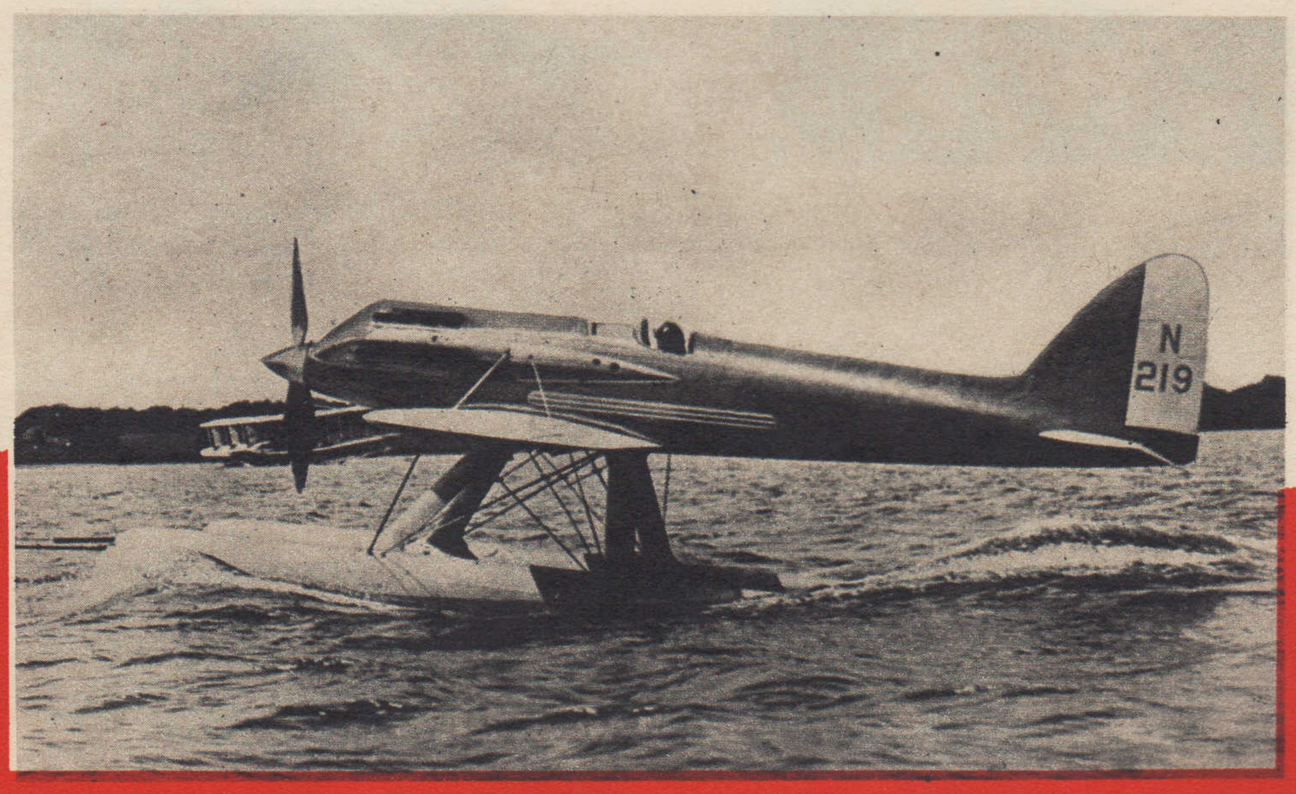
Reg Mitchell was certainly the shyest man in the aviation business. He avoided being photographed and did not like publicity. Usually his name never got on the captions of press photographs. Few people who knew him realized he was a sick man. He never mentioned his illness, he worked harder than most people and never revealed he was suffering. In him there was burning perpetually the flame of enthusiasm that forges the determination of those who have a task in life. The only outward and visible sign of his inward determination was his nose—the nose of a man who does things. Few people knew then that Mitchell was in a hurry, in a hurry to design, in a hurry to do things for aviation. He alone may have known he was dying. He had been warned by the doctors to rest up and to take things easy, but he continued to burn the midnight oil and throw all his energy into his beautiful streamlined planes which, when they were first put on paper, were so revolutionary that aviation folk were shocked, and a little angry at a man who expected aircraft construction to produce the impossible. Mitchell knew that it *was* possible. He worked on. There came a time when the doctors ordered him away for a complete rest, and for what might have been a cure. We have it on very good authority that he refused, on the score that he had a job to do. That job was perfecting the design of the Spitfire that now roars in triumphant might through the embattled skies of the world. If he had taken that holiday the history of Europe might have been different, because none can deny that, with the Hurricanes in support, the Spitfires bore the brunt of the German air assault during the Battle of Britain.

Reggie Mitchell's life story is a paradox; the story of a small-town boy who became a designer of big things, of massive behemoths in steel, of huge flying boats, of a man who did not fly, of a man who produced the fastest and neatest plane in the world. Mitchell died the death of an industrial hero before the first RAF pilot climbed into the cockpit of the machine into which he had put all his enthusiasm, engineering experience, and aëronautical skill. He was primarily an engineer. His ships were always designed from the viewpoint of the engineer. He delivered his drawings to the workshops only when the machine was a complete flying unit, without need of modifications or stress augmentations. Every machine he designed and built was what the Supermarine factory hands proudly termed "an engineering job."

Mitchell was born the son of a schoolmaster turned printer in Longton, Staffordshire. Longton was one of the five towns made famous by Arnold Bennet in his famous novels. Reggie attended public school, played with the other kids in the block, went for long walks rather than belong to the football team, and read ceaselessly. One day the science teacher—and the teaching of science was limited in those days—discovered that one of his pupils was a genius in mathematics and general physics. He wrote to Mitchell's father regarding this, and the father wisely had the boy transferred to a better school where he had more opportunity to follow his bent. At sixteen young Mitchell was apprenticed to a firm of locomotive engineers. He worked his way through the shops that turned out the massive steel monsters that dragged the trains of Great Britain and India. At the outbreak of the first World War he found himself assistant engineer to the company. Two years later, in 1916, the British government appealed for engineers for the growing aircraft industry. Mitchell went south and settled down to work in the Supermarine Aircraft Co.'s sheds on the shores of the English Channel. His job was installing aircraft engines.

One day there landed on the company's airfield a tiny aircraft that was faster than anything that had ever been seen at the time. It was a Bristol monoplane. The story goes that because a high official of the Royal Flying Corps had boobed a landing in the machine during its trials, it had been pronounced hopelessly dangerous. The little machine's compactness, its slim fuselage with steel-tube construction, impressed Mitchell; indeed, it may have sown the seed of what was to be his great idea. We do not know. The little aircraft flew away to be forgotten, and Mitchell, by this time thoroughly enthusiastic about aircraft, and fired with the possibilities of a new field for his draftsmanship, went on with his job of turning out the big flying boats that have always been a specialty of Supermarine.

At the end of the war he was chief *(Turn to page 60)*

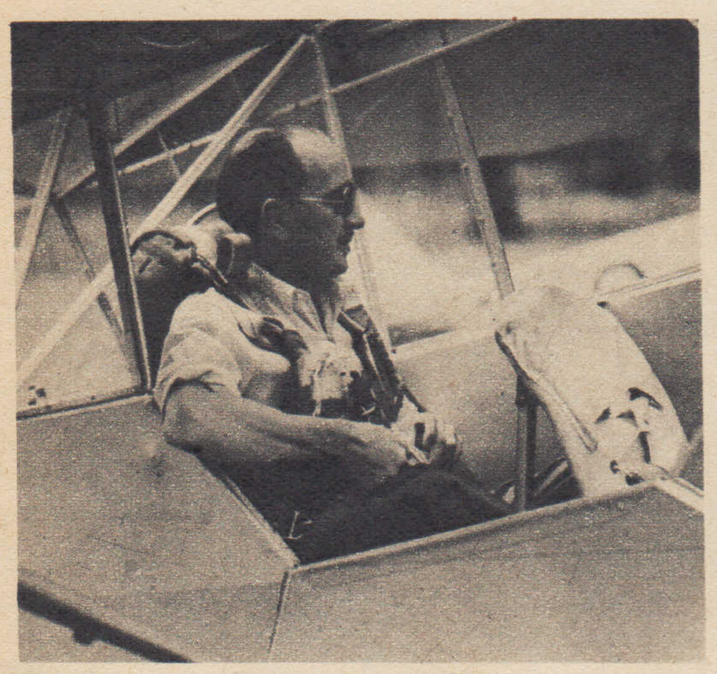


The Spitfire is descended from famed Supermarine racers. Pictured is S-5 of 1927. In 1931, S-6b made 407 m. p. h.!

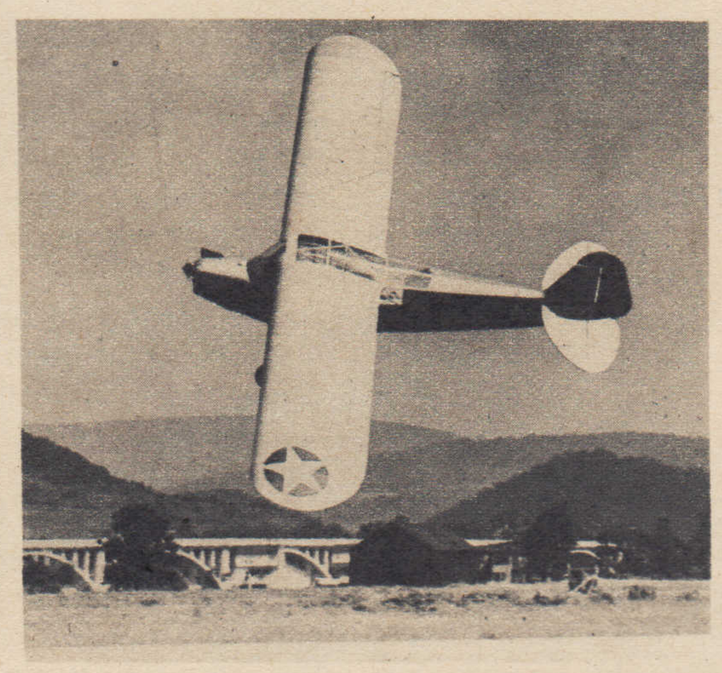
Grasshopper Test Hop

Before the army accepts a lightplane it is put through an interesting check-flight procedure—like these Piper L-4Bs.

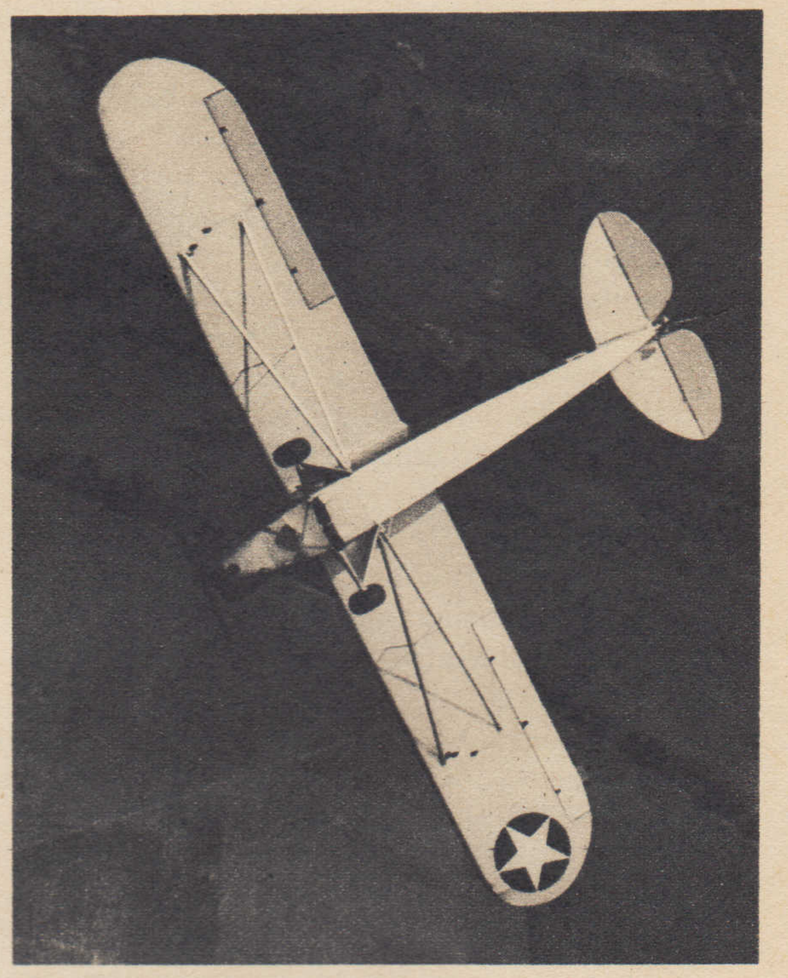
After factory inspection and fueling, the ship is raised in flying position and compass compensated.



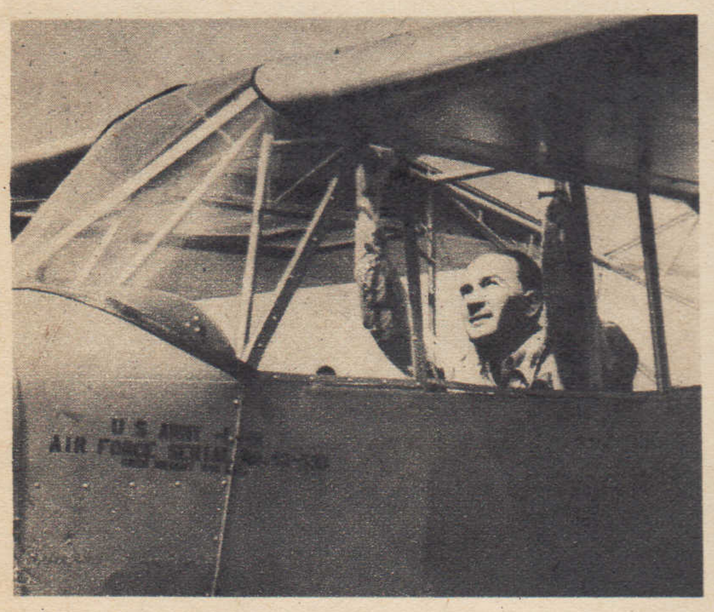
He rides the Grasshopper. Frank (Hoot) Gibson, flying from the rear cockpit, gets set for test hop.



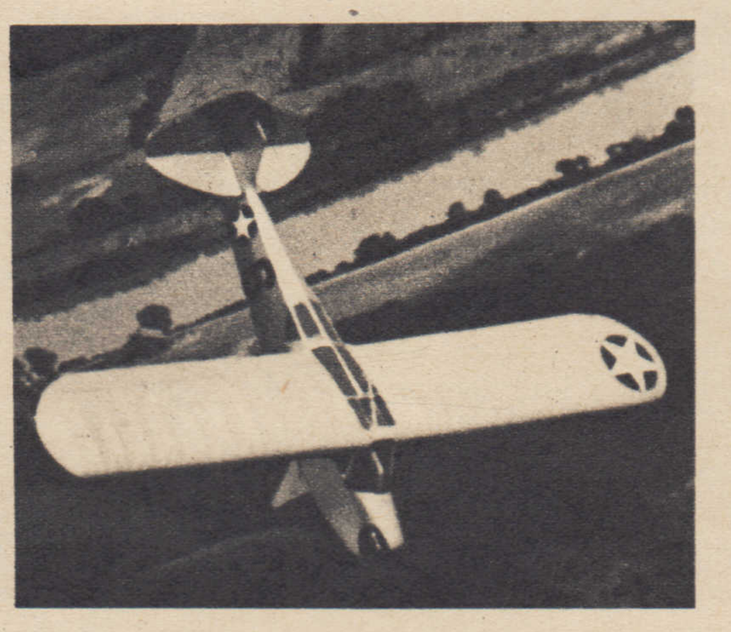
Would-be P-40 (P for Piper?) takes off in fast climbing turn. Ship has excellent visibility to rear.



Finally a slow roll and another Piper L-4B passes its test. Carries messages, officers, spots artillery fire.



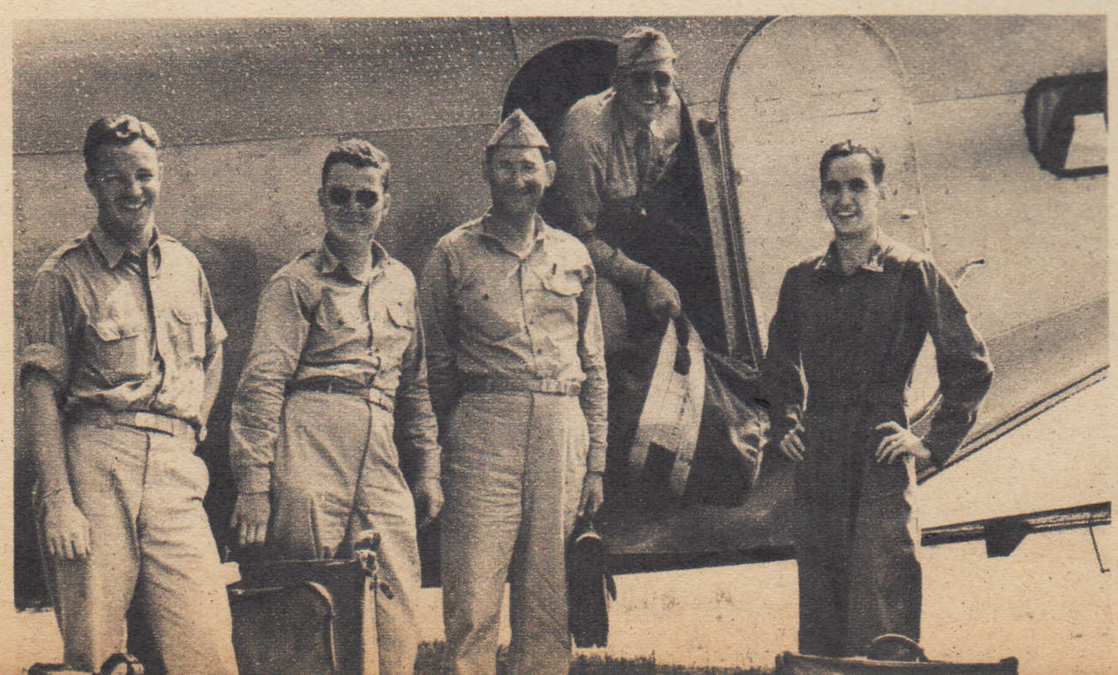
Flying hands off to check stability. Continental-powered trainer is designated L-4B by air forces.



