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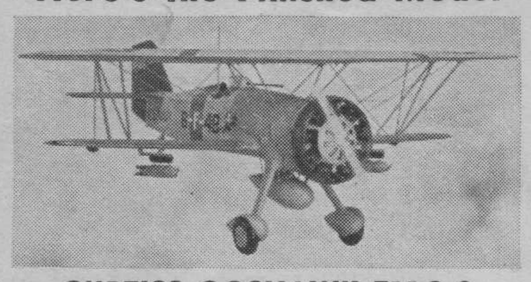

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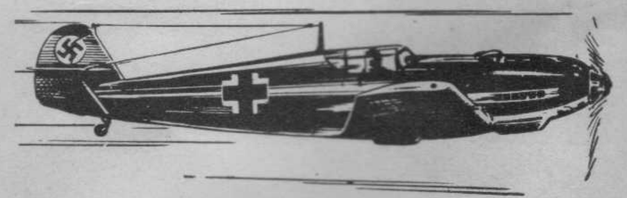

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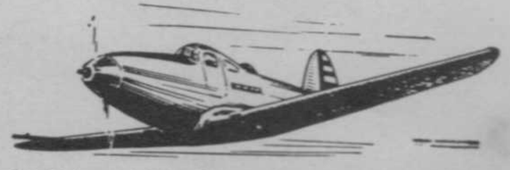

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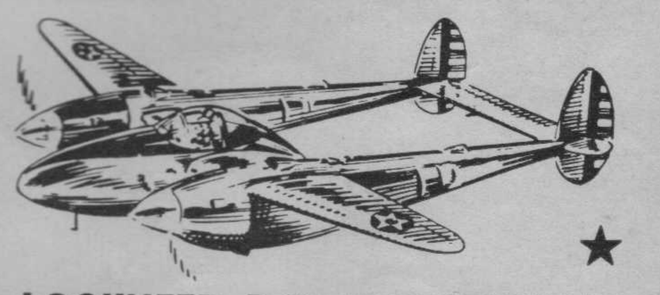

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DECEMBER, 1941 — VOLUME XVII NO. 3
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FEATURES

DEPARTMENT

MODEL SECTION

FULL-COLOR COVER PHOTO OF STANDARD U. S. FIGHTERS
BY RUDY ARNOLD

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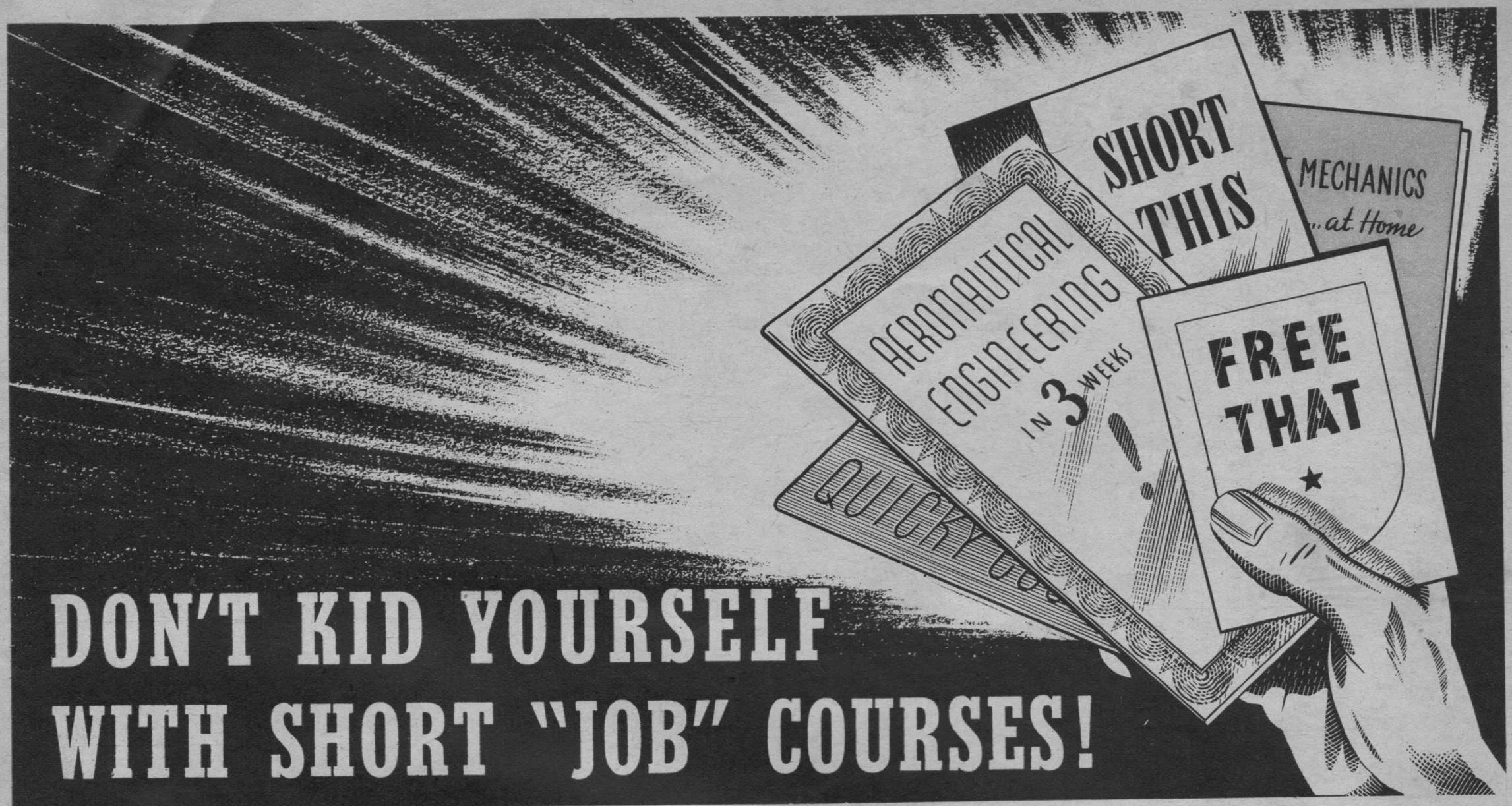