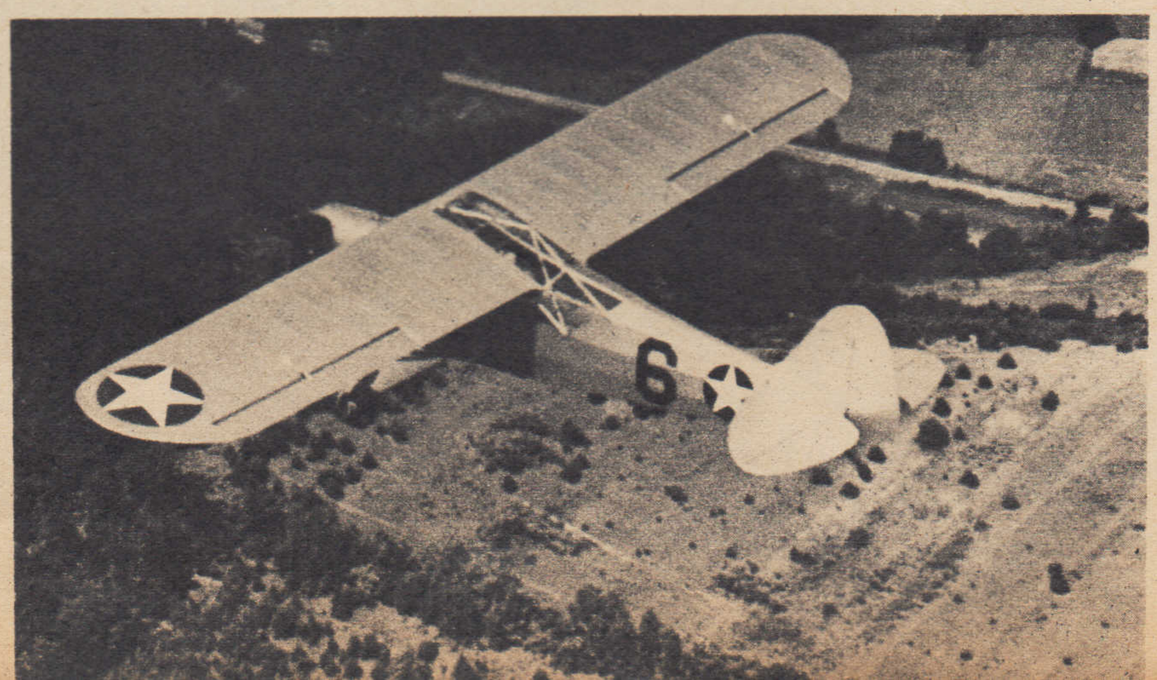
Spins to both right and left check spin ability and recovery characteristics. Top speed is 88 m. p. h.

The air forces factory representative has to approve each ship before it is accepted and put into service.

Army ferry pilots come to Lock Haven in an old Boeing 247, all set to pick up a batch of Grasshoppers. Grasshoppers proved worth in three months' maneuvers.



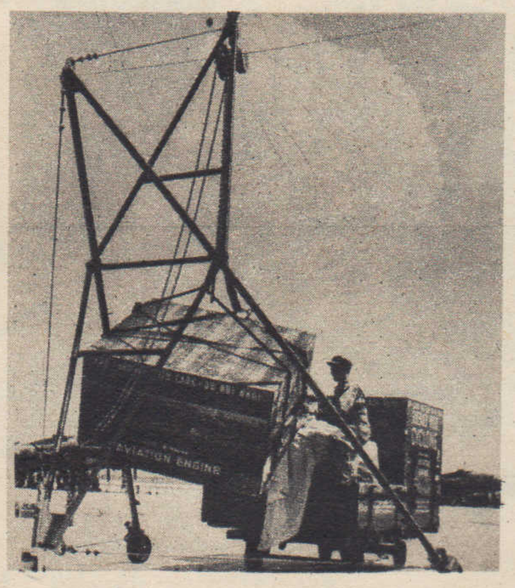
Off to the wars. The same ability for getting in and out of postage-stamp fields makes the Piper as well liked by army fliers as it was by thousands of private pilots.



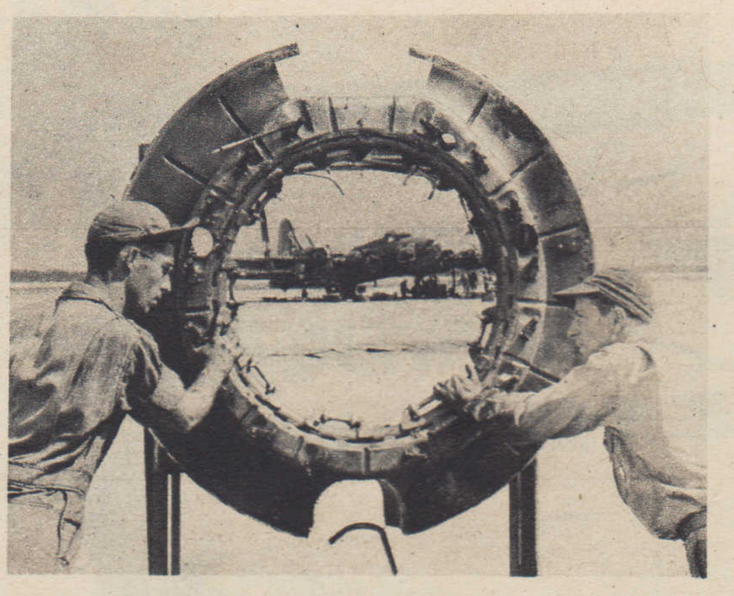
Fortress Engine Refill

The ability of ground crews to change engines quickly can save many bombers on ground.

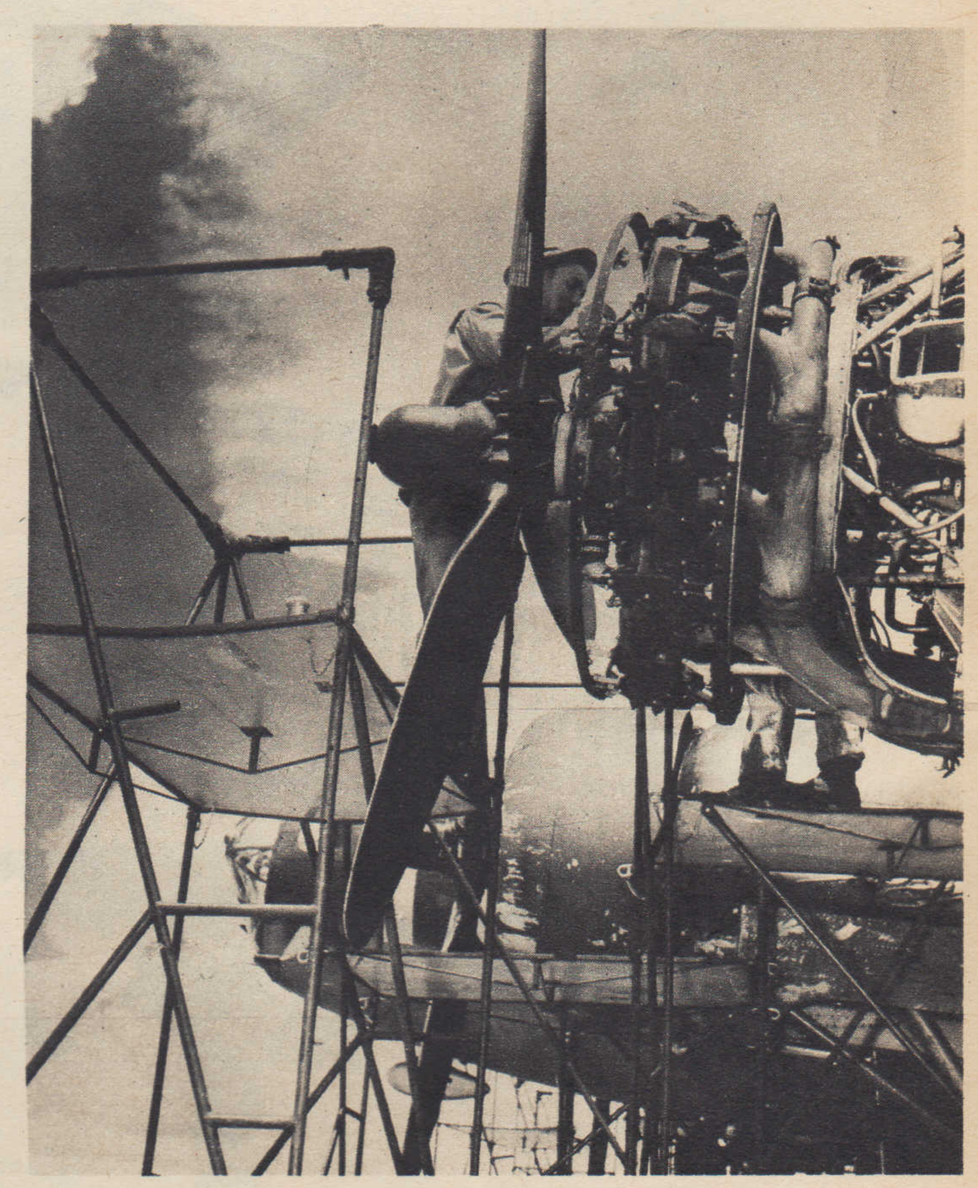
Quickly as circus hands, mechanics erect tent to keep dirt out of motor in emergency in field.



Empty engine crates go back for another engine, sometimes are lived in.



New motor mount for wounded Fortress. These ships often come back on three, sometimes two, engines.

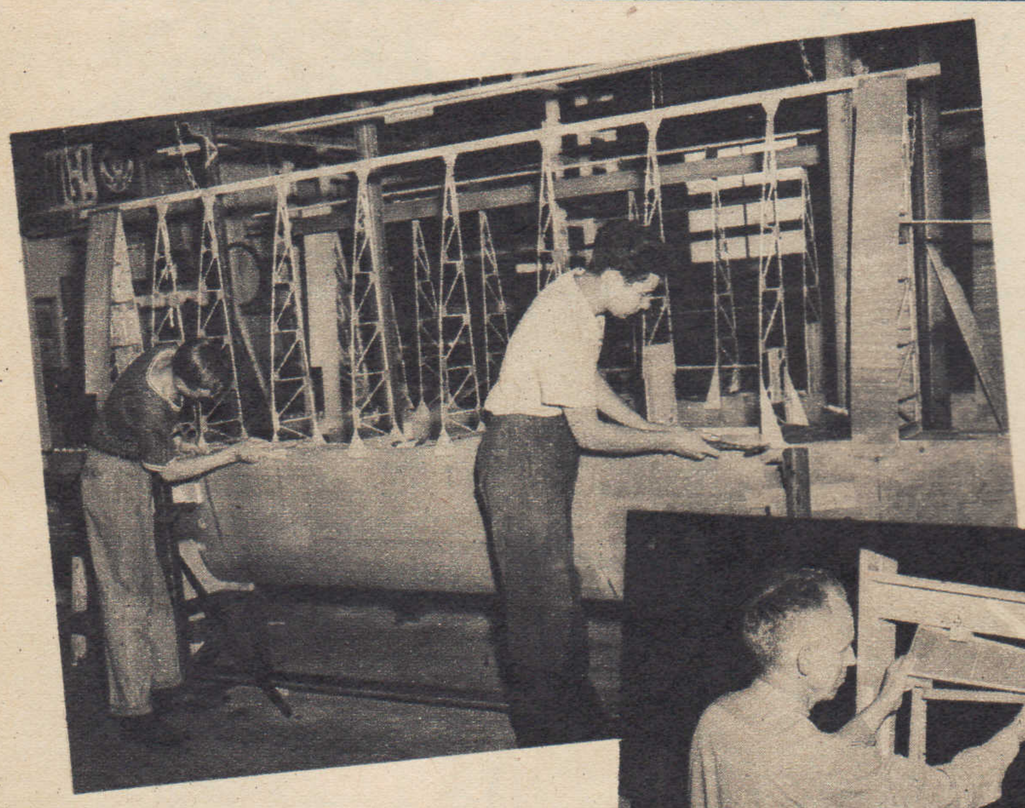


Facilities of first-class field are not always available in battle. The mechanics who keep 'em flying have repaired motors in dark.

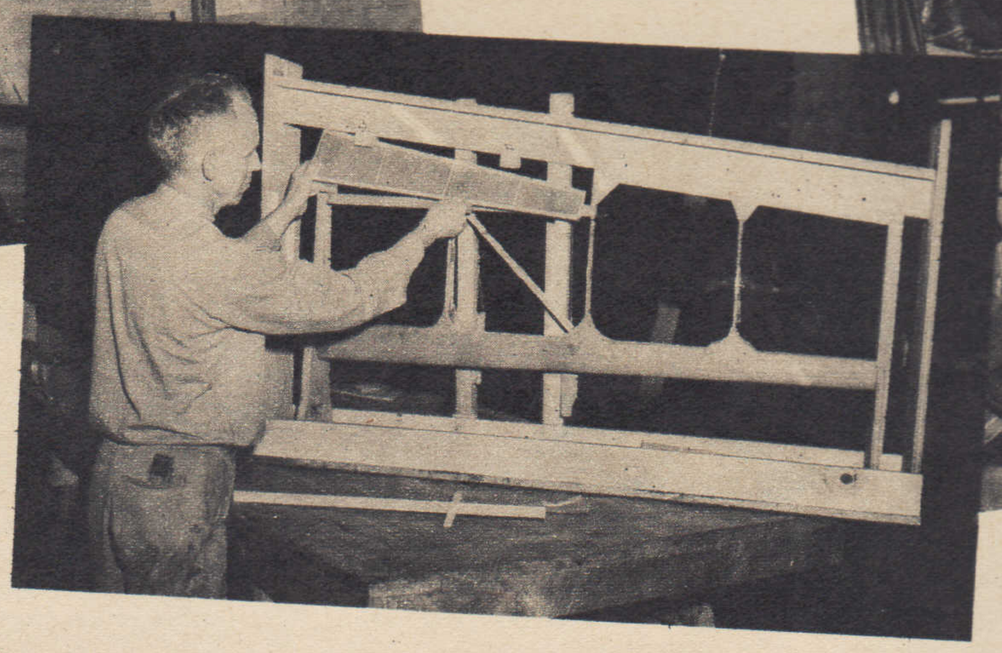
For top and major overhauls, engines are taken out, new ones installed rather than keep airplane out of service. These are Cyclones.

Glider Factory

These close-ups at the Schweizer brothers' plant give a clear idea how army training gliders are made.

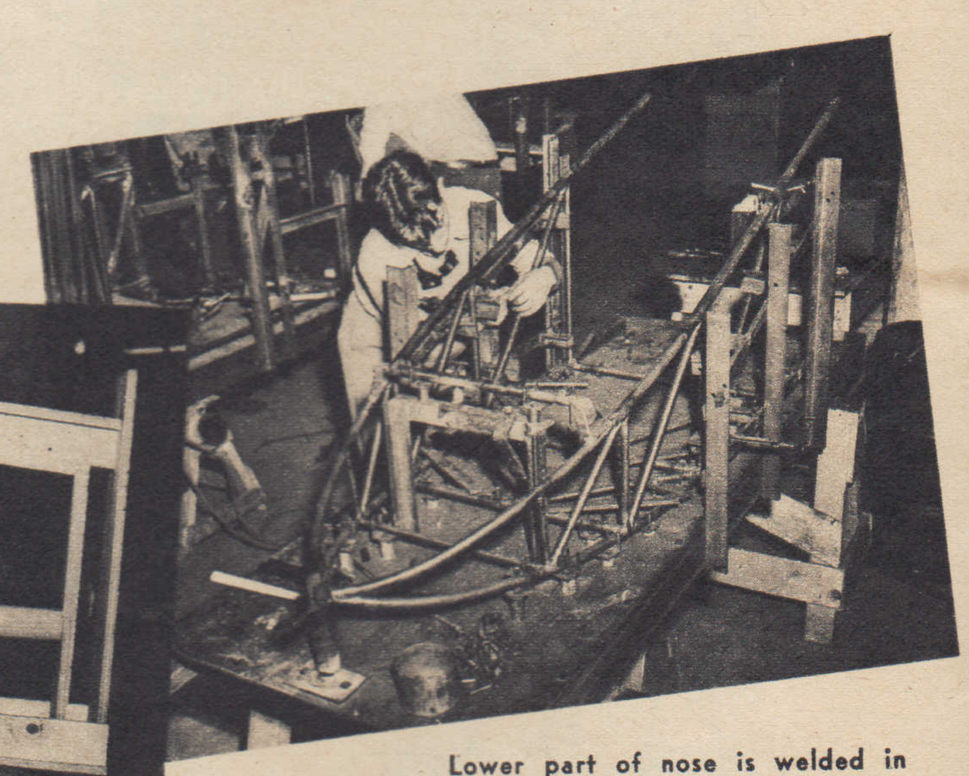


Above—The insigniaed wings are attached to the finished fuselage. Aircraft spruce at right awaits machining.



Covering the leading edge of wide fabric-covered wing with plywood.

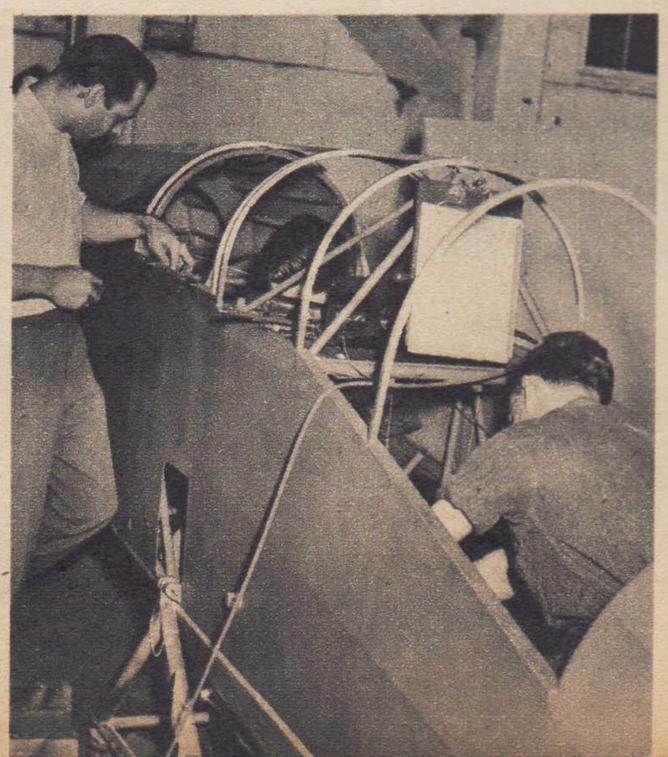
Right—Fitting small plywood trimming tab to uncovered elevator.



Lower part of nose is welded in accurate steel jig. Light and tough.

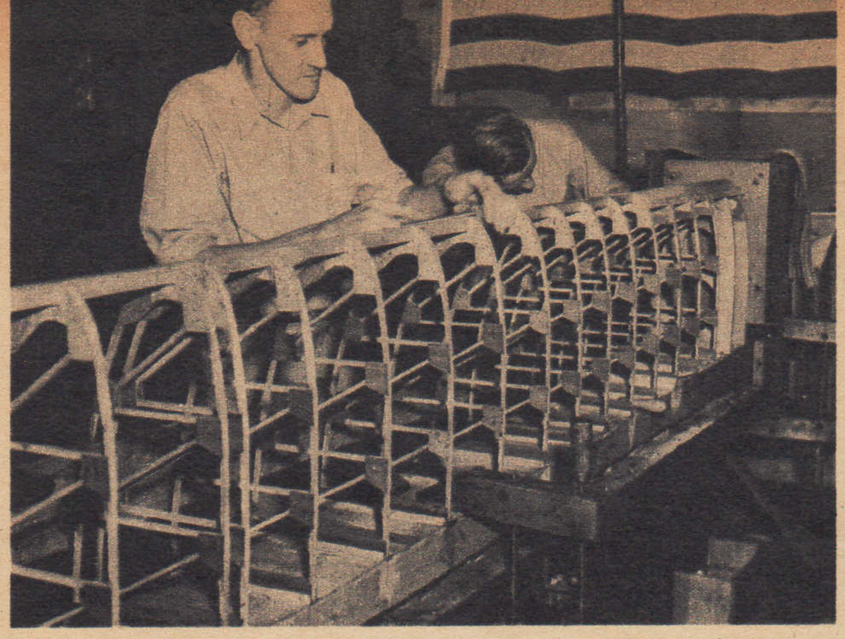
Splicing control cables calls for skill and responsibility.

Fitting control sticks is painstaking job. A glider can do any power-plane maneuver.