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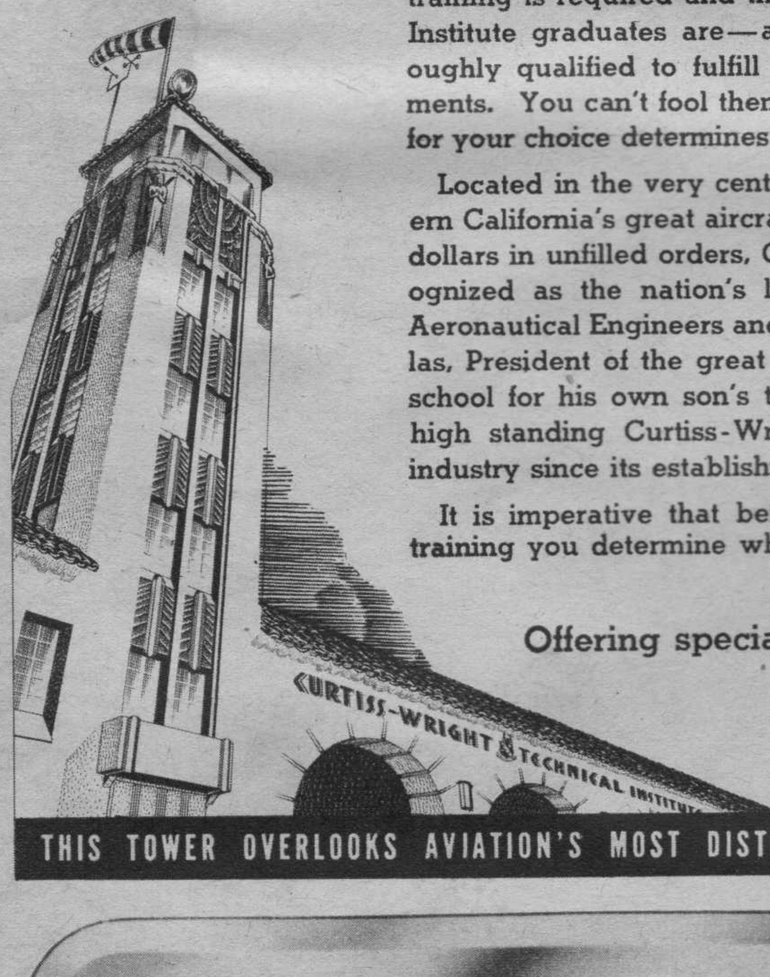

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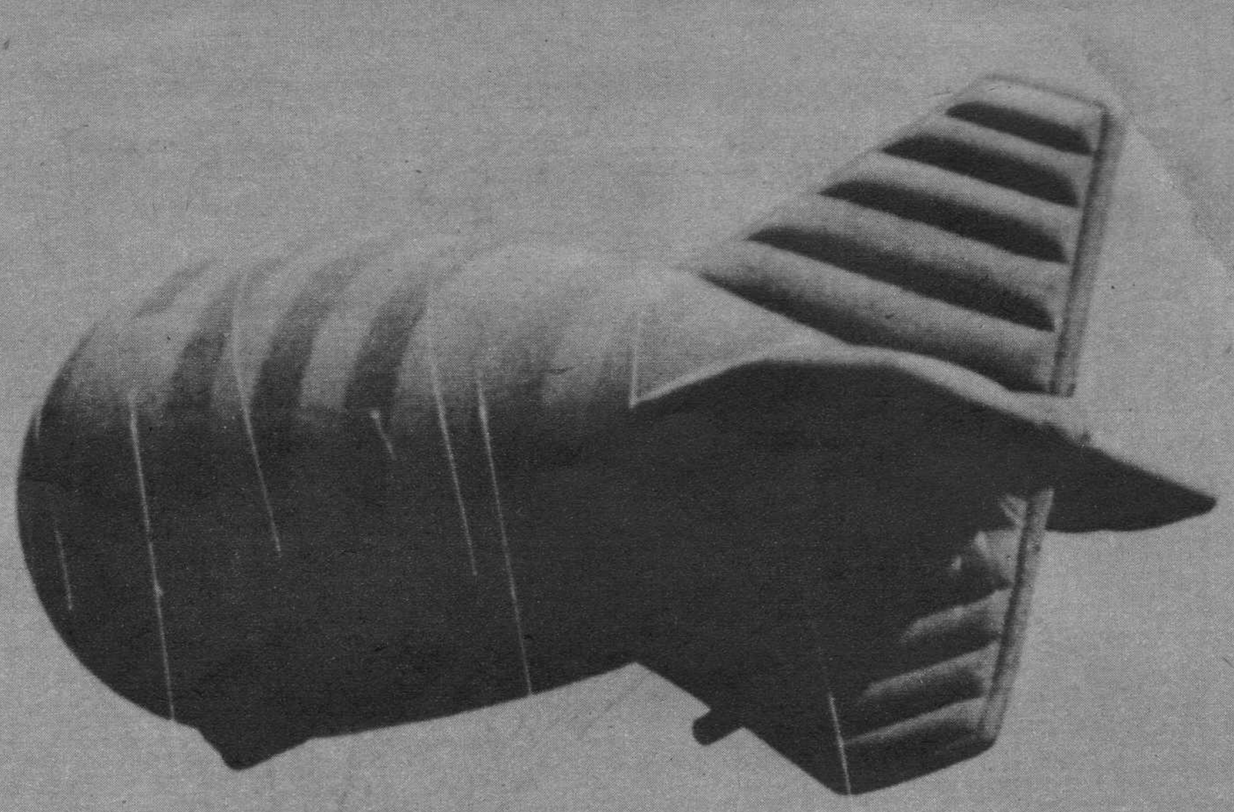
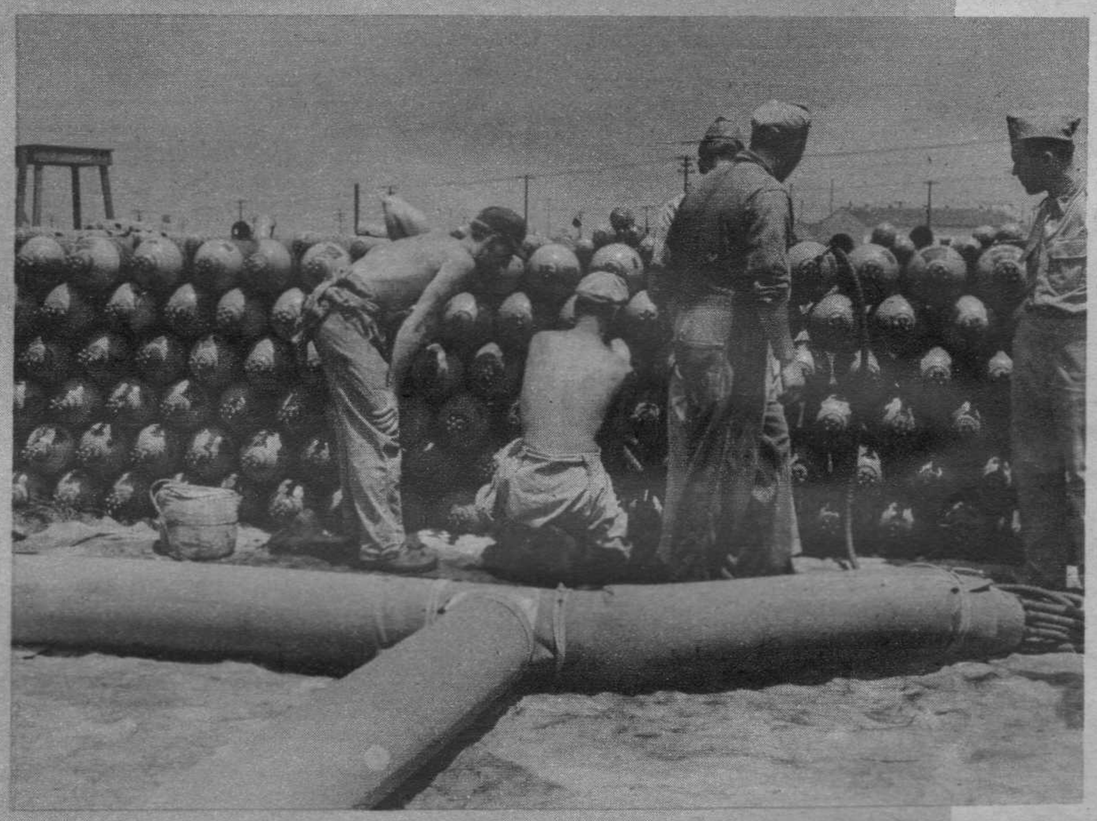