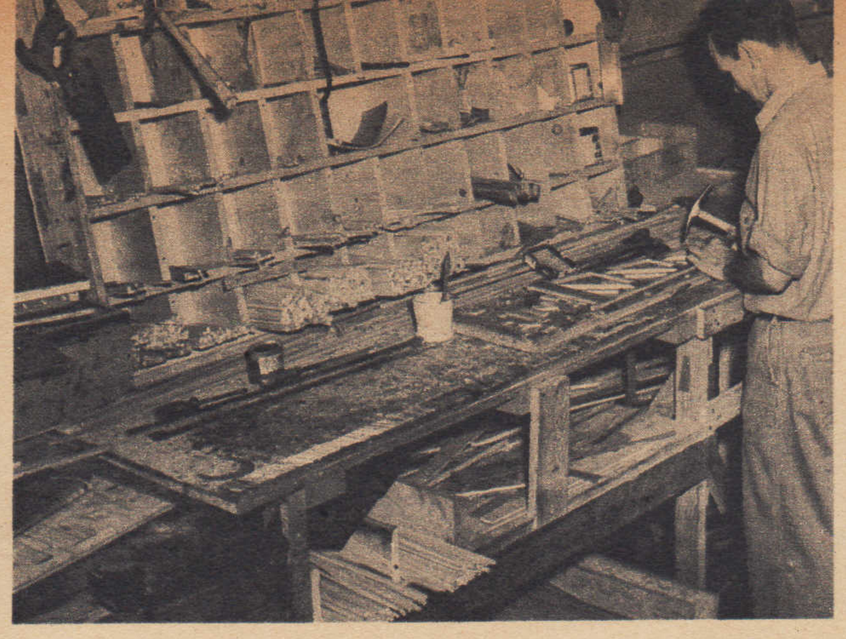


After the welded fuselage has been covered controls and instruments are carefully added.

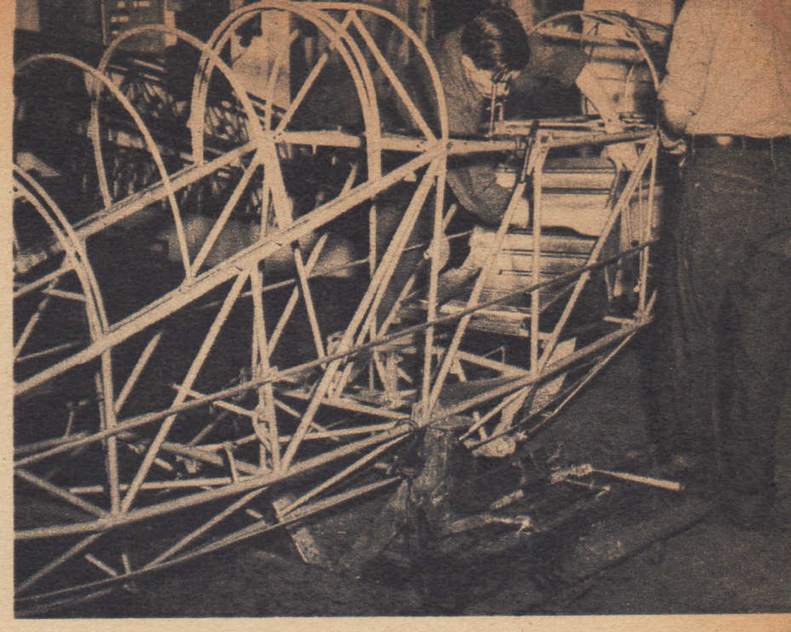
One gadget not found is throttle. Round pull knobs for tow release and spoilers.



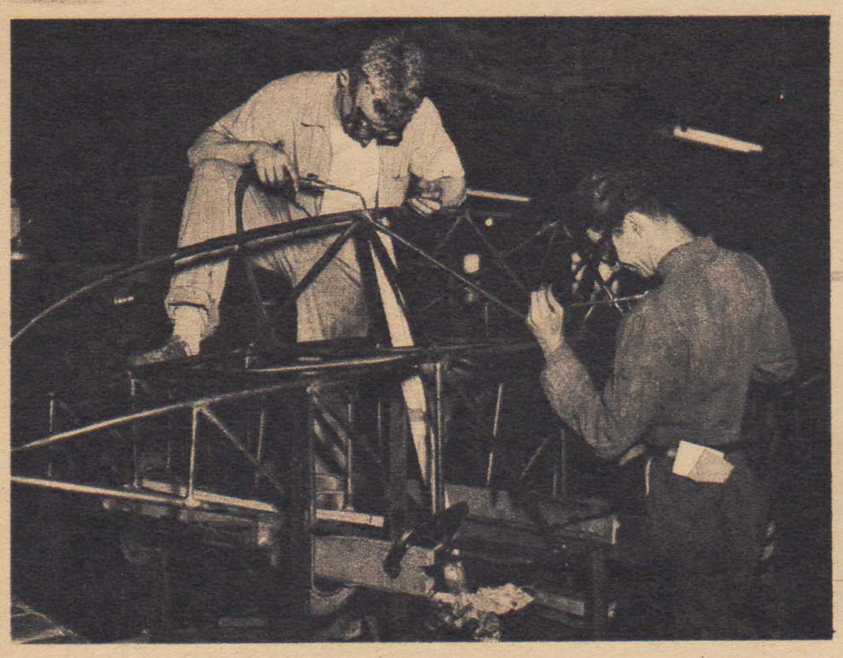
Leading edge of wing is assembled by expert woodworkers. Here nose ribs attached to leading edge are smoothed.



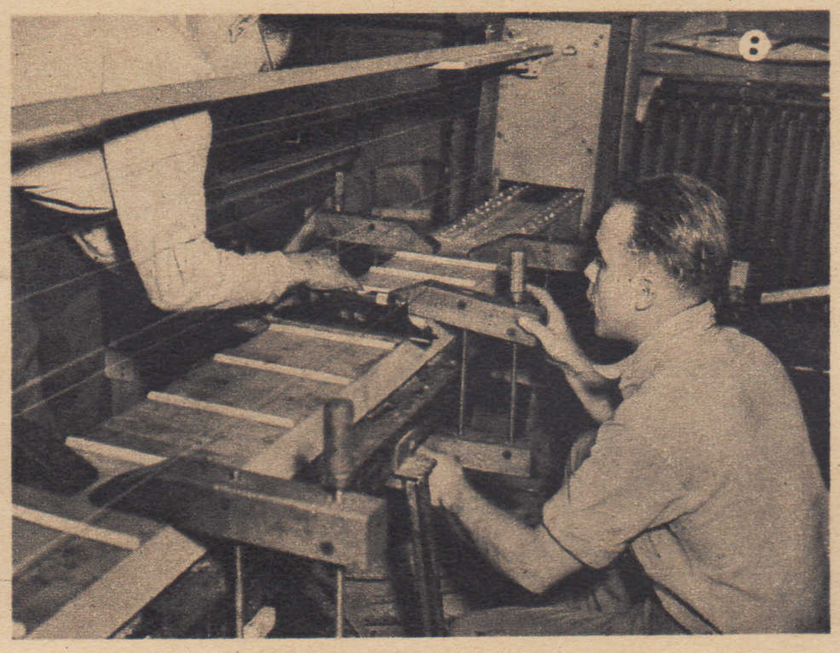
Making the ribs is a painstaking job for the woodworker. Parts cut to fit in bins are glued and nailed in jig.



Fitting the copilot seat into welded fuselage before covering. Ship is TG-3 training glider.

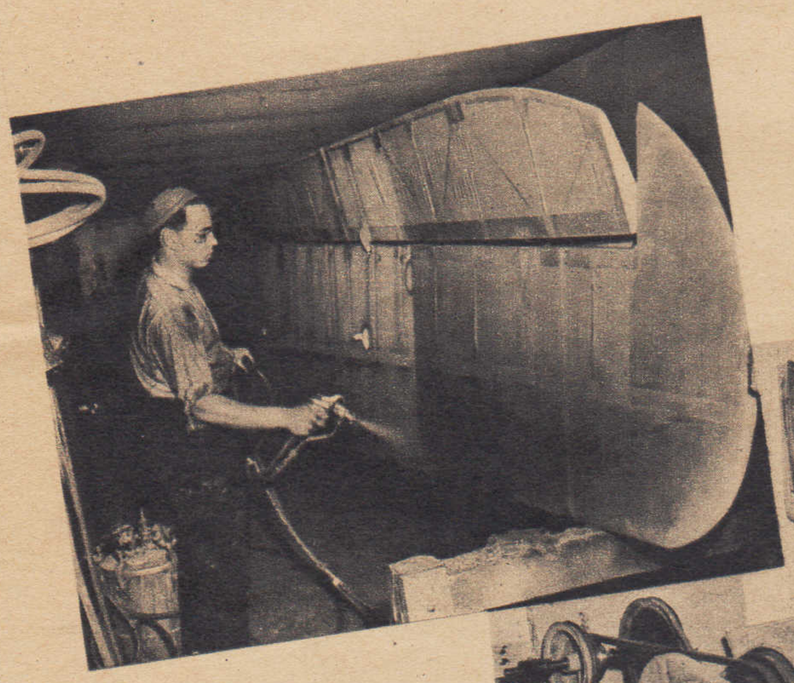


Keel is welded to inverted fuselage. Along this rugged keel will be placed the wooden brake skid, single landing wheel.

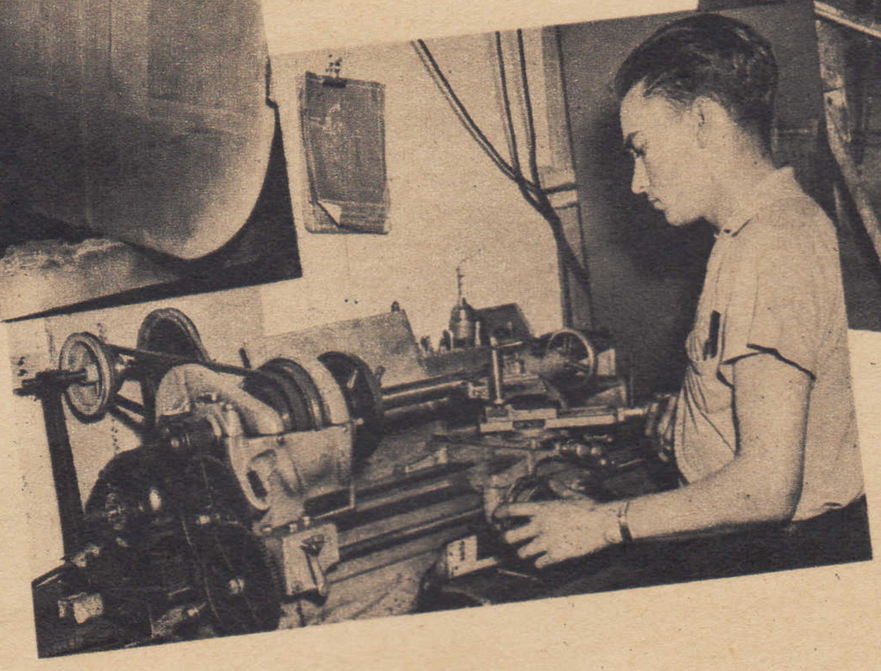


Selected spruce spar is trued up before the ribs are attached to cross pieces. Strings indicate rib contours.

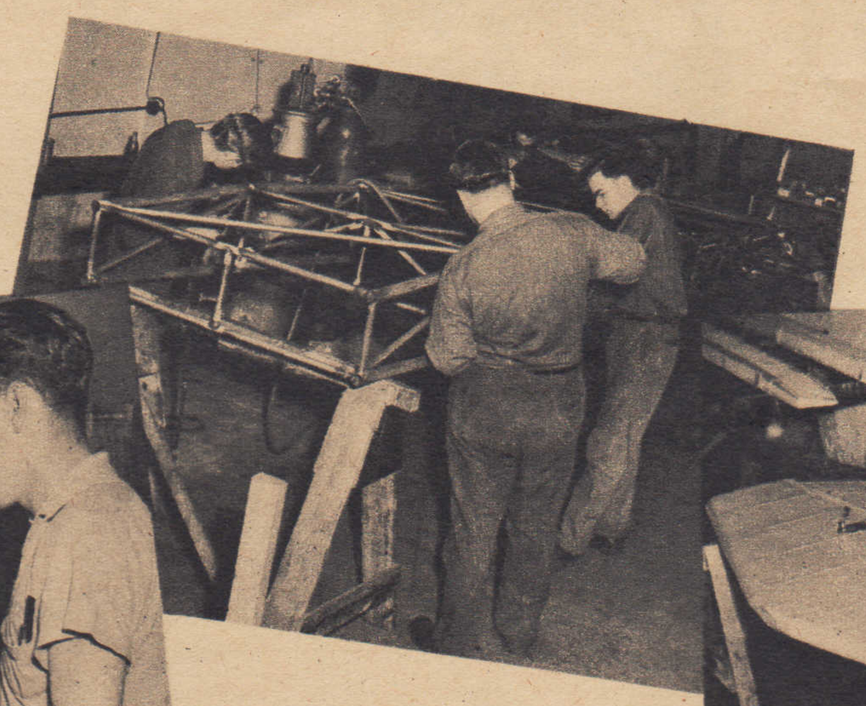
Rib-stitching fabric to wing before doping. Little door opened is really dive brake under wing.



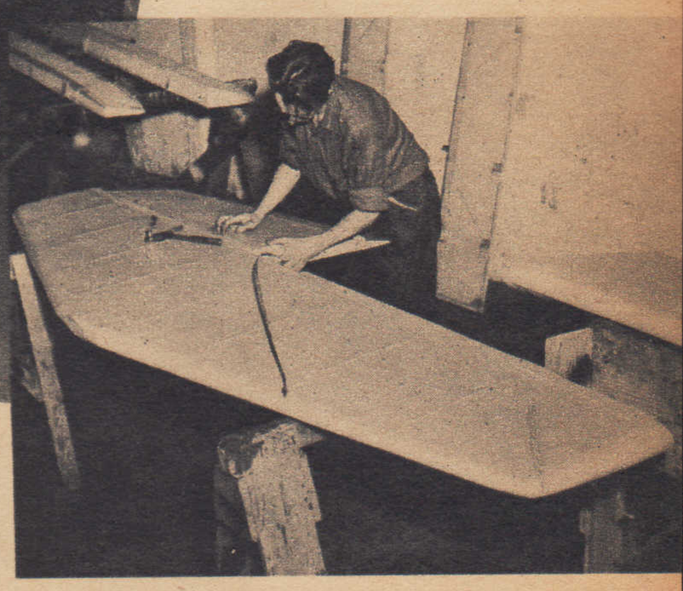
Dope sprayed on fabric-covered wing tightens and also protects the cloth.



Fittings of fine dural and steel are made in factory as needed.



Factory also builds trailers for transporting of gliders.



Fitting elevators to stabilizers before final assembly takes place.

Making slipcovers for wings and fuselage of selected fine-weave fabric.

This makes it official. Army insigne goes on rudder. Infra-red lamps speed drying.

Fitting the rudder is fussy job. Control areas must move smoothly for good control.

Attaching stabilizers to tail of ship. Note open inspection plate.

BY JAMES L. H. PECK

ILLUSTRATION BY JO KOTULA

Torpedoes Have Just *Begun* to Fly!

Midway was only a small sample of what the torpedo plane may do. One recent development, use of land-based "torp" craft, may even spell doom of all carriers.

YES, it's the final year of World War II. The once-feared fleets of Hitler and Hirohito have been sunk, or lie crippled or bottled up in Fascist harbors. The Axis no longer exists, and the evil partners who tried to impose their bigoted new order upon the world lie dying of starvation and gaping battle wounds. United Nations' success has been accomplished, not with a new secret weapon, but with a comparatively old one: a war utensil that, during the hectic summer of 1942, gained for itself the reputation of being the war's greatest naval weapon, although its use prior to that year had been somewhat limited, notwithstanding the fact that the deadly instrument made its debut during World War I.

This Axis nemesis is what once we called the torpedo plane. It has outgrown that title and now is known as a "destroyer." It carries not one but many torpedoes, and can cruise a couple of thousand miles, if necessary, to trail the enemy. During the now historic battle of Midway Island, where we handed the Japs their first serious naval defeat, the naval air service used a couple of squadrons of torpedo bombers. They attacked singly or in small formations. But we didn't establish our aërial blockade by using torpedo-carrying craft in this manner.

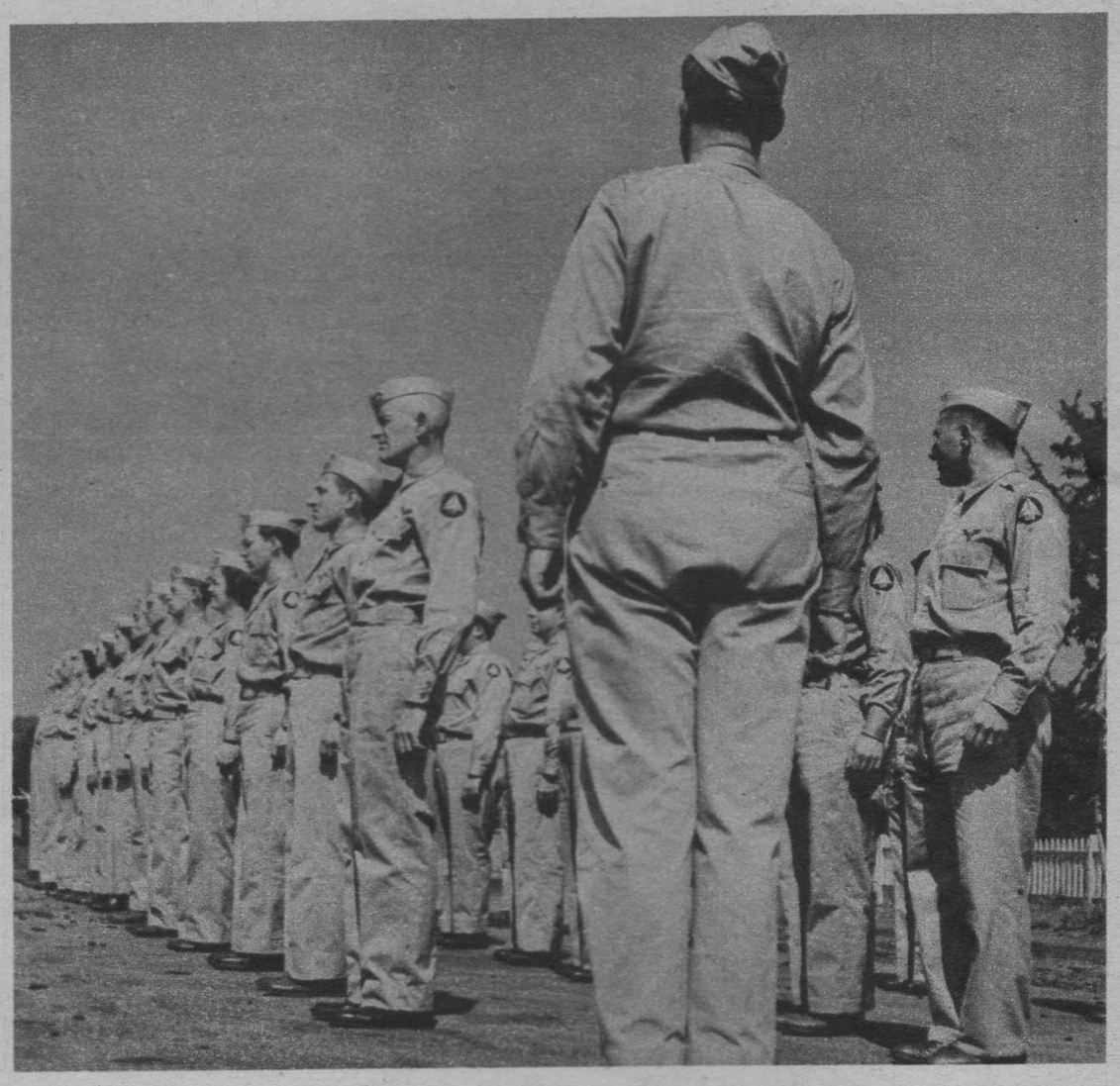
Over the Pacific, the Mediterranean, the North *(Turn to page 48)*

Civil Air Patrol

National staff. L. to R., Col. H. H. Blee, Lt. H. Hawgood, Maj. J. Vilas, Lt. J. G. Leigh, Capt. J. F. McBroom, Capt. K. C. Hoyt, Lt. O. Smith, Maj. E. L. Johnson.

Through these nimble fingers have passed over 58,000 applications for membership in the Civil Air Patrol. Each is first thoroughly and carefully checked by F. B. I.

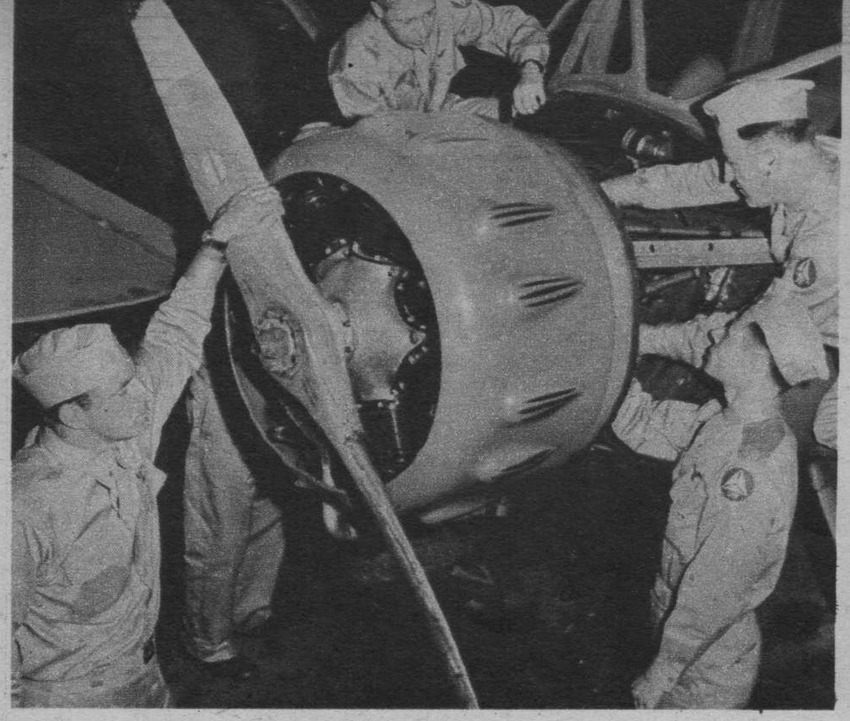
First step to application is being fingerprinted. Anyone with a poor record better not apply for CAP work; for members have to pass rigid inspection for character.



It's not all flying. Twenty hours of military drill start the training of new recruits. Discipline must be observed and drill is important in establishing well-ordered unit.

Regular army procedure throughout. Squadron Leader Heber Sutton of the New York Wing dictates to Pilot Whitehouse while Adjutant Crowley checks file records.

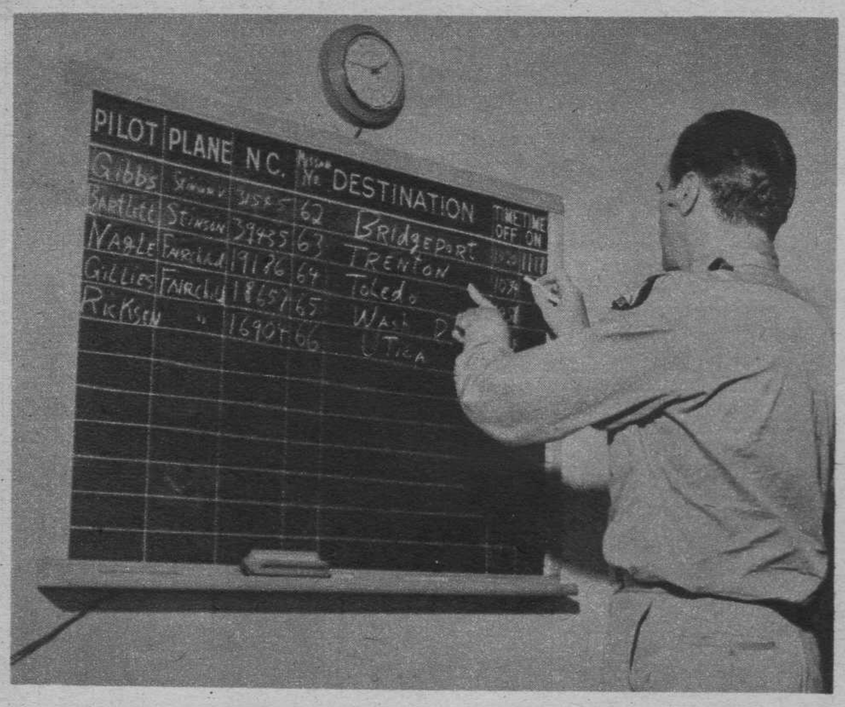
Classes in meteorology, avigation and radio form part of the extensive list of subjects the members study to prepare for active duty. Most members are pilots.



Pilot and mechanic CAP members service own planes and equipment. Members provide own planes, uniforms, time.

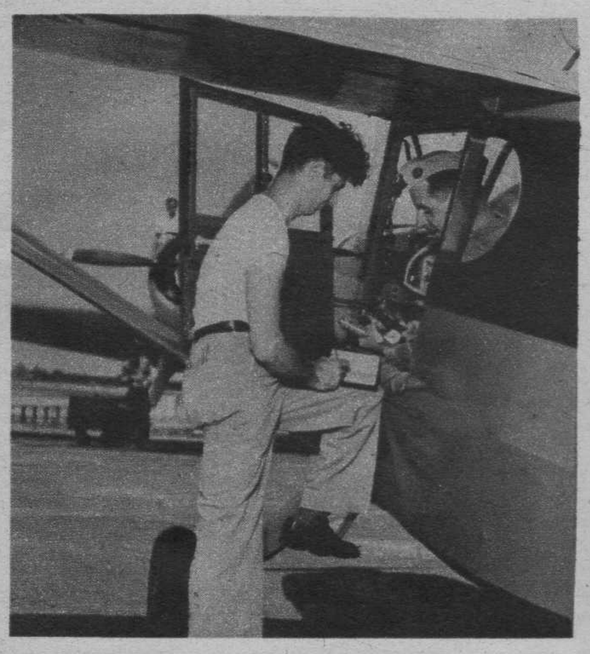
Many of the women members are veteran pilots experienced in aerial navigation, observation and maintenance of ships.

Each flight must be cleared before take-off by airport officer. Pilot must vouch for each of his passengers every trip.



Close check of each plane of CAP on task-force duty is kept by dispatcher. Location of task-force fields is military secret.

One advantage of use by the armed forces of members of the Civil Air Patrol and their planes is their ability to get into and out of small fields where the bigger military ships cannot make a landing.



CAP supplies army with courier service: small parts are delivered to factory.

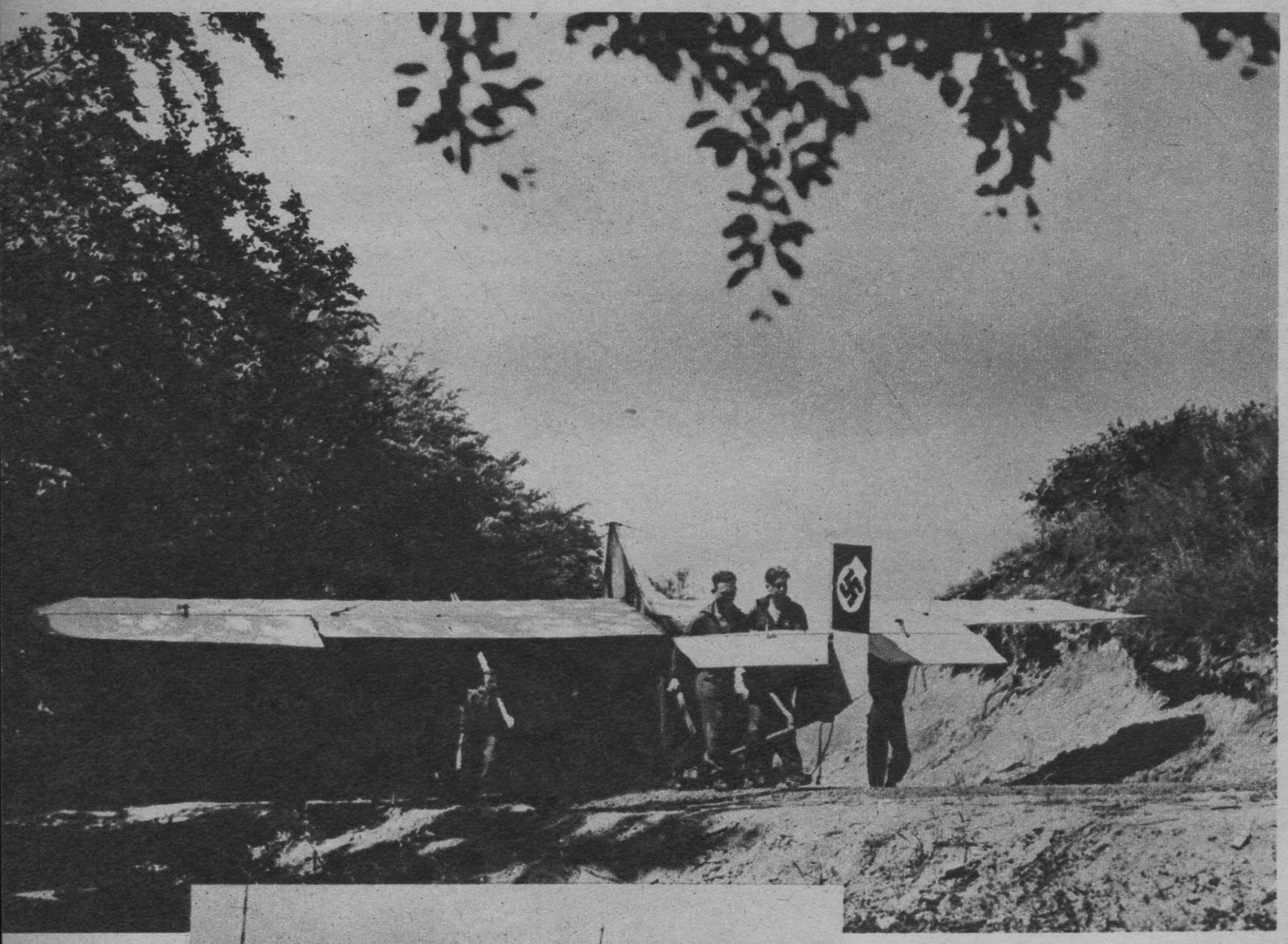
Army personnel is also shuttled to various destinations in CAP courier planes.

Editor Colby, left, acts as observer for CAP Pilot Bill Whitehead in latter's Fairchild.

Sub patrol, power-line patrolling, rescue flights, are other important CAP duties.

YOUTH IN AVIATION ★★

The War Spotlight



You know about Canada's and Great Britain's Air Cadets. Now read what Palestine, Russia and other countries also have accomplished.

Hitler's Luftwaffe personnel is supplied by government-controlled youth movements where gliding and models are encouraged.

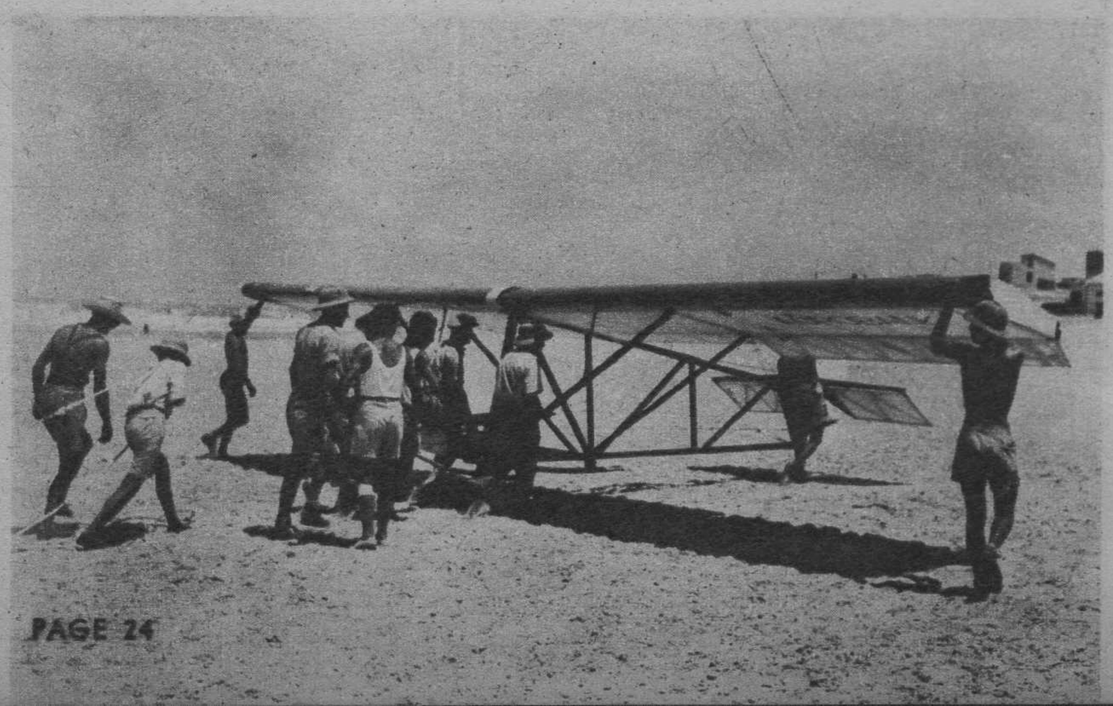
The first Chinese-built glider by German technicians now aids the Allied cause by training pilots. U. S. organizations are now engaged in youth-training programs.

GERMANY and Italy formed model clubs and aviation classes in their public schools, and glider clubs and flight-training courses in their high schools long before war. They demanded that their youth become air-minded whether they wished to or not. This accounted for their vast numbers of trained airmen when the time came to wage war.

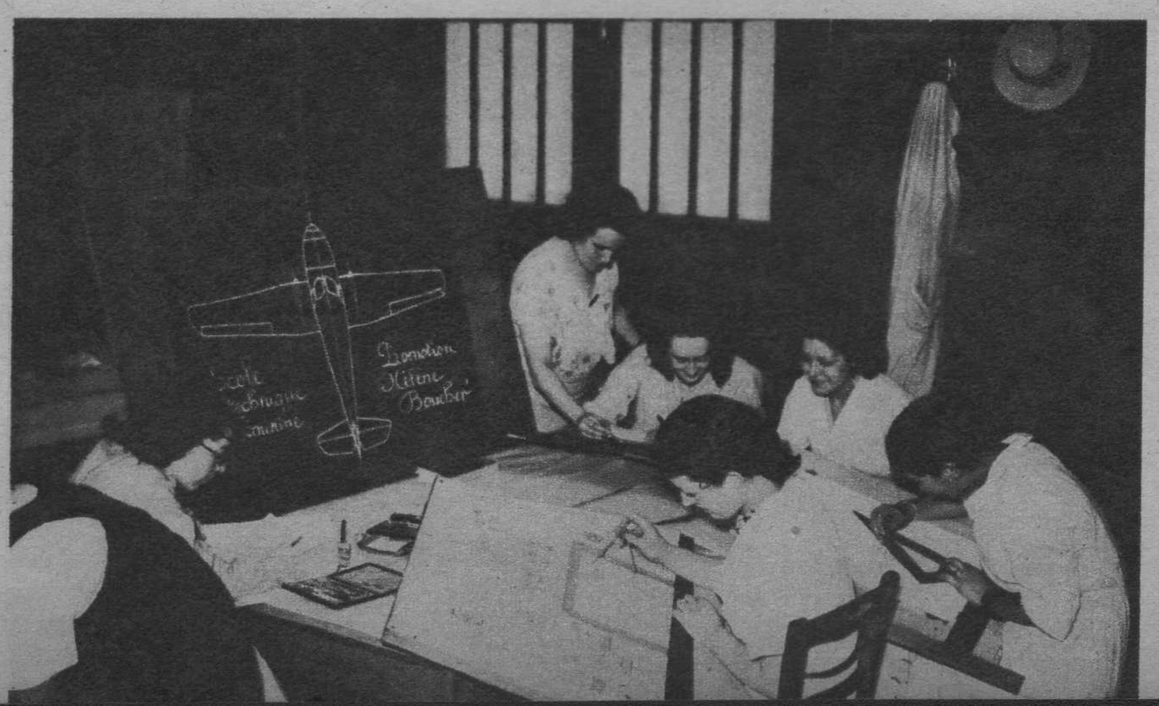
Lately, though, both Italy and Germany are known to be running short of youth power. The Nazis are publishing appeals in German newspapers and broadcasting for youthful volunteers to enter parachute corps. They are known to have greatly intensified the training of their Hitler youth movement and enlarged terrifically the National Socialist Flying Corps. These organizations are the primary schools of the Nazi air force. National Socialist Flying Corps members are usually trained as parachutists, and Hitler boys take a practical course of glider flying, leading to air-crew training in the Luftwaffe or learning to be wireless operators, mechanics or parachute packers.

But we are more or less familiar with what countries like Germany, Britain, Canada and Italy have done. Surprisingly enough, many other lands have interesting air-youth activities. Take Palestine. There, both boys and girls are studying aviation intensively and the effect of their

Despite lack of government sponsorship, Palestine's youth have formed gliding clubs and preflight programs.. Many of the students are now serving with the RAF.



Women working in aviation is nothing new. Here's a group of girl students studying airplane design in a French aircraft school. Time: pre-Hitler, during 1936.



Turns To Youth

BY BRUCE KEITH

training is being demonstrated now in the Egyptian battles.

"Fully alive to their country's share in the Allied war effort are the young men and women of Palestine," *Flight* magazine pointed out recently. "Some years before the war a group of flying enthusiasts began to make the local youth air-minded. With poor financial resources but plenty of drive, efforts were made to start gliding clubs. The response of the young people was more than magnificent. In Jerusalem, Haifa, Tel-Aviv and in the farming settlements of the valley of Esdralon gliding became a most popular adventure. (At least three years ago, Air Trails readers in Palestine wrote in to this magazine about gliding in that country.—*The Editor.)* These clubs had rather an unusual aspect; they were mainly recruited from students, workers, young farmers, taxi drivers and mechanics. Summer camps were organized in which intensive training, supervised by refugee gliding instructors from Austria and Germany, was given (up to International License standards).

"With the growth of this movement it was possible to go a step further and to establish the Aviron Palestine Aviation Co. The main object of this organization was, and still is, to foster flying among the young generation and to establish facilities for their training. During the past few years, quite a number of pupils have passed through a training center and acquired the usual licenses. Some of the more promising pupils were helped to go abroad, to Great Britain and the United States to complete their training. But the main service rendered by these various groups of flying enthusiasts was to make flying familiar to the minds of the average young boy.

"The fruits of these efforts have been shown since the outbreak of this war. Several thousand young people have volunteered for service with the RAF and have rendered a good account of themselves in Greece, East Africa and Libya. The majority of them are serving as maintenance personnel, and a few have been accepted for flying duties. There is certainly no shortage of volunteers keen on operational flying, and it is understood that facilities for their acceptance are constantly extended. The value of these volunteers is not in their numbers, for although about thirty percent of the total number of the Hebrew population have signified their willingness to join some branch of his majesty's service, their figure is of but relative importance. The existence, however, of keen and largely trained young men in the very heart of the Middle East war theater can be of great value to the Allied war effort.