Menace to enemy bombers, our barrage balloons require thousands of trained men.

Laying out the balloon before it is inflated. Coast guard artillery and the air corps are training 3,000 men at Fort Davis, in North Carolina.



20,000 cubic feet of helium is fed into each barrage balloon from 150 of these gas cylinders. T-shaped pipe in foreground leads to the balloon.

Hanging on the ropes. Balloon is ready for ascension and sand bags are being removed. Balloons prevent dive bombers from coming real low.

Left above—Curiosity killed a cat. Supervisor crawls into balloon to look for leaks. Right—A rigger marks leak with chalk for subsequent patching.

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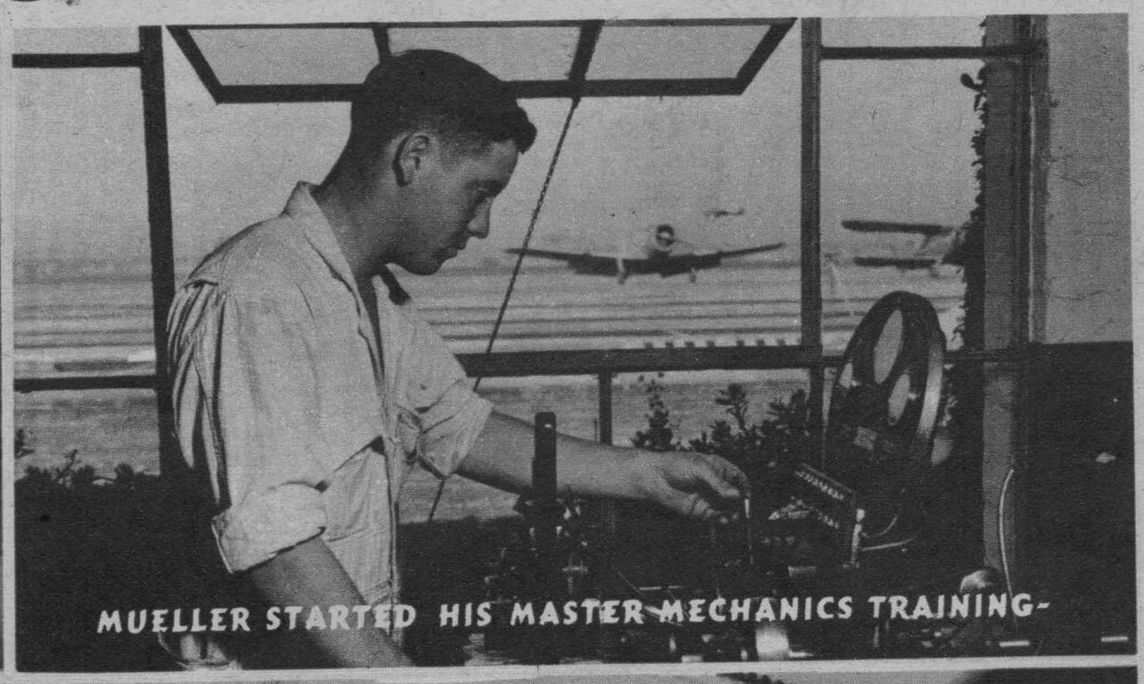