"That the desire to serve is close to their hearts is evident from the latest news in the Holy Land. To inspire even the very youngest with the idea of flying, the construction of models has been introduced as a regular subject in the curriculum of all Hebrew elementary schools. This, in itself, is not a complete innovation, for similar systems have been successfully introduced in schools in Russia, Italy and Germany.

"In this manner, young boys acquire their first knowledge of elementary flying science and the simple principles of aviation during their most impressionable years, and grow up in close familiarity with flying. At the age of sixteen they transfer to actual gliding instruction, and those especially keen can continue training on aircraft. The educational authorities are naturally giving their full support to this innovation. Since for obvious financial reasons, it was found impracticable to employ special instructors at each school, selected elementary and secondary teachers gave up a good part of their summer holidays to undergo a special course in the construction of models. After qualifying, they returned to their urban, village and communal settlement schools and imparted their newly acquired knowledge to the youngsters, who eagerly absorbed it.

"It is obvious that these attempts are not calculated to produce immediate results, and cannot produce an immediately available air-force personnel. But coupled with the existing gliding and flying clubs they form a very valuable nucleus for the expansion of Palestine's potential flying personnel. It would perhaps be a good idea if this trend of interest among local schoolboys could be helped by the creation of some such suitable framework as the Air Training Corps in Great Britain. It would not indeed be a measure designed exclusively for the benefit of the youth of Palestine. The expansion of the ATC organizations to Palestine and other parts of the Empire would, apart from its value as a premilitary training, have a most beneficial influence on the growing generations.

(Turn to page 54)

For fifteen years Russian youth has had the benefit of a well-organized government program. Model building, gliding, and preflight training were encouraged.

Germany has long recognized the importance of model building for aviation training. Note the unusual glider designs and background of uniformed onlookers.

Japanese and Chinese model builders take time out from a contest (before the war, of course) to witness a glider being dedicated by a Japanese Shinto priest.

YOUTH IN AVIATION

Official Air Youth News

Prepared By ALBERT L. LEWIS, Air Youth Consultant, National Aeronautics Association

AVIATION Education—How Should It Be Extended?" was the topic before approximately a thousand of America's leading educators attending an unpublicized conference in Washington, D. C., recently. As "Problem 20" before the conference of the National Institute on Education and the War, called by U. S. Commissioner of Education John W. Studebaker, a strong plea for more aviation courses in colleges and high schools was made to a distinguished gathering of college presidents; State, county, and city commissioners of education; leading librarians of the nation, and other well-known educators.

Dr. Ben Wood, of Columbia University, and chairman of the Civil Aeronautics Administration-U. S. Office of Education Joint Advisory Committee on Aviation Education, was in charge of the aviation section of the Institute. Army, navy, and Federal officials told the delegates what was needed in the way of more aëronautical training, from the kindergarten up.

The big question as the schools and colleges of the nation opened their doors for the fall term was, "How many preflight aviation courses will be available to students?"

For months, Federal officials, special consultants, and educational authorities have been laboring to produce an aviation program for America's elementary, junior and senior high schools. The Aviation Education Research Project's much-touted texts on aviation for high-school courses were rushed off the presses by the MacMillan Co. the first of September. Not only are they inexpensive, but they bear the authorship of distinguished educators and aviation leaders, and the sponsorship of the Institute of the Aeronautical Sciences.

As usual, the big question remained—*Who is going to teach the aviation courses in the schools?* Schedules are already overcrowded, it was pointed out, and something would have to be dropped. The younger teachers are going into war work. Aviation exhibit materials are scarce. There was an answer for all this. Teachers have been trained in summer schools conducted by scores of colleges. The Federal government finally has awakened to the realization that aviation is just about the most important subject in a world dominated by air power. The model concerns have ample supplies of education kits on hand to start the industrial art aëromodeling programs, and new training devices such as miniature wind tunnels for classroom use, and small models with movable controls to illustrate flying techniques, are being developed rapidly.

As the aviation education program got under way in *(Turn to page 56)*

★ ★

Looking Ahead For Teachers

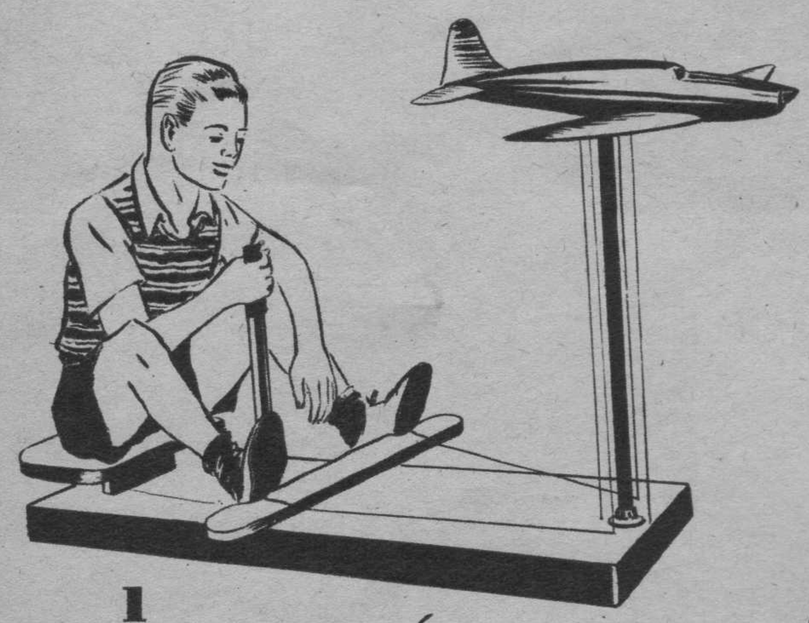
BY RICHARD ROBBINS

Good news for instructors. Visual aids, designed to simplify teaching, will shortly be available for school preflight training programs.

TEACHERS and their pupils are clamoring for visual aids to preflight training in schools and school activity groups. Under the auspices of the National Aeronautical Association, five projects are being designed especially for use with groups studying aviation, literally from the ground up. The army and the Office of Public Education are anxious that these projects be distributed as widely as possible, to acquaint American youth with the fundamentals of flying.

Every teacher knows that visual means of teaching are among the most efficient, and if it is possible for the student actually to operate the device he is studying, the benefits to him are further increased. So the value of the model of an airplane with movable controls operated by a real control stick and rudder pedals (Figure 1, with full-scale plans to be obtainable from the NAA shortly) can immediately be seen.

Although the control surfaces naturally do not actually operate the airplane, the ship is rigged in such a *(Turn to page 58)*



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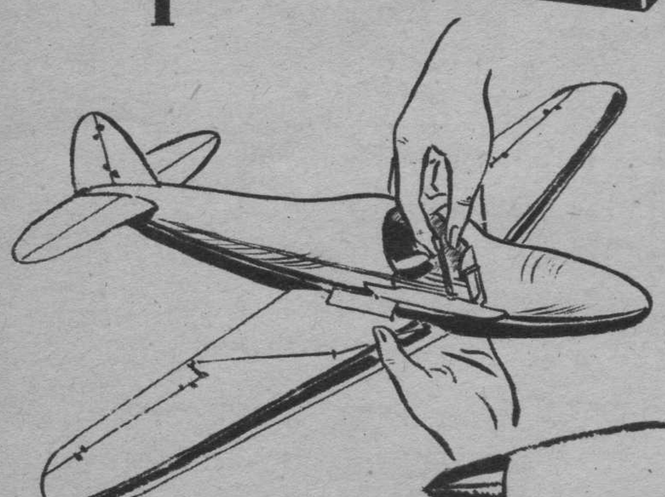

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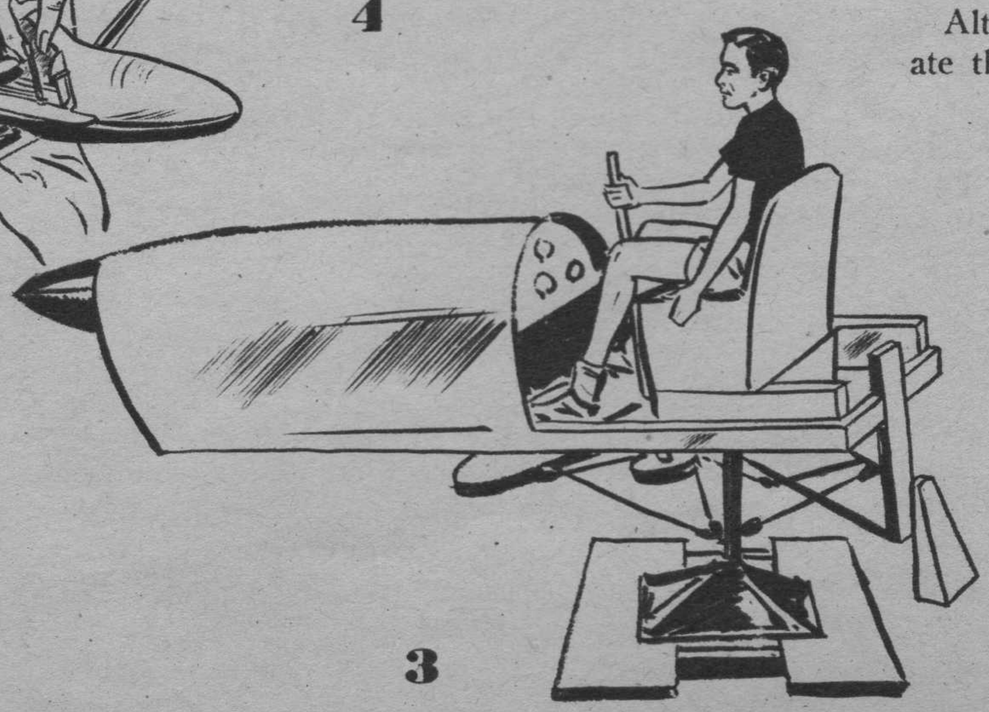

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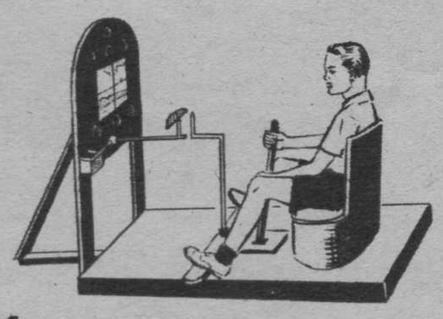

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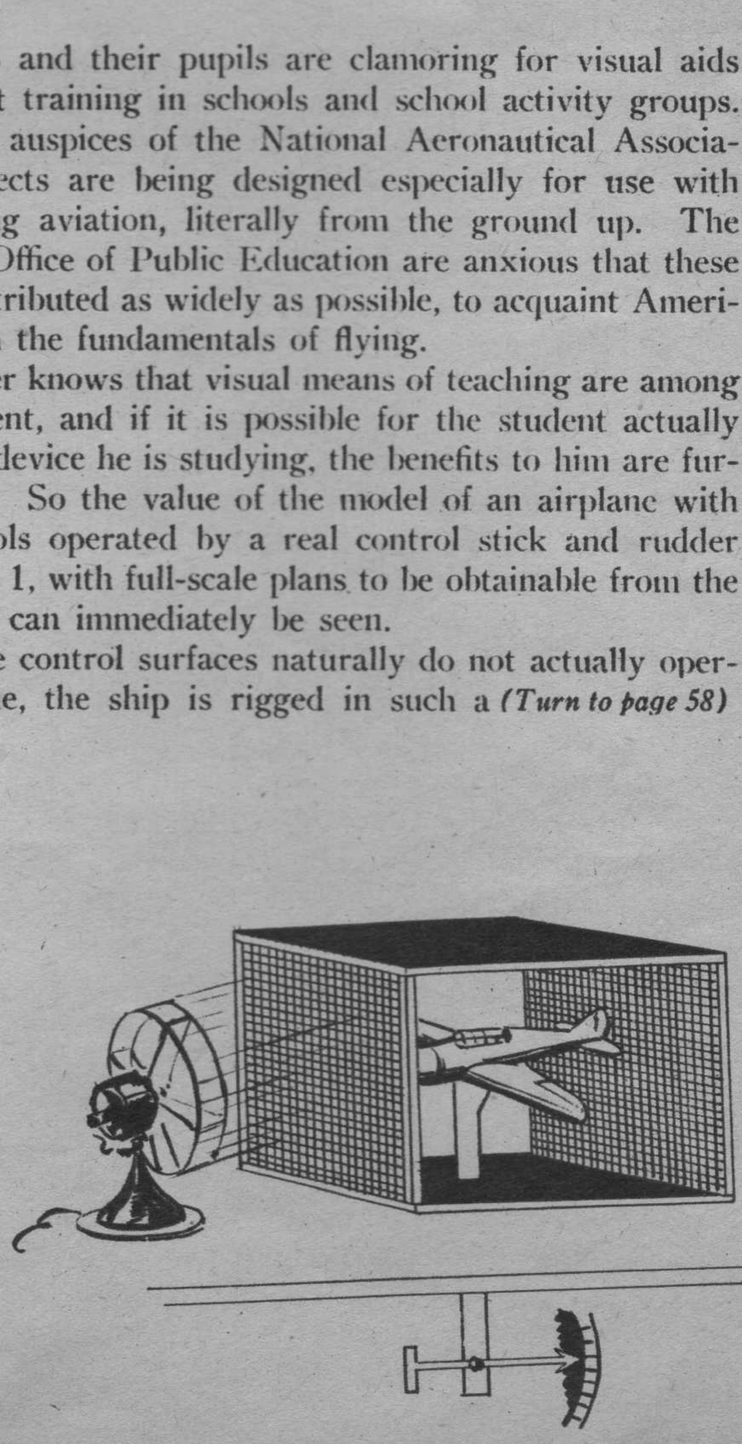
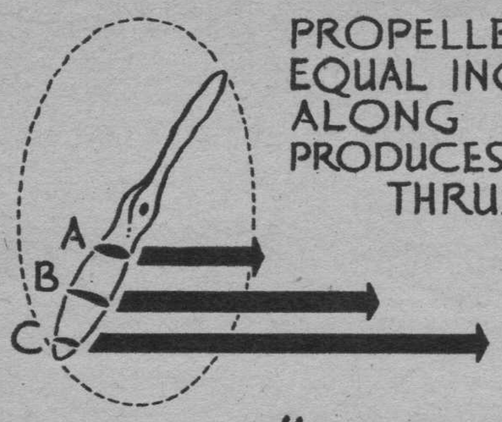


5

Air Manual

LESSON NO. 5

PROP THEORY



PROPELLER WITH EQUAL INCIDENCE ALONG BLADES PRODUCES UNEQUAL THRUST

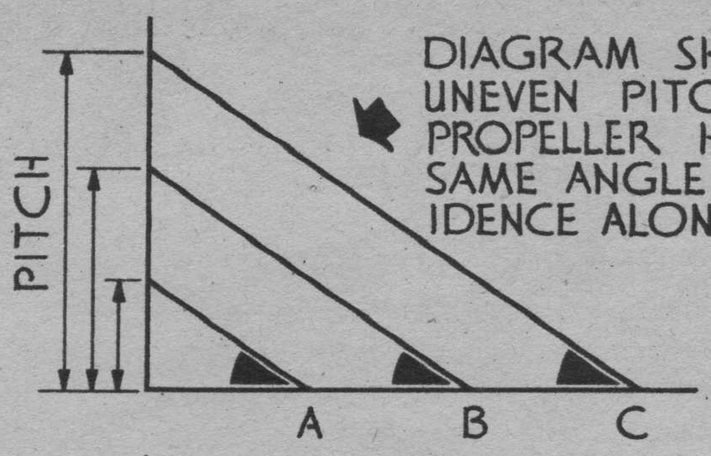
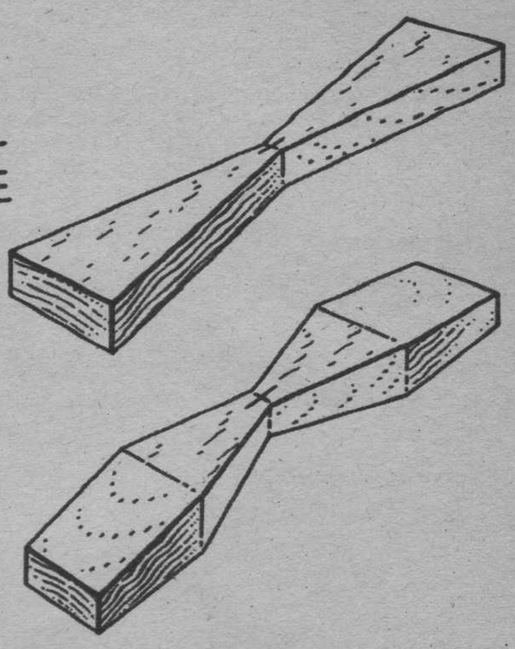
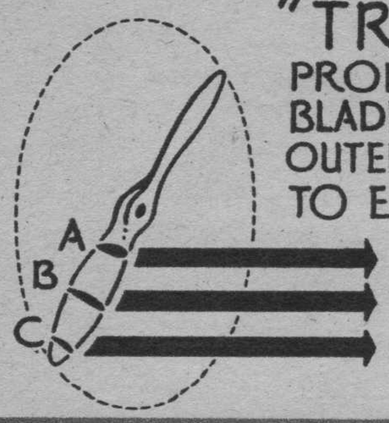


DIAGRAM SHOWING UNEVEN PITCH OF PROPELLER HAVING SAME ANGLE OF INCIDENCE ALONG BLADE

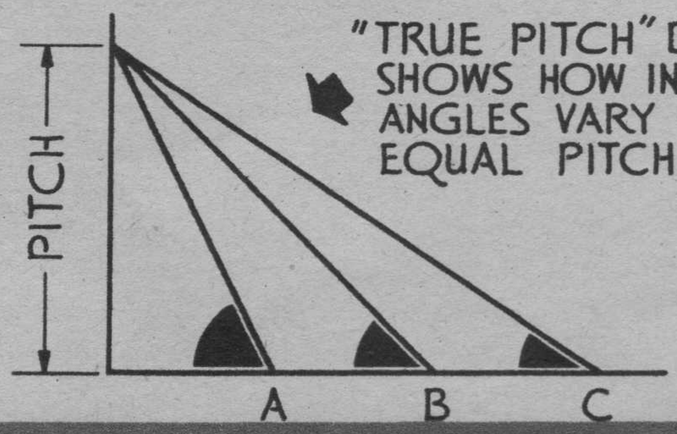


MODEL BUILDERS TAPER PROPELLER BLOCKS, REDUCING INCIDENCE AT TIPS, FOR TRUE PITCH

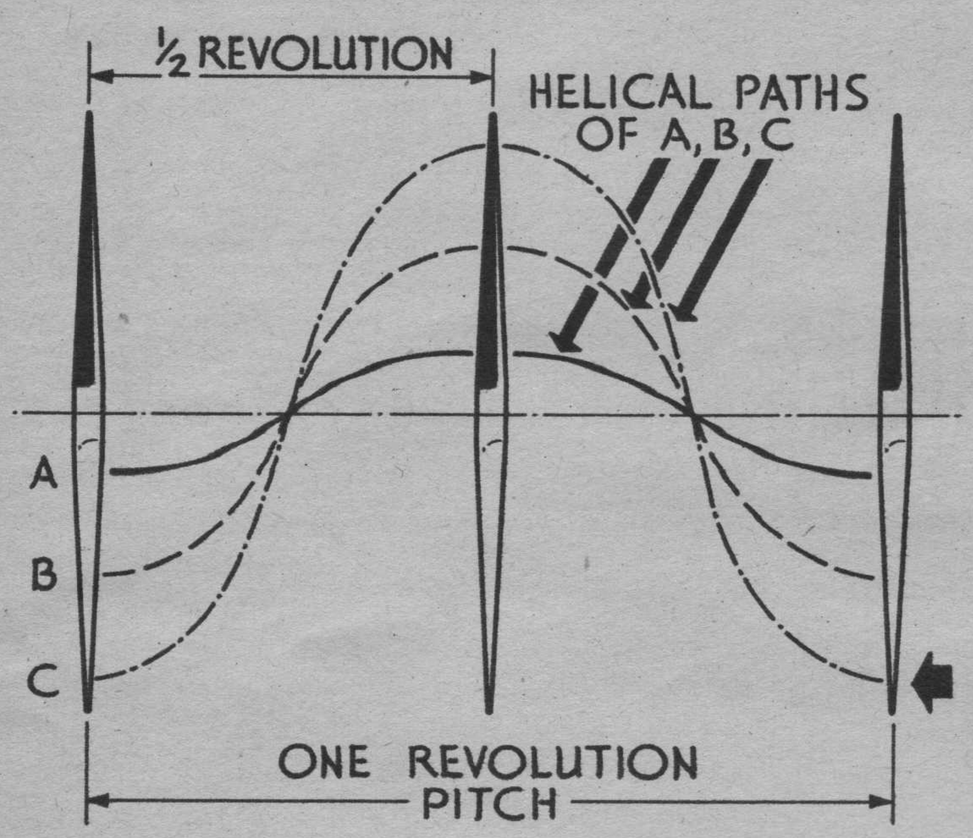


"TRUE PITCH"