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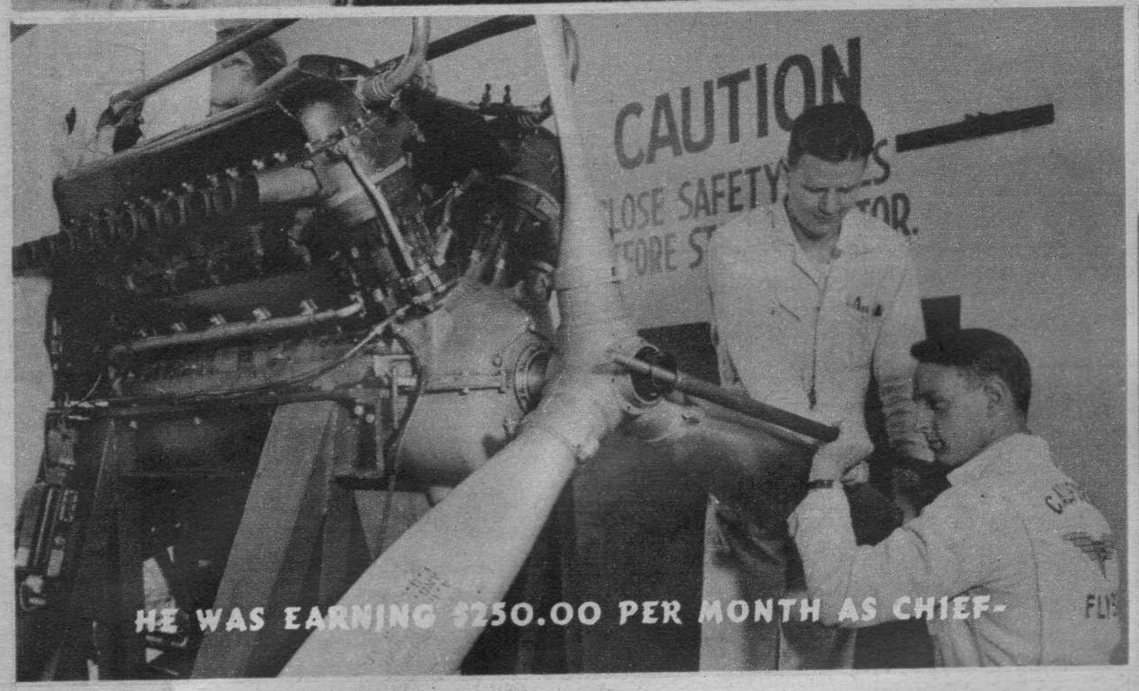

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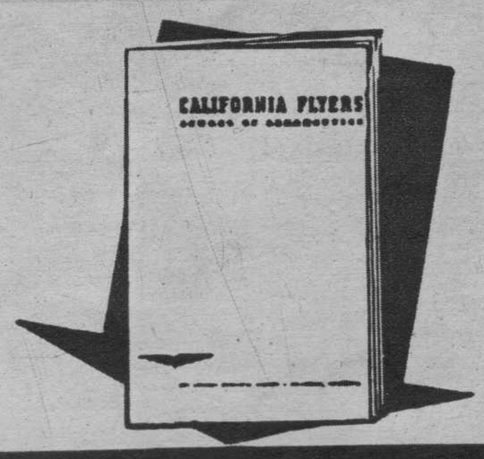

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WHAT'S YOUR QUESTION?

QUESTION: Could you tell me whether the Vought-Sikorsky XF4U-1, the Grumman Skyrocket, North American XP-51 Apache and the Vultee Vanguard have been put into production in a big way? Has any of them been discarded? C. C., Indianapolis, Ind.

Answer: Sorry, but we have no information in regard to production figures of the above-mentioned airplanes.

Question: Is it true that one must belong to the National Aeronautic Association in order to set an official record with a model? How can one join the N. A. A. and the Academy of Model Aeronautics? G. N., Los Angeles, Calif.

Answer: Yes, you must belong to the National Aeronautic Association in order to make official any records established by model planes. Write to the headquarters of these organizations at the Willard Hotel, Washington, D. C., for membership application blanks.

Question: I would like to know what the world's gliding records are. Would a glider with a wing span of 35 feet be any good? B. D., Fairmount, W. Va.

Answer: In our July, 1941, issue of Air Trails we published an article on all records established by gliders. Send 15 cents for it to Mr. Clifford of our circulation department. If properly designed and built there is no reason why a glider with a 35-foot wing span should not be good.

Question: What does a student's permit entitle its holder to? Could a person who wears glasses get a private pilot's certificate? On an average, what would a private pilot's certificate cost? J. H. D., Cochranton, Pa.

Answer: A student pilot's certificate permits its holder to fly solo or solo cross country, provided that he has had at least 8 hours of dual instruction. On these flights he is not permitted to carry any passengers. If the person's vision is brought close to normal by use of eyeglasses, he can then qualify for a private certificate. The average cost of a private certificate is between $250 and $300.

Question: Could you tell me what would happen to the Sikorsky helicopter if its engine would suddenly stop in flight? H. C. and K. H., Ozone Park, N. Y.

Answer: There is a clutch arrangement on the Sikorsky helicopter between the engine and the main rotor which disengages the rotor from the engine and lets it freewheel through air pressure; the main motor is connected to the tail rotors, so that they also turn, and therefore the whole ship can be landed safely under full control.

Question: How old does one have to be in order to receive flight instructions? Is the North American Apache as good as the Curtiss P-40? L. S., Riggs, Calif.

Answer: The minimum age at which one can get flying instructions is 16. Sorry, we cannot answer your last question. Only a person who has flown both types of airplanes would be qualified to judge.

Question: Please tell me and my friend what is the streamlined object under the SBC-4 dive bomber pictured in Air Progress for 1940. M. S. and R. O. W., Kansas City, Kan.

Answer: The streamlined object beneath the SBC-4 is an auxiliary gas tank.

Question: Now that the navy has taken over Floyd Bennett Field, Brooklyn, N. Y., are there any private airplanes there? If not, where did they go? Is Rudy Arnold still located there? M. M., Brooklyn, N. Y.

Answer: There are no private airplanes at Floyd Bennett Field; they have gone to different airports located in the vicinity of New York City, such as Sunrise Airport, Flushing, Roosevelt Field, et cetera. Rudy Arnold's address is now P. O. Box 60, Sheepshead Bay Sta., Brooklyn, N. Y.

Question: From three different sources I have found the specifications of the Messerschmitt Me-109 to be as follows: Span 32 ft. 6 in., length 32 ft.; span 34 ft., length 30 ft.; span 32 ft. 6 in., length 28 ft. 10 in. Which is correct? W. K., Cleveland, Ohio.

Answer: The correct dimensions of the Messerschmitt Me-109 are: Wing span 32 ft. 6 in., length 32 ft.

Question: Please give me the following specifications of the Ercoupe: Rate of climb, fuel capacity, ceiling, maximum range, baggage capacity, wing span and landing speed. What instruments does it carry? G. H., Toledo, Ore.

Answer: The rate of climb of the Ercoupe is 800 ft. per min.; fuel capacity 14 gals.; service ceiling 14,000 ft.; maximum range 350 miles; baggage capacity 40 lbs.; wing span 30 ft.; landing speed 45 m. p. h. The ship is equipped with the following instruments: Compass, altimeter, air-speed indicator, tachometer, oil-pressure gauge, oil-temperature gauge.

Question: I am inclosing a picture of an airplane on which it states that the ship shown is a British Spitfire. Unfortunately, it does not resemble any Spitfire that I have ever seen. Could you tell me if the caption is correct or whether the picture is of some other type of plane? J. I. S., San Francisco, Calif.

Answer: The plane pictured on the clipping which you sent us is not a Spitfire but a Miles Master advanced trainer powered by a 710 h.p. Rolls-Royce Kestrel.

Question: Could you give me any information regarding the Republic's Thunderbolt fighter? E. H., Atlanta, Ga.

Answer: Sorry, the information on this ship is restricted. All we know is that it is powered by a 1,800 h.p. engine and is supposed to have a ceiling close to 40,000 ft.

Question: I am interested in gliding. Can you tell me the names and addresses of the soaring clubs within reasonable distance of Mount Vernon, N. Y.? R. L., Mount Vernon, N. Y.

Answer: The soaring club nearest you is the Airhoppers Gliding and Soaring Club. For further information write to its secretary, Peter Sutherland, 314 East 51st St., New York City.

Question: What are the prices of the following aircraft: Bell Airacobra, Consolidated B-24, Lockheed P-38, Lockheed Hudson, Consolidated Catalina and Bell Airacuda? Is the Bell Airacuda in service with the British? C. P., Beaupaire, Canada.

Answer: Sorry, we do not know the prices of these ships. Fighter aircraft may cost anywhere from $50,000 to $80,000, bombers from $150,000 to close to $500,000. There are no Bell Airacuda planes in service with the British.

Question: In the January, 1938, issue of Air Trails you published a scale drawing of the Boeing Clipper. In this drawing the ship had only one rudder in the tail assembly. I recently saw pictures of the ship and it had triple rudders. Why is this? R. F., Los Angeles, Calif.

Answer: The first model of the Boeing Clipper came out with only one rudder. However, it was found insufficient, so two more were added.

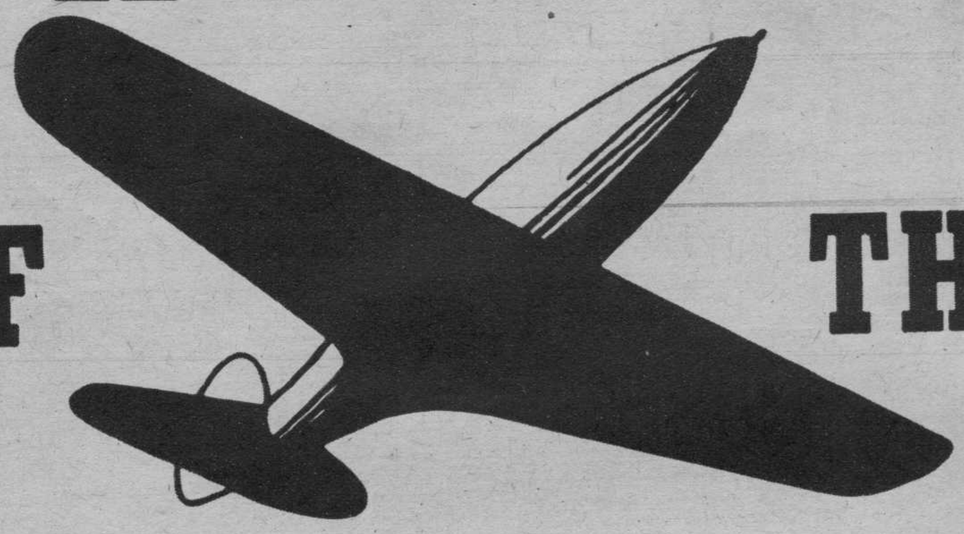
Question: I would like to build a secondary glider. How can I obtain a license for it? L. E., Petaluma, Calif.

Answer: Your best bet is to purchase a kit of an approved glider. Then if you build it according to manufacturer's specifications under the supervision of a licensed mechanic, a license will be granted for it upon visual inspection by a representative of the Civil Aeronautics Authority. At the present writing the only approved glider available in kit form is the Briegleb BG-6. You can buy it from the Briegleb Aircraft Co., 16005 Bassett St., Van Nuys, Calif.