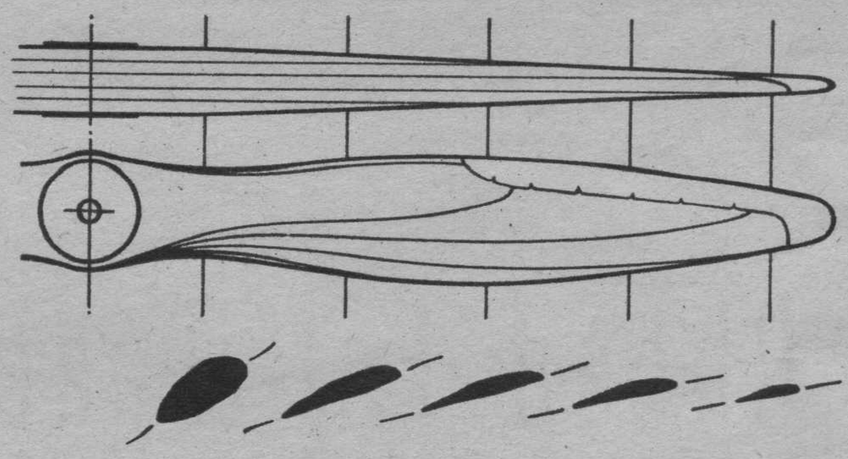
PROPELLER WITH INNER BLADE ANGLES INCREASED, OUTER ANGLES REDUCED TO EQUALIZE THRUST



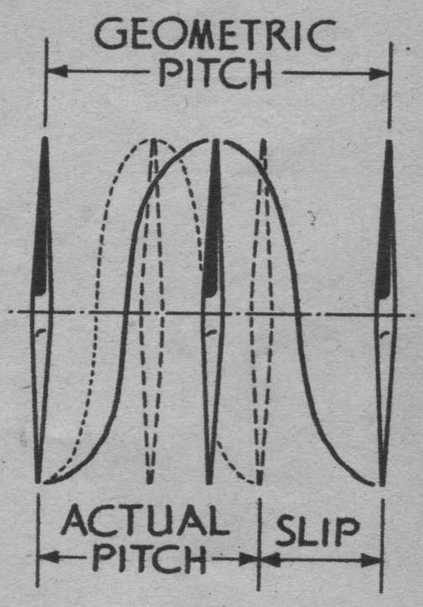
"TRUE PITCH" DIAGRAM SHOWS HOW INCIDENCE ANGLES VARY FOR EQUAL PITCH



THIN TIP SECTIONS WITH LITTLE INCIDENCE PRODUCE PROPORTIONATE THRUST DUE TO HIGHER TIP SPEED

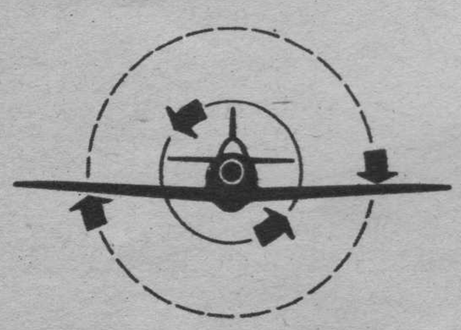


PROPELLER SECTIONS TOWARD HUB ARE THICKER FOR STRENGTH WITH GREATER INCIDENCE SINCE SPEED IS LESS THAN AT TIPS



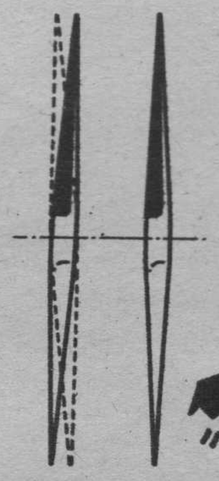
"SLIP"

ACTUAL PROPELLER PITCH NEVER EQUALS GEOMETRIC PITCH DUE TO PROPELLER "SLIP"



"TORQUE"

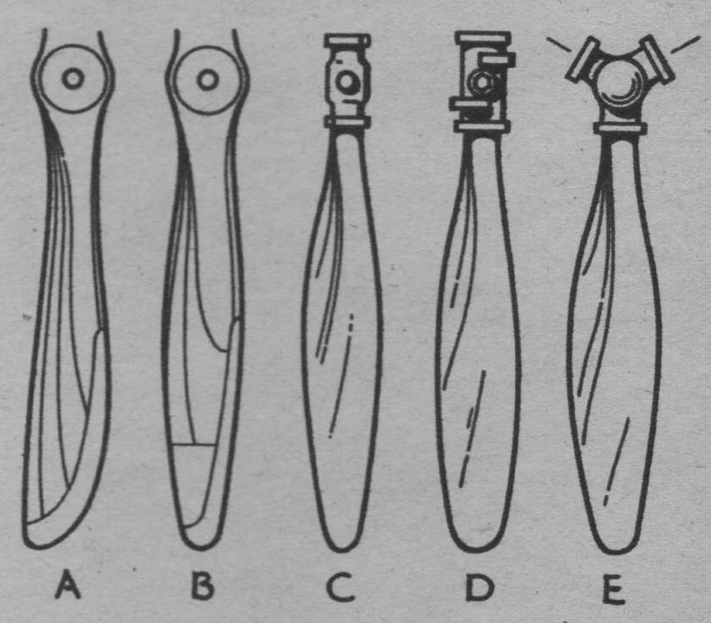
THE ENGINE, TURNING PROPELLER, EXERTS A REVERSE FORCE OR TORQUE ON THE AIRCRAFT



"TRACK"

PROPELLER, REVOLVING EVENLY, WITH TIPS FOLLOWING SAME PATH, IS SAID TO "TRACK"

A- EARLY WORLD WAR I "CLUB" PROPELLER
B- TYPICAL MODERN, WOODEN LIGHTPLANE PROPELLER
C- ADJUSTABLE-PITCH METAL PROPELLER
D- CONTROLLABLE-PITCH (IN FLIGHT) PROPELLER
E- ELECTRIC CONSTANT-SPEED PROP. - 2, 3, & 4 BLADES



Thomas

A propeller is the means of transmitting engine power into thrust or traction, and is comparable to a revolving wing or air screw. Theoretically, the most efficient propeller design would be one-bladed, as it would eliminate lowered efficiency caused by the second blade working through the backwash of the preceding blade. But practically, it is not feasible, as it would need to be so much larger than a multi-bladed prop that it would necessitate extra-long landing gears and other undesirable changes in design. In fact, present trends point to three, four, and even six-bladed props to absorb the tremendous power of improved engines. Propeller aërodynamics have kept pace with other aircraft improvements. The first step from the old fixed-pitch type (on the ground) was an adjustable (on ground) metal-prop. Then came the controllable pitch (in flight) type, similar to shifting gears in a car. Now we have electric and hydraulic constant speed propellers which permit high engine speeds for rapid take-offs. On this type the pitch automatically varies for different flight conditions, although the engines maintain a constant speed. . . . Propeller efficiency is constantly under research to take the full advantage of improved engine design.

Exit Balsa—Enter Basswood

BY CLAUDE D. McCULLOUGH

Regardless of WPB's rulings, you'll find basswood has certain advantages over balsa. Here's the lowdown.

"ORDER me a 3 x 3 x 36" balsa block," I said as I rested my elbows on the counter of the local model store. "I've got a swell U-control design with a round fuselage and an elliptical—"

"Roll down your flaps and read this," said the dealer, handing me a sheet of paper, "and don't lean on the counter. You'll wear the paint off, and it's hard to get."

The sheet of paper was dated Monday, August 3rd, and concerned WPB's General Conservation Order M-177, freezing all stocks of balsa wood in excess of 100 board feet. Balsa wood, along with aluminum and steel and countless other materials, had gone to war.

When dealers' stocks of under 100 board feet are exhausted, it is almost certain that there will be no more obtainable for the duration. Not only has the shipping situation made its importation from Ecuador difficult, but many important wartime uses have been found for balsa. It is approximately twice as buoyant as cork and is used by the navy and merchant marine for floats for life lines and life preservers. Its resiliency makes it an excellent shock-absorbing material for packing delicate objects and as foundation pads for machinery. Extensive use is found for balsa wood in refrigerators and cold-storage rooms because of its insulating properties, and it has even been used in the interiors of airliners. Small wonder that it has been withdrawn from use for models.

Of all domestic woods that might be used as a substitute, basswood seems to be the most practical. There are other woods that are lighter, but they are so scarce or inaccessible as to make widespread utilization impossible. Basswood grows in great profusion throughout the northern States, Michigan and Wisconsin producing about half of the annual consumption of some 100,000,000 board feet. The wood is used mostly for furniture, and it is hardly likely that it will become scarce.

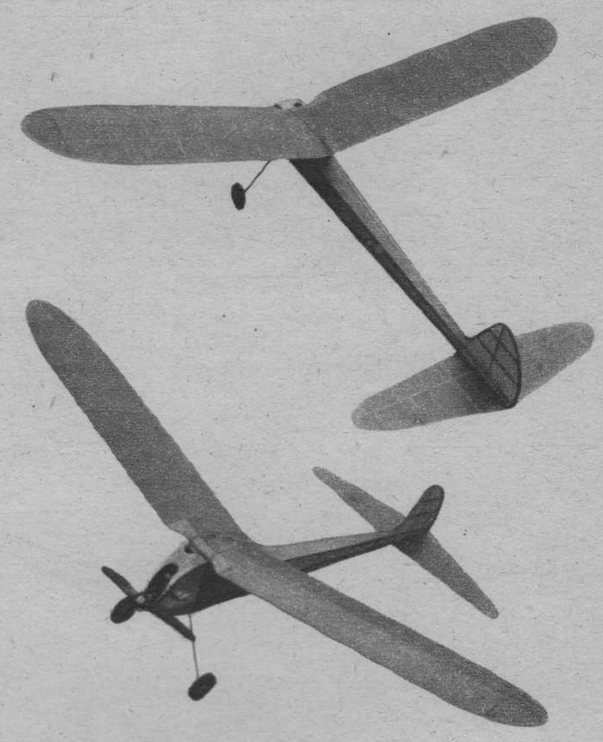
The basswood—or more romantically, the linden—is a soft, fast-growing tree, and its tough inner bark or bast was used in ancient times for mats, ropes and nets. Its light-colored wood is turned easily on a lathe; it is resistant to splitting and is ranked by wood carvers second only to tulip poplar for carving purposes.

Unfortunately, compared to balsa it is rather heavy. Seasoned balsa weighs seven to ten pounds per cubic foot, while a cubic foot of basswood weighs twenty-eight pounds. However, since it has a higher tensile strength it can be used in smaller sizes than balsa, partially compensating for the weight disadvantage.

Manufacturers have already introduced cut sizes of basswood, basswood solid model and naval identification model kits, and have replaced some of the balsa parts in kits with basswood. It is now available in the following dimensions: $^1/_{16}$" and $^1/_8$" square; $^1/_{28}$", $^1/_{16}$" and $^3/_{32}$" flat, and in several assorted sizes in strips. Prices are the same as for balsa of *(Turn to page 46)*

Try this job on your Class B motors and see for yourself the advantages of hardwood construction. Neat cowl and sleek lines for performance.

Pinch Hitter



BY PAUL PLECAN and GIL SHURMAN

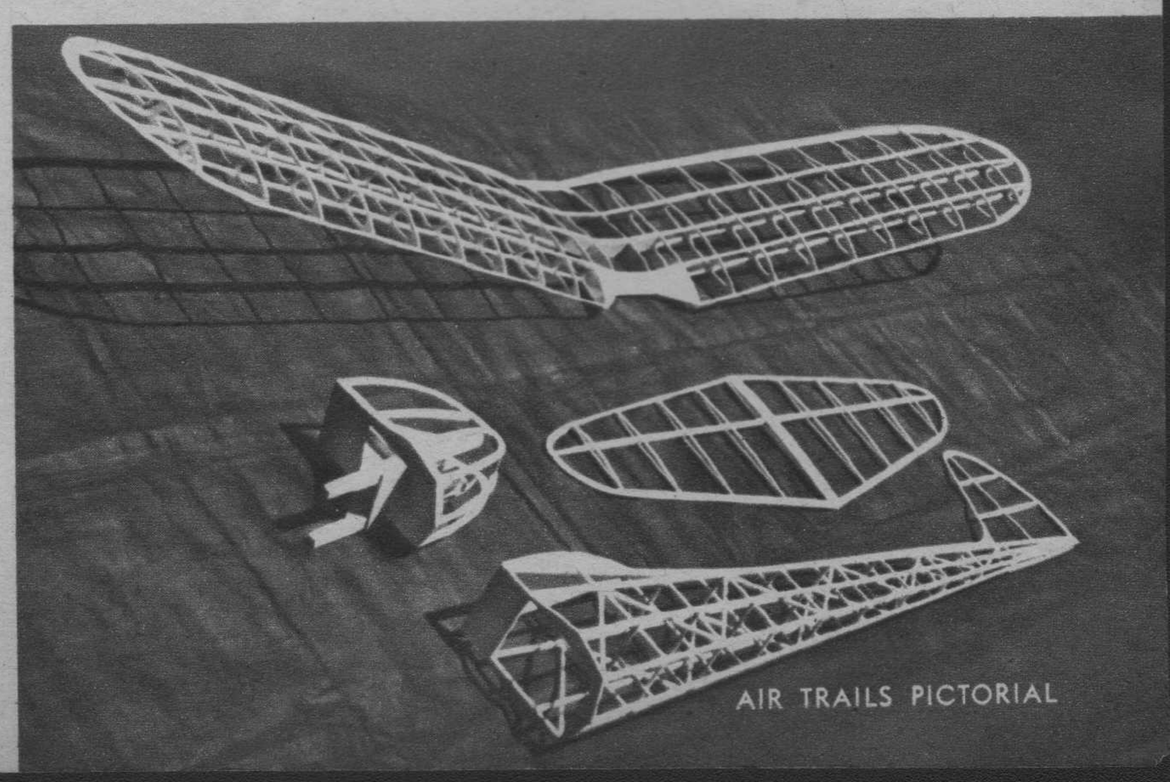
No balsa? Don't worry! Learn all the secrets of hardwood technique by building this "substitute" gas job.

HERE y'are, boys—a gas job, complete, ready to fly, without even a splinter of balsa in it. Here are some of the advantages: First, it's cheaper, as you can always pick up some scrap pine or spruce and have a friend strip it for you. Second, the all-hardwood construction makes possible a tough and resilient framework that can "take it" better than any balsa model. The design lends itself to contest work very well—what with its thin flying surfaces, general slimness, high-lift airfoil, generous moment arm, and reflex section stabilizer airfoil. If you have a Rogers 29 or similar motor on hand, try building this unusual ship.

The original model gave the authors quite a shock in that it didn't quite reach weight rule, necessitating additional doping and heavier batteries. The most outstanding characteristic, however, is the flexibility of the model. Subjected to plenty of flying and transportation manhandling, the model is still in perfect condition. Impacts have shattered the tissue at times, but the framework is still as sound as the day it was assembled.

You, too, can make the Pinch Hitter. It's easy. First, two main side frames are constructed of $^1/_8$" square pine, spruce, or what have you. Even mahogany is O. K., but don't saw *(Turn to page 64)*

Designer Plecan shows how to use simple framework and still have looks.