Question: Could you tell me what is meant by a "dead-stick" landing? What is the highest altitude reached by a man in a single-place plane? Can bombers fly higher than 45,000 50,000 feet? C. W., Worcester, Mass.

Answer: A dead-stick landing means that an airplane is landed with the engine stopped and the propeller standing still. Col. Mario Pezzi of Italy holds the world's altitude record in a single-place plane—56,032 ft. Bombers cannot as yet reach altitudes of 45,000, 50,000 feet.

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.

WINTER CLASSES START JAN. 5, 1942

AVIATION TRAINING AT ITS BEST

SIGN AND MAIL COUPON TODAY

ROOSEVELT AVIATION SCHOOL
at Roosevelt Field, Mineola, Long Island, N. Y.

Without obligating me, send details of course checked:

☐ COMMERCIAL PILOT ☐ COMBINATION FLIGHT-MECHANIC
☐ PRIVATE PILOT ☐ MASTER AIRPLANE & ENGINE MECHANIC

Name.....*Age*.....

Street Address.....

Town.....*State*.....

A. T. DECEMBER, 1941

DOUGLAS CITY

The Douglas plant at Santa Monica, Calif., is a real community all its own. Come take a look.

Noon-hour wrestling in "Punch Bowl" helps employees wrestle with job problems.

One of Douglas City's trains rounds the busy corner of 27th Street and Avenue D.

AMERICAN AIRLINES

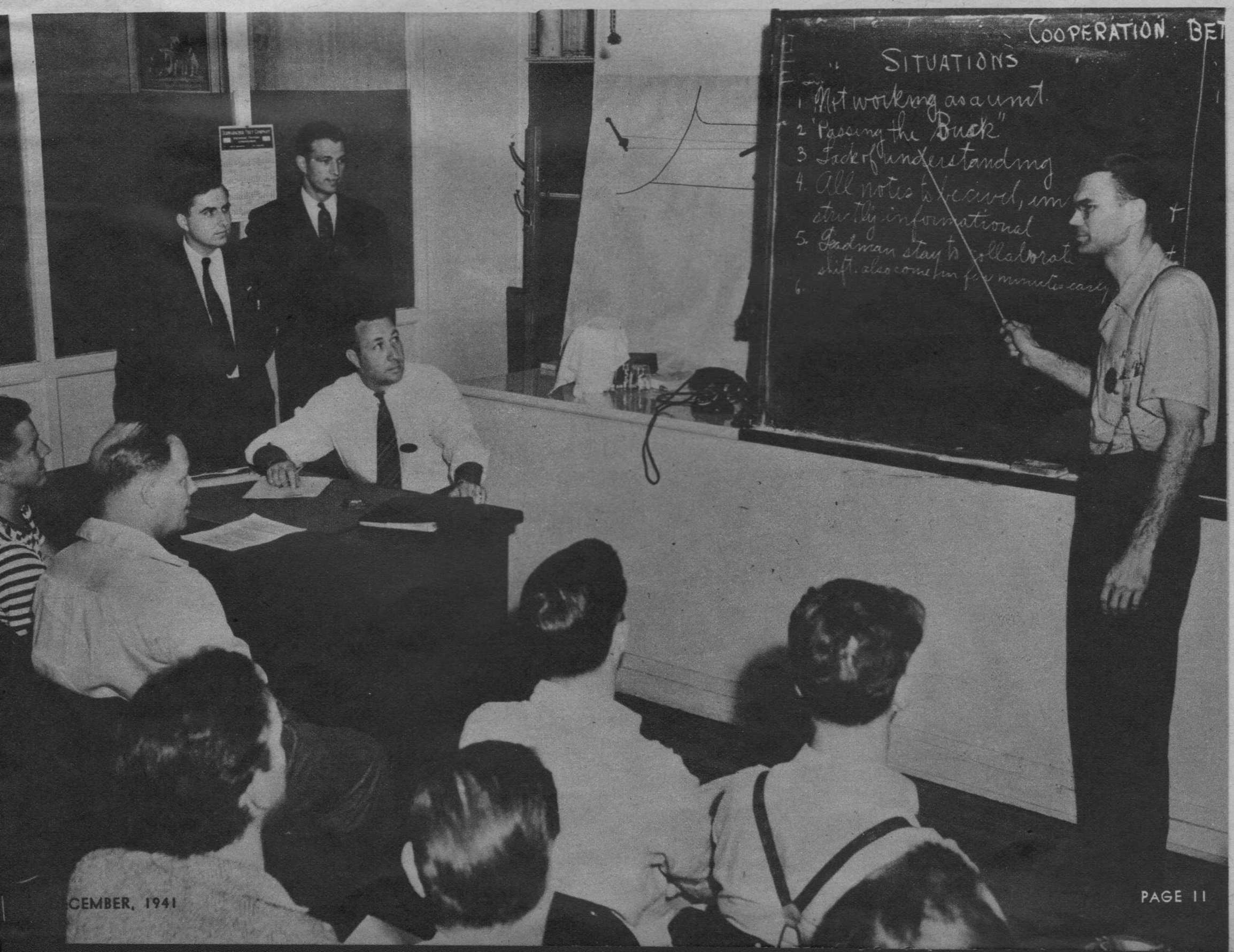
FLAGSHIP DOUGLAS

U.S. MAIL

Douglas Club. Everybody here is named Douglas, all members of the community, including the flagship. Fifth from right is Donald Douglas, president.