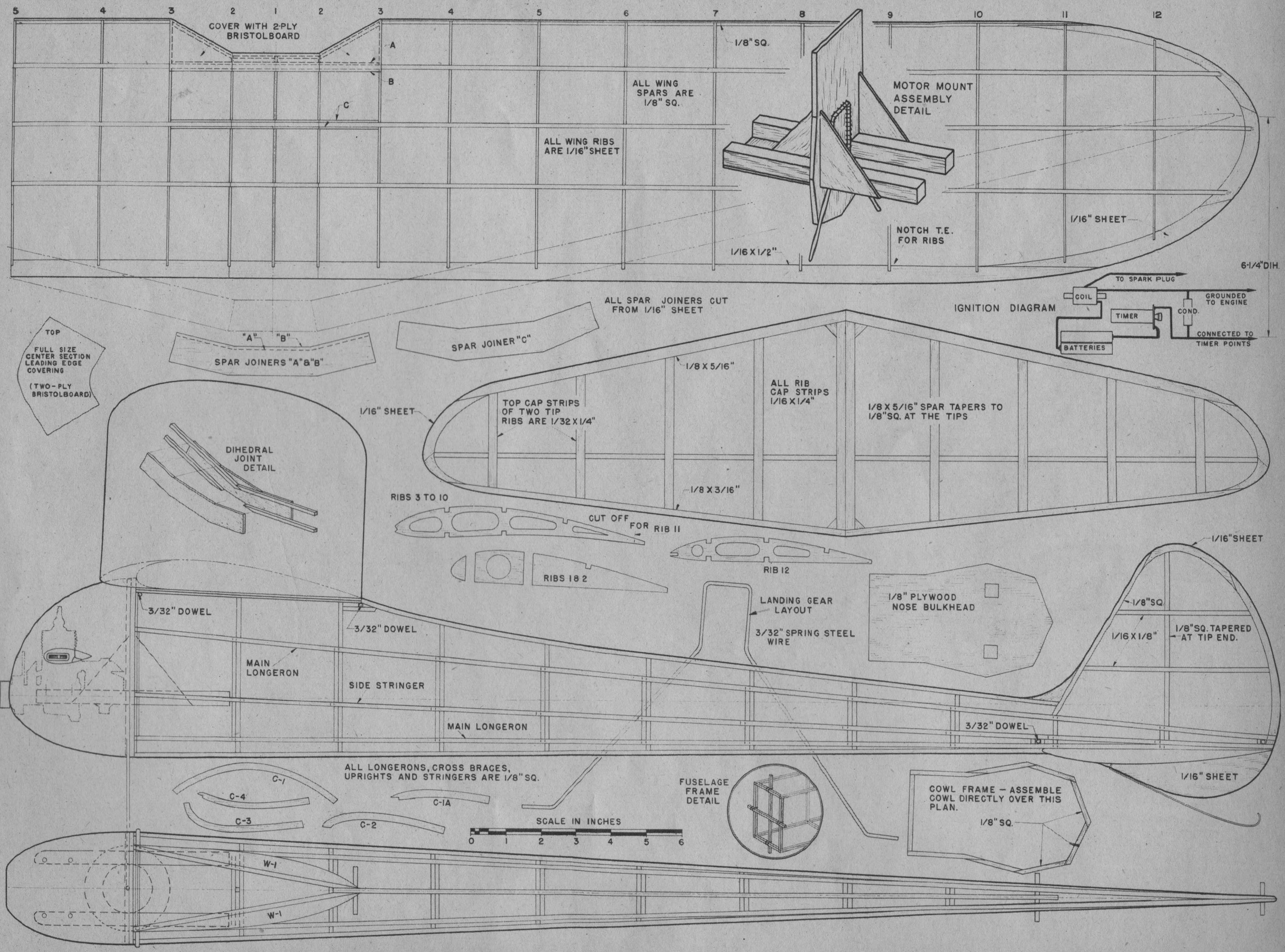


NOVEMBER, 1942

15c

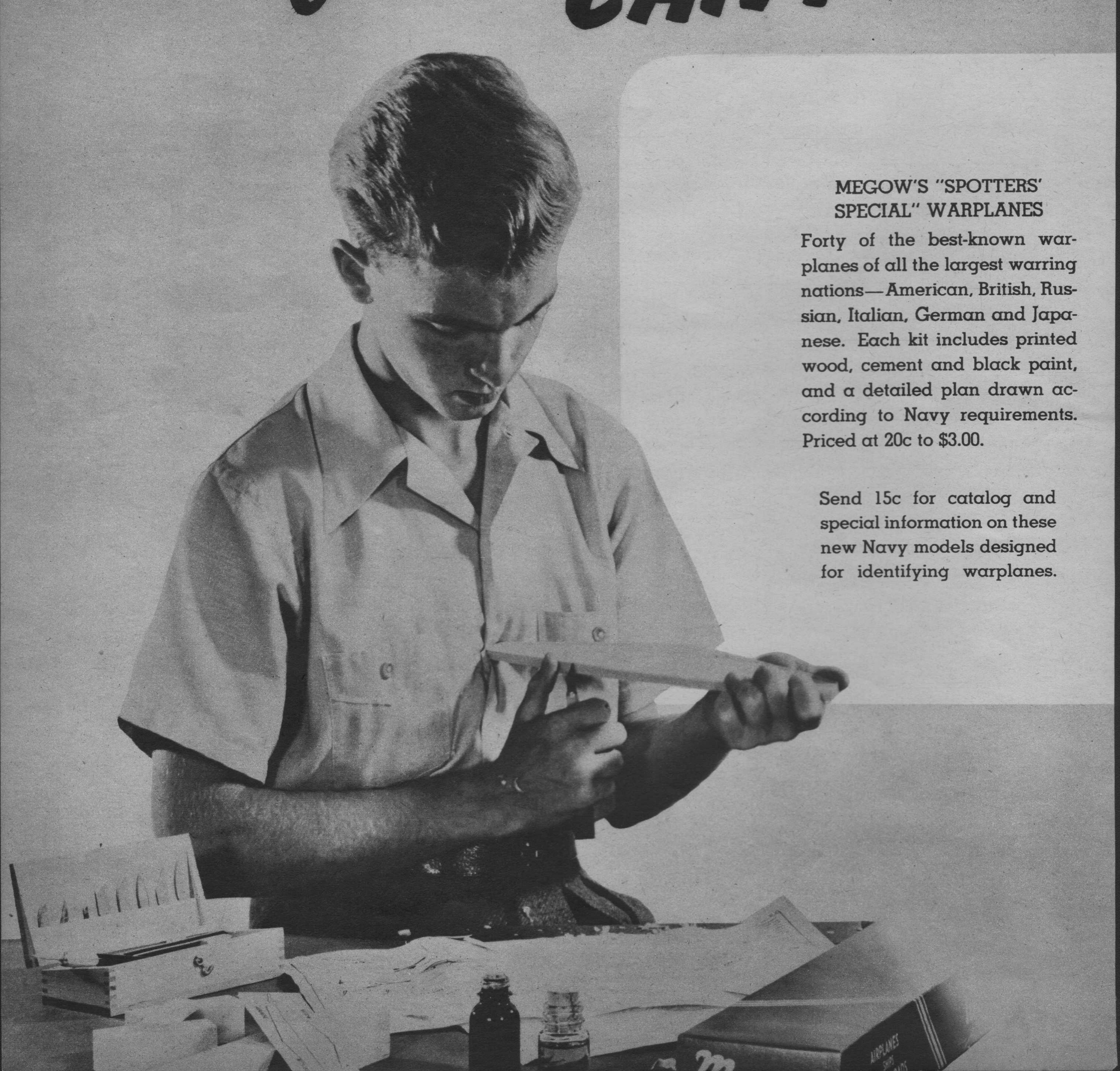
FULL-SIZE PLANS of this model may be obtained by sending fifteen cents to

AIR TRAILS FULL-SIZE PLANS, 79 Seventh Avenue, New York, N. Y.



PLANS DRAWN BY PAUL PLECAN — INKING BY GIL SHURMAN

THE INGENUITY of American CAN'T BE

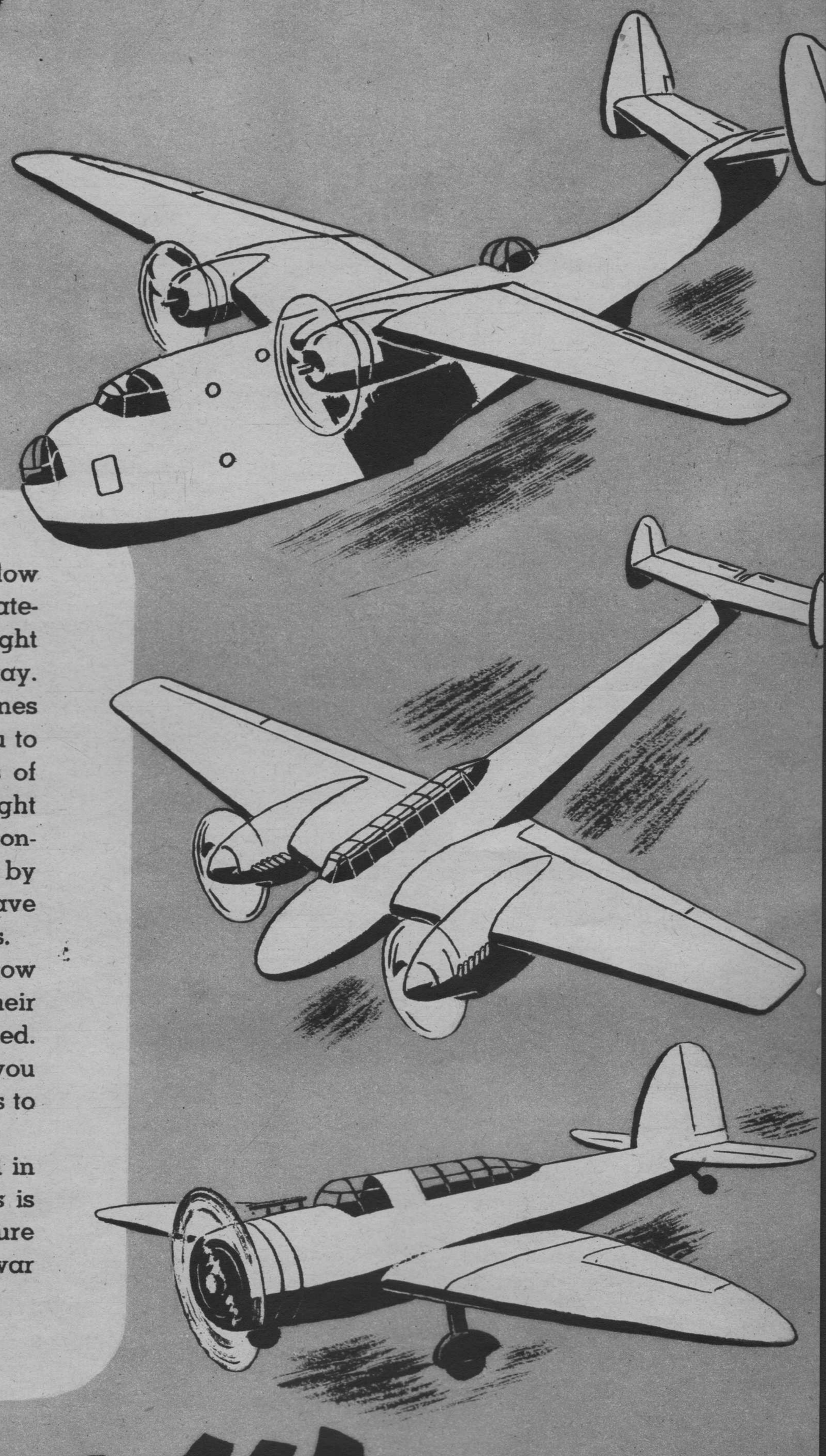


MEGOW'S "SPOTTERS' SPECIAL" WARPLANES

Forty of the best-known warplanes of all the largest warring nations—American, British, Russian, Italian, German and Japanese. Each kit includes printed wood, cement and black paint, and a detailed plan drawn according to Navy requirements. Priced at 20c to $3.00.

Send 15c for catalog and special information on these new Navy models designed for identifying warplanes.

Youth LICKED!



THE BUILDING of model airplanes makes a fellow skillful and ingenious. Take his favorite material, balsawood, away and he will still go right on building more and better models every day.

The use of balsawood in model airplanes has been restricted, but Uncle Sam doesn't want you to stop building models. In fact, he needs thousands of model airplanes and he is anxious that you keep right on developing your skill. All he asks is that you contribute to the war some of your ability and ingenuity by finding and using other materials, so that he can have the balsawood for life rafts and other war essentials.

Megow foresaw this situation months ago, and Megow engineers have re-designed Megow models so that their lightness and other advantages will be maintained. They show you *how*—and all that is required from you is a little more time in construction. The main thing is to KEEP THOSE WAR MODELS COMING THROUGH!

A large part of the Megow plant is now engaged in war production, but the production of regular lines is continuing. If an occasional delay occurs, we feel sure our dealers and customers will understand that war needs come first.

Megow

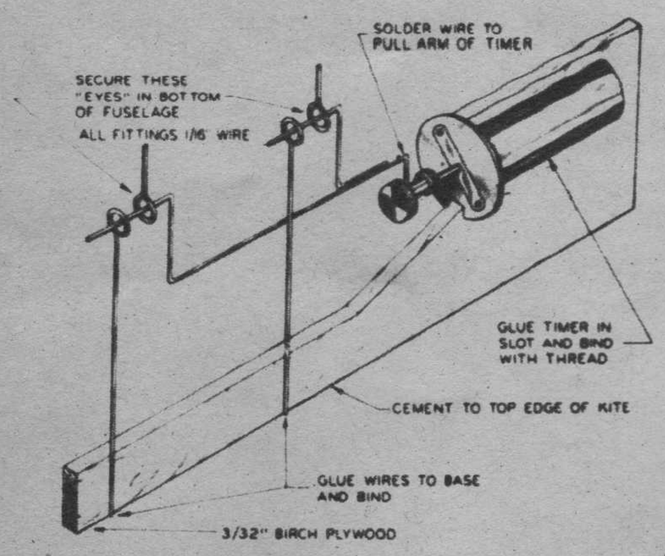
WORLD'S LARGEST MANUFACTURER OF MODEL AIRPLANES • SHIPS • HO-GAUGE RAILROADS

From Box Kite to the Clouds

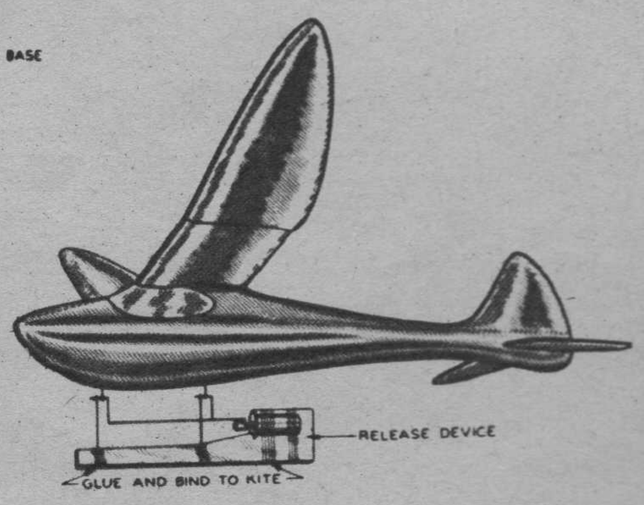
BY FRANK EHLING

MODEL glider launching technique is liable to prove difficult to the beginner, since a model that is adjusted for small-diameter circles in order to keep in thermals will usually prove erratic during the tow launch. However, all this trouble may be eliminated with this novel box-kite launching system.

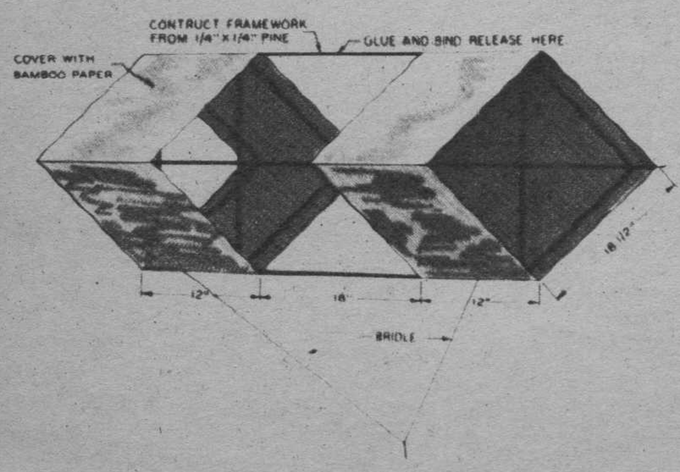
The author has found that by using the box kite it's possible to launch your glider from any altitude up to 500 feet. Windy weather, previously a handicap for ordinary launching methods, now works to our benefit by allowing the box kite more easily to lift the additional weight of a glider. But gliders designed to operate in a slight wind must have incorporated features for additional stability such as ample dihedral and stabilizer area. It is best to use a short moment arm of about two to one so that you can adjust for a slight stall and tight circle to take advantage of every slight thermal. This arrangement seems almost to climb on every gust of wind. Longer moment arms make the recovery from stalls too long and are also *(Turn to page 52)*



Assembly view showing release attached to glider. Care must be taken in lining up the fittings. With this device it's possible to launch your glider from any altitude. The timer can be adjusted for thirty minutes.



Drawing of glider release, showing how the glider is secured to the top of the box kite by two small "eyes" glued to the bottom of the fuselage. Use a fairly stiff wire for all fittings to assure a smooth-working mechanism. Bind and glue timer securely to the plywood framework.



This box kite should be a simple project for any model builder. Construct the frame from ¼" square pine strip. Bind and glue all joints. Cover with heavy gas-model tissue and do not dope. Glider release is cemented to the upper top longeron. Experiment with different kinds of bridles for varying winds.

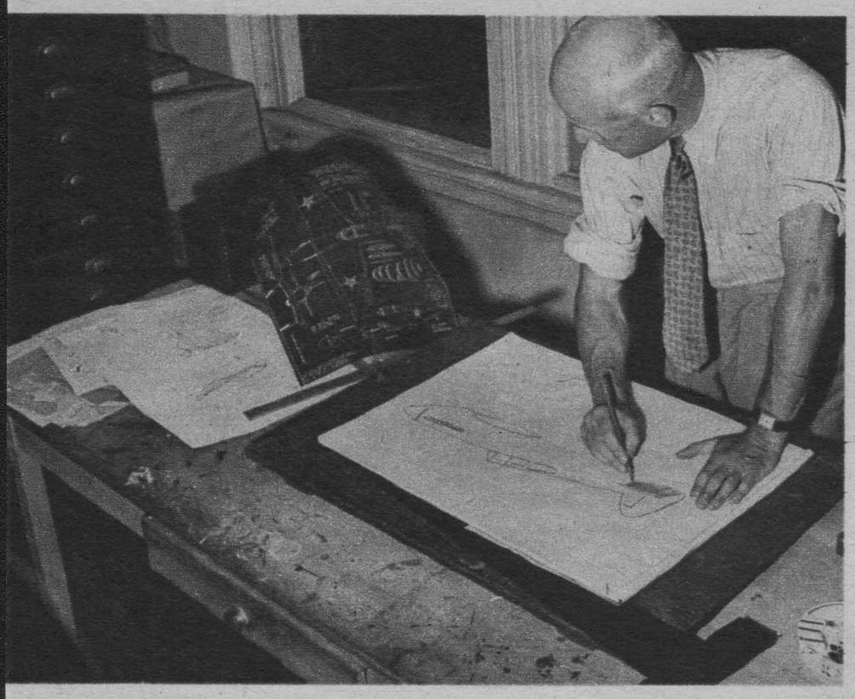
Rigby—

WALLACE RIGBY'S New York studio is cluttered up with paper—in such interesting forms as a paper Superman who glides through the air and overhead monorail train cars. This cheery, lively Englishman creates realistic models of airplanes, boats, autos and whatnot, all in paper, that have made him internationally famous. He's an enthusiastic model-plane builder from way back, with all a builder's experiences. Once, testing his Wakefield on a foggy night, he wound to capacity, hand-launched, listened to the whirring sound. Then silence. He groped across the field after his ship—and yes, it flew smack into the back of his head. Also, he's had his models (paper) eaten by animals—by goats at Gibraltar, dogs in England, even by pigs. But he keeps making new ones, for kits, comic strips, books (his latest book of cut-out planes sold over 30,000). Besides floating paper gliders from his eleventh-story window for relaxation, he likes to remember an incident at Lake George, N. Y. Rigby was showing some boys how his paper models flew. Suddenly a speedboat cut across the lake, and out hopped an excited young man who said: "May I see that model? I know of a fellow in England who makes paper planes just like it—fellow name of Rigby."

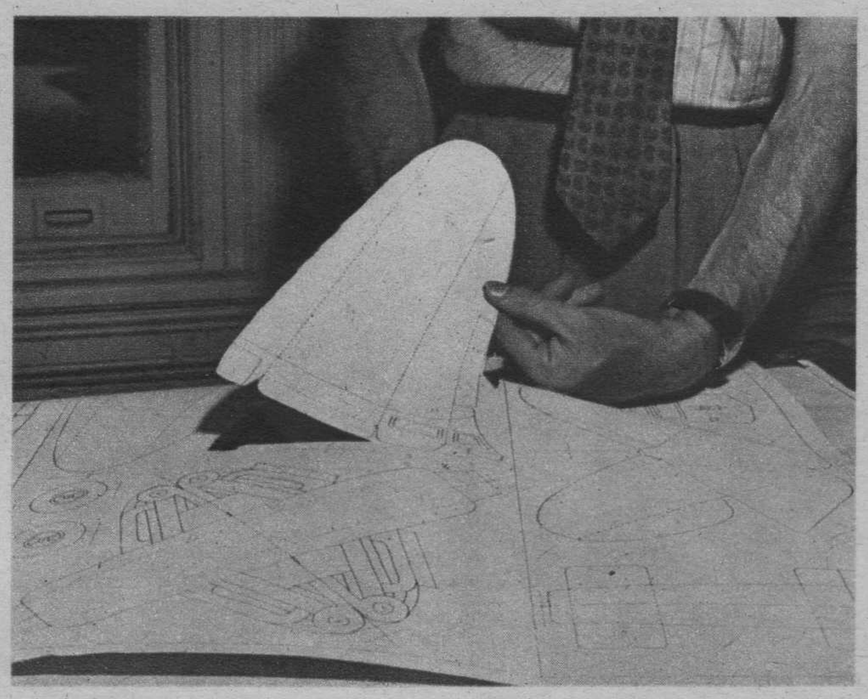
Model-maker Rigby carefully checks finished model against his paper layout to see that when plans are printed they may be successfully cut out, assembled.

The Paper Man

What, paper models that can fly? Rigby's been making 'em for years; here's the inside on his famous design procedure.

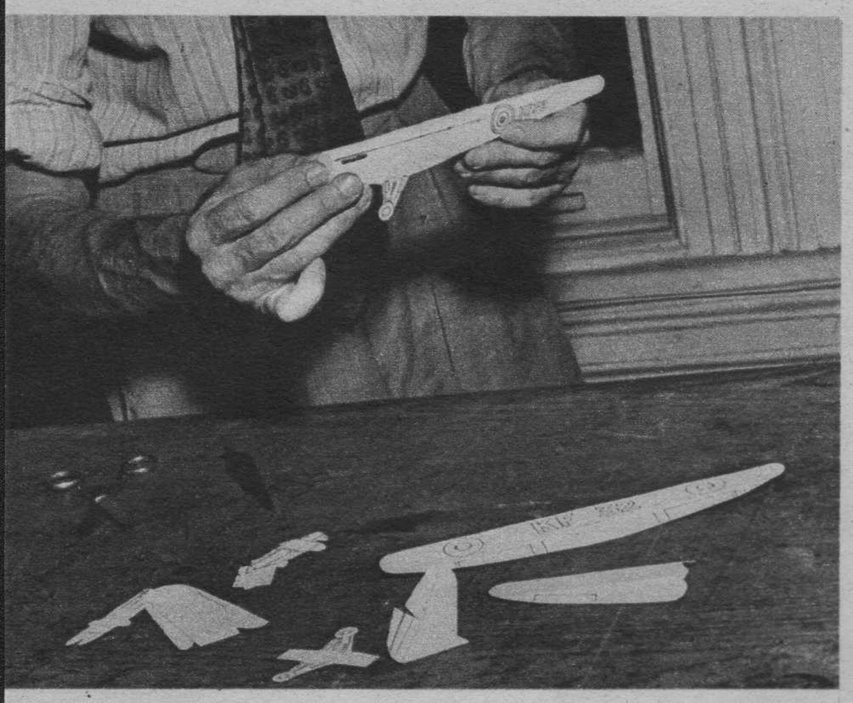


First step in design is to find authentic three-view drawings of the plane. Next, redesign for paper work.

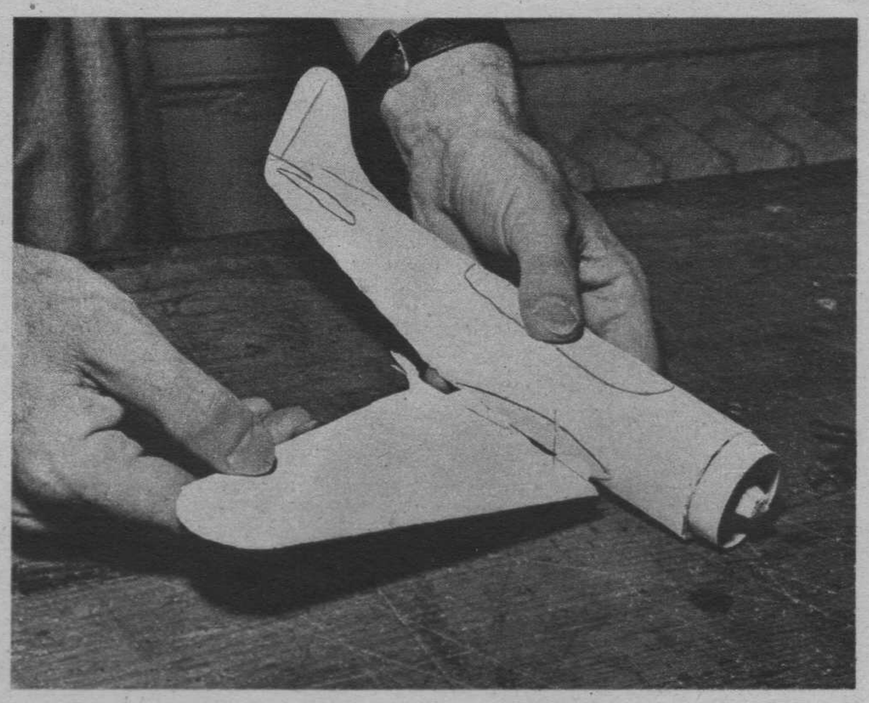


It calls for quite a knowledge of geometry to transfer all the curved surfaces of the plane into accurate flat projections.

Rigby uses a very sharp model-making knife to cut out various model pieces.

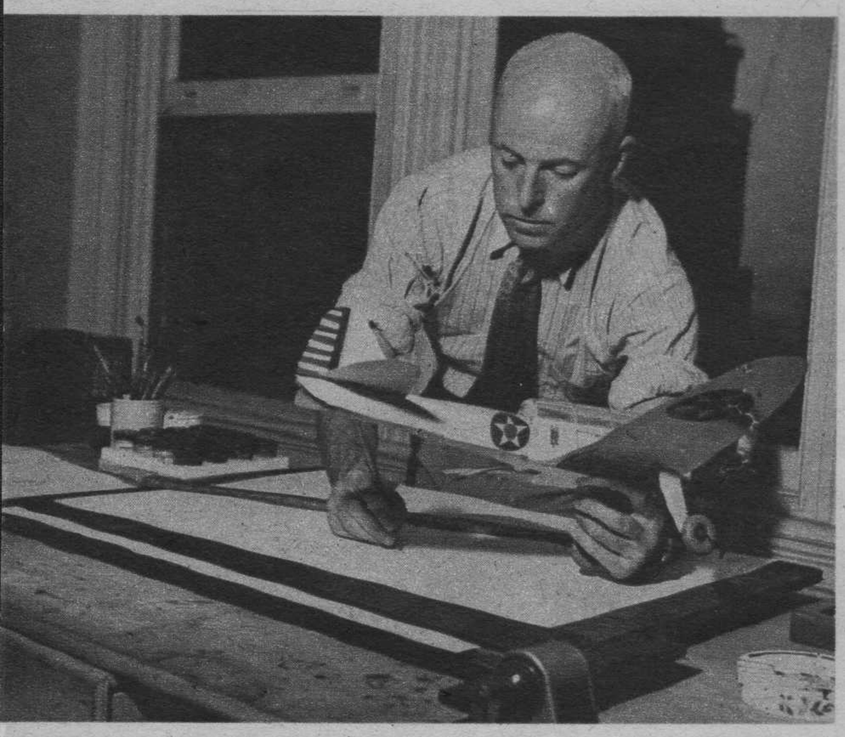


With a few deft folds and creases, the fuselage appears in three dimensions from thin cardboard.



Wings fit smoothly into finished fuselage. Rigby has developed different types of wing fittings to simplify assembly.

All models are carefully decorated to correspond accurately with original planes.



After finishing the original model, Rigby makes necessary changes and draws finished plans for the printer.

Here's the finished model being test-hopped. Don't be fooled; paper models can compete with any usual balsa model.

There's no size limit with paper models as proved by this example. Both fine fliers.

Needlessly technical articles make aerodynamics a bugaboo. This series presents the important facts in an easy-to-read way.

Glide

BY GEORGE H. TWENEY

ACTING DIRECTOR DEPT. OF AERONAUTICS, UNIV. OF DETROIT

LAST month we discussed the various factors which affect the climb characteristics of an airplane, and as a foundation for that study we analyzed the forces acting on an airplane in normal horizontal flight.

Let us next consider the flight of an airplane while "gliding" under the influence of the force of gravity, and without the use of the engine. In this study, we shall have to recall from time to time the various forces which act on the airplane in level flight, and the relationship of those forces to one another. So, it might be well to have your copy of Air Trails Pictorial, with the first article in it, right beside you as you read this discussion of the glide.

Of the four forces, *lift, weight, thrust,* and *drag,* we now are deprived of the thrust, and therefore when the airplane is traveling in a steady glide it must be kept in a state of equilibrium by the lift, drag and weight only. This means that the total reaction—that is, the resultant of the lift and the drag—must be exactly equal and opposite to the weight. A glance at Figure 1 will illustrate this point. If the reader remembers the original definitions of lift and drag, he will realize that the lift now is not vertical, but at right angles to the path of the glide, while the drag acts directly backward, parallel to the gliding path.

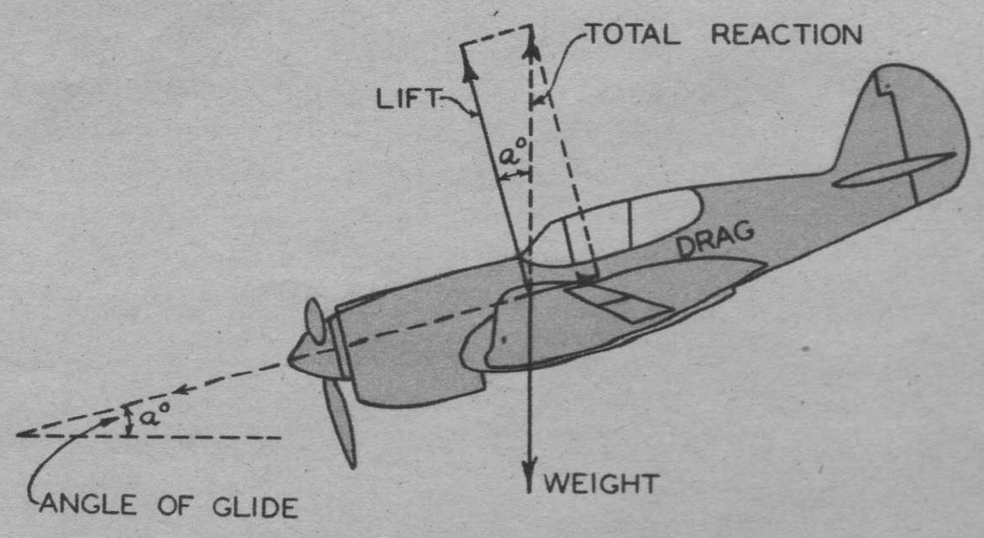


FIG. 1: FORCES ON AIRPLANE IN A GLIDE.

Referring again to Figure 1, by a process of simple geometry, it is easy to see that the angle formed between the lift and the total reaction is the same as the angle "a" between the path of the glide and the horizontal, which is called the *gliding angle.*

Therefore (by trigonometry):

$$D/L = \tan a.$$

This means that the less the value of D/L—in other words, the greater the value of L/D—the flatter will be the gliding angle. This is a very important factor governing the selection of an airfoil section for an indoor endurance model or a gas model. The model builder wants both these types of ships to have as flat a gliding angle as possible in order to increase the endurance, so an airfoil with a high value of L/D should be chosen.

From the above simple fact we can easily come to some very important conclusions; for example:

(1) The gliding angle is directly dependent on the L/D, which is really the efficiency of the design of the airplane; and, therefore, the more efficient the airplane, the farther it will glide. Expressing this the other way around: the measurement of the angle of glide will give a simple estimate of the efficiency of the airplane.

The word "efficiency" is apt to have a rather vague meaning, and the reader must understand that we are using it here in a particular sense only. We are not concerned with the efficiency as regards engine power, nor with the merits of its internal structure from the standpoint of a high strength/weight ratio. We are concerned only with the success, or otherwise, of the designer in obtaining the maximum amount of lift with the least amount of drag, or what is sometimes called the "aërodynamic" efficiency of the airplane. For example, our conclusion shows that any improvement in streamlining which reduces the drag will result in a flatter gliding angle, thereby improving the "aërodynamic" efficiency of the airplane.

(2) If an airplane is to glide as far as possible, the angle of attack during the glide must be such that the lift/drag ratio is a maximum. This means that the angle of attack during a long glide will be very nearly the same as the angle of attack during normal flight.

In connection with the above conclusion, we might note that the model builder sets the wings of his model at a small angle of two or three degrees (the angle of incidence). This is done while the airplane is in the position of normal horizontal flight, and this angle is chosen to give the airplane the best efficiency during such flight. This efficiency, like that for the glide, is chiefly a question of L/D, and the value of L/D will be very nearly the same in each case, although it is true that it may be slightly affected by the slipstream when the propeller is running. Of course, it does not follow that because the L/D of the wings is greatest at say, three degrees, that the L/D of the complete airplane is also greatest at the same angle. This, however, is approximately the case.

(3) If the model attempts to glide at an angle of attack either greater or lesser than that which gives the best L/D, then in each case the path of descent will be greater.

Perhaps this conclusion may be considered superfluous, as it is simply another way of repeating the previous one. It is purposely repeated in this form because there seems to be such a strong natural instinct on the part of students of the subject to think that, if the airplane is put in a more horizontal position it will glide farther. Even if one has never flown, it is not difficult to imagine the feelings of a pilot whose engine has failed and who is trying to reach a certain field in which to make a forced landing. It gradually dawns on him that the way in which he is gliding he never will reach the field!

What then could be more natural than that he pull up the nose of his airplane in his efforts to reach it? What happens? In answer to this question the student often says that he will stall the airplane. Not necessarily. He should, in the first place, have been gliding nowhere near the stalling angle but at an angle of attack of only three or four degrees, so that he has many degrees through which to increase this angle before stalling. But what will happen most certainly is that the increase in angle will decrease the value of L/D, thereby increasing the gliding angle and, although the airplane will lie flatter to the horizontal, it will glide toward the earth at a steeper angle, and will not travel as far as it would have otherwise.

The air speed during such a glide will be less than that which gives the best gliding angle.

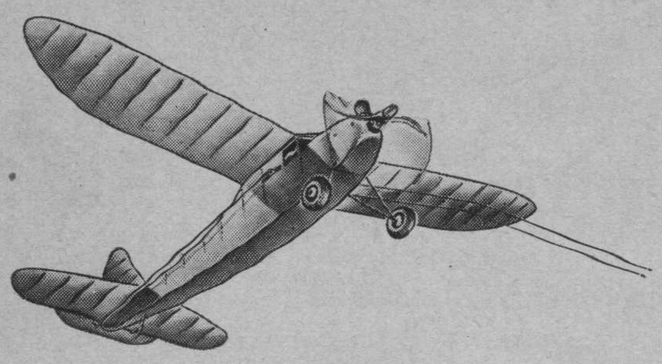
Suppose, on the other hand, that when a pilot is gliding at the angle of attack which gives him his greatest value of L/D, he puts the nose of the airplane down. This will decrease the angle of attack which, as before, will decrease the value of L/D. Therefore the steepness of the gliding path increases, but this time the air speed will be greater than that which gives the best gliding angle.

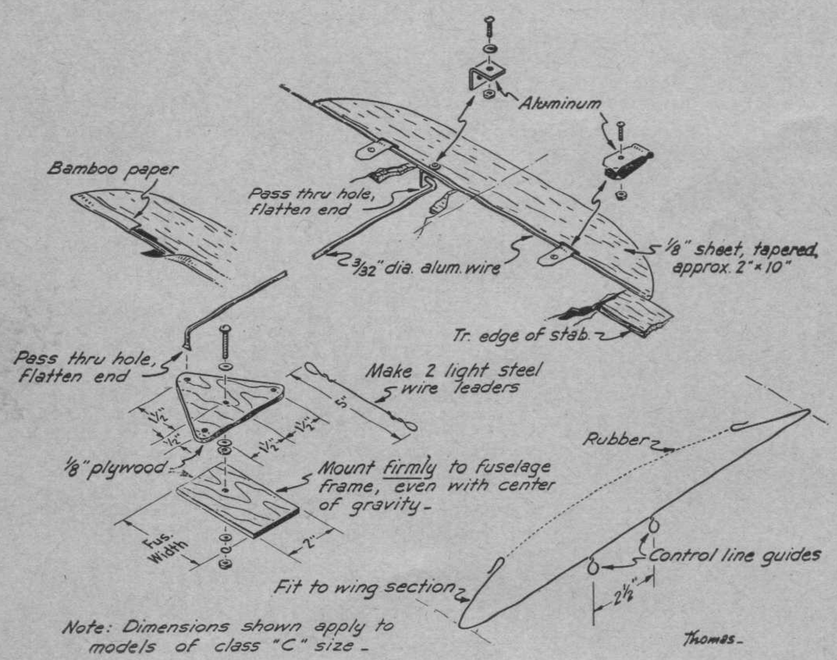
The reader should remember that all we have said above with reference to gliding must be considered as relative to the air. To an observer on the ground, an airplane gliding into the wind may appear to remain still, or in some cases even to ascend. In such instances there must be a wind blowing which has both a horizontal and an upward velocity, and to an observer traveling on this wind in a balloon the airplane would appear to be traveling both forward and descending. When viewed from the ground, an airplane gliding against the wind will appear to glide more steeply, and when gliding with the wind will appear to glide less steeply than the real angle relative to the wind.

Removable Control Unit

BY H. A. THOMAS

Equip your ordinary gas buggy for control-line flying with this removable unit. It's an easy method of learning how to handle the ropes.





MANY control-line flying fans are so impressed with the zippy performance of the tiny, clipped-wing racing models that they overlook the possibilities of larger, slower-flying controlled models. Instead of hand-launched starts and cartwheels at the end of each flight, larger models are capable of graceful take-offs and realistic, three-point landings. Slower speed makes for less critical control, giving the beginner a better chance to "solo" successfully.

Why not equip your regular gas model with this removable U-control system? Then you can fly it at the nearest playground as a controlled model or quickly remove the controls for free flights.

For best results, make these adjustments to your model before attempting controlled flights. Move batteries forward, or otherwise adjust model for less climb, loosen motor bolts and shift engine for maximum right thrust your mounts will allow, and bend the rudder tab to full right position. (These are for counter-clockwise flights.)

Install the control as shown. The push-pull rod may connect outside the fuselage as shown on the sketch, or it may enter the fuselage and connect from within. If the model is a large one, a wire alignment guide may be cemented to the fuselage halfway to the tail to prevent the aluminum wire from bowing. A ten-inch length of dowel will do for a control stick, the ends being notched to hold the lines securely. Light fly-fishing line is fine for the control lines. Heavy, large-size fishing line is unsatisfactory both from the standpoint of weight and wind resistance.

Fast controlled models usually have limits to elevator travel to prevent over-controlling, but this is not necessary for slower flying models. In fact, almost full up-elevator is needed for a slow, three-point landing.

★ ★

The Commando

BY LLOYD V. HUNT

CONTROL-LINE flying has zoomed its way into the workshop of almost every modeler in the country. But some builders have not the powerful motors necessary for speed for big ships. So I sat down and designed a very small model for the Atom. The first one I built had a nine-inch span, but when in flight it would spin, so I changed it. I made the span ten inches long and made the stabilizer bigger. After that it flew very well for its size. In building a model of this kind it should be made of one-eighth-inch material for the body and one-sixteenth sheet for the formers. The stabilizer and rudder should be made out of one-eighth-inch material and then sanded down to size. I found that a model of this size should have no warpage at all. If it has it will not fly. The coil and batteries should be about in the middle of the center of gravity. Your rudder should be turned about five eighths to the left or right, whichever way you are flying it. The wing construction should be made very strong because of the strain. I found that a thin airfoil gave more speed. The ship should be hand-launched. The control lines can be made out of strong fish line, twenty to twenty-five feet long. I feel that in the future there will be many models of this size and different designs, and I am sure that the boys who build them will be very much pleased.