CONTINUED ON NEXT PAGE

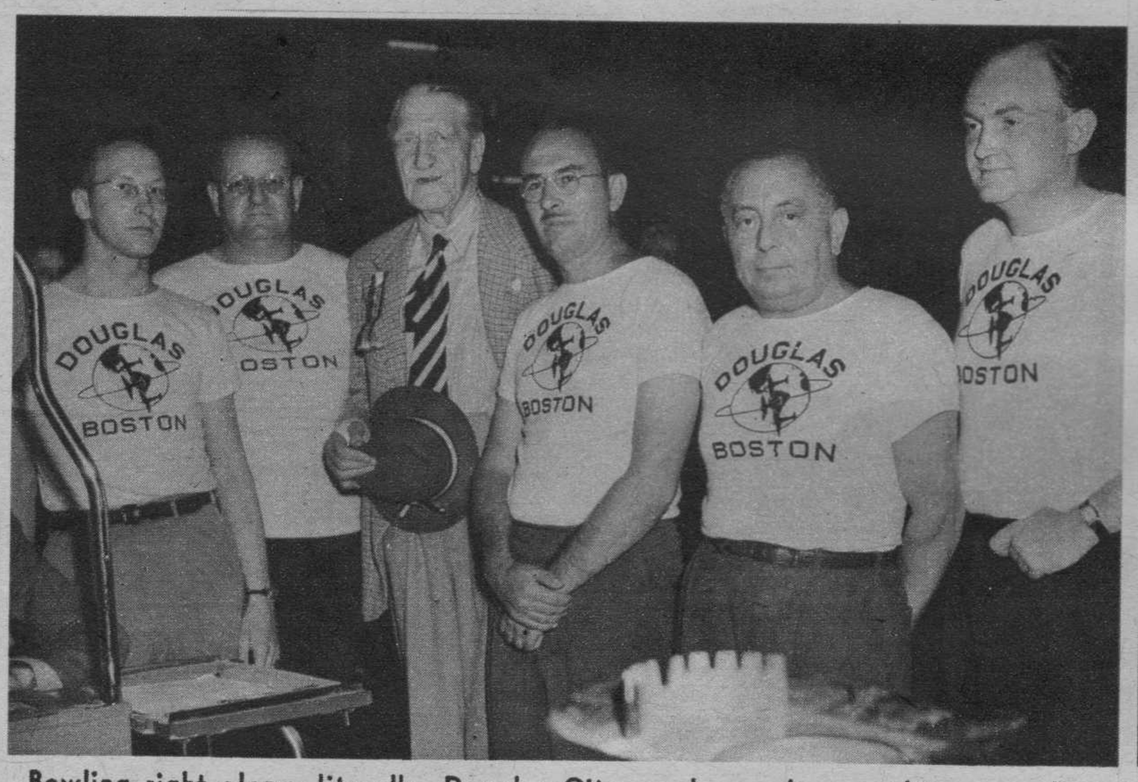
Thousands of employees take advantage of the city's school system to learn more about their individual jobs. Douglas has own educational department.



On one particular street of Douglas City are three of the four giant hydraulic presses developed by this company. They press over 44,000 parts a day.

DOUGLAS CITY

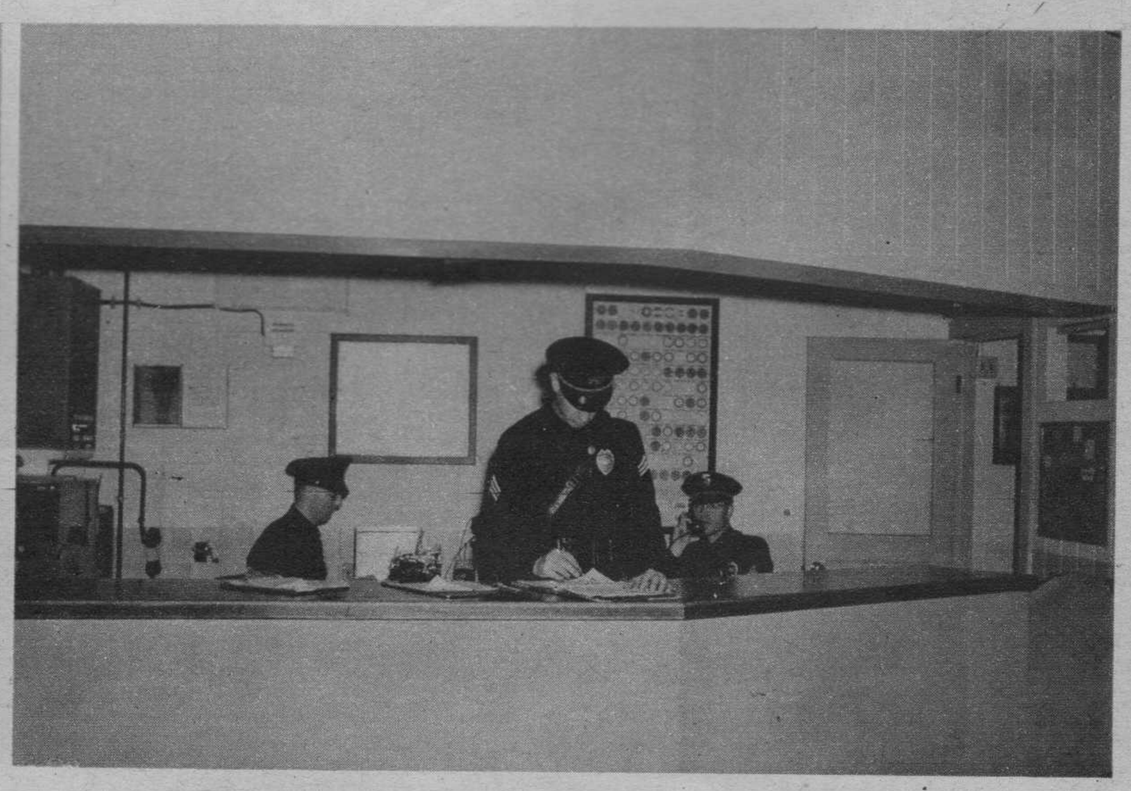
Continued from Preceding Page



Bowling right along, literally, Douglas City employees keep making records, whether in sports or production. C. Aubrey Smith congratulates winners.

Through seventy trunk lines over 100,000 calls a week from all parts of the country and abroad keep these Douglas City operators busier than two bees.

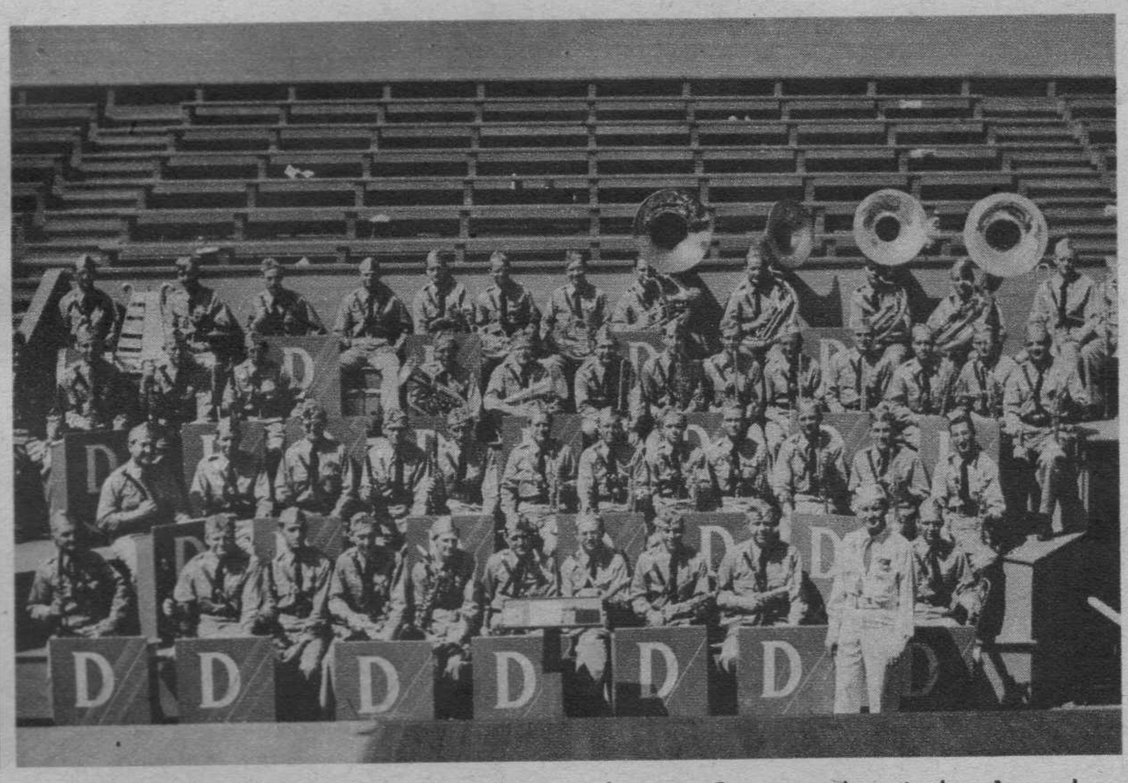
No need to page Dr. Kildare here, for Douglas City has own hospital ready and able to handle any sort of situation demanding medical attention.



Headquarters. The Douglas City police, co-operating closely with the army, F. B. I., and other government agencies, runs vast plant-protection system.

One-way street. Here American and British production lines carry DB-7s down Douglas City street and out the door for flight testing from field beyond.

Lunch hour. L. to R., Donald Douglas, president; Carl Cover, vice president; W. H. Ball, assistant to president; A. M. Rochlen, public-relations head.



Douglas City has own band, and a good one. Composed entirely of employees, this marching band is a familiar sight whenever parades are in order.

Welcome breadline. Feeding thousands of employees every noon is a problem ably handled by trained staffs and ample cafeterias within the city.

Standing room only. The popularity of many annual Santa Monica plant dances is attested to by crowds. These are held at nearby country clubs.

This resulted from several small bombs dropped during a daylight raid on Cologne power plant. From now on the order will be bigger bombs from high altitude.

BRITAIN WILL ATTACK!

New ships, equipment, strategy, says this English authority, portend an R. A. F. bombing program of which current raids are mere rehearsals.

BY WILLIAM COURTENAY

TWO years of war have taught us in Britain something of the nature of the proposition we are up against if air bombing is to be depended upon to bring decision in this war.

The old principle that the infantry soldier must finally go in with the bayonet may still be true. But he may not necessarily have to go in by fighting his way over trenches, barbed wire, and by being withered like the corn before the sickle. He may go purely as an occupying force. We know that air power cannot occupy territory. The Royal Air Force cannot "put the bailiffs in" at Berlin. That is a job for an occupying force of infantrymen.

But can the Royal Air Force bomb Germany into surrender and submission? Can long-distance bombing by itself, without the aid of a field army, compel Germany to relax her tentacles from the grip on ill-gotten gains? Can continued persistent and merciless bombing of the industrial targets in the heart of Germany so smash the morale of her people and so break her heart that she collapses? That

The author, left, shown with the distinguished Antarctic explorer, Admiral Sir Edward R. G. R. Evans.

WILLIAM COURTENAY *is one of Britain's foremost aëronautical journalists. He is the aviation editor of the London Daily Sketch and Allied Newspapers, the biggest group of papers in the British Empire. A pilot himself, he has been closely associated with the development of English aviation for twenty-five years, and has had a colorful and romantic career as soldier, airman, traveler and lecturer. He saw active service under Allenby in the Near East during the last war, and served as a pilot in the first R. A. F. As a newspaperman specializing in aviation, he helped the late Amy Johnson and her husband, J. A. Mollison, in the preparation; organization and management of many of their long-distance flights across the Atlantic, to the Cape of Good Hope and to Australia. He made several flights to India. On the side of civil aviation, he did much to help develop interest in airport sites in Britain. In 1938 he helped form London's Balloon Barrage defenses. He was mobilized with the R. A. F. during the "Munich crises" of September, 1938, when London was given its first protective barrage, and again in August, 1939, for the present war. He served two years, from the spring of 1938, and commanded a flight in the defense of London.*

For the attack. The new Boeing 17-E, redesigned Flying Fortress for future English air offensive.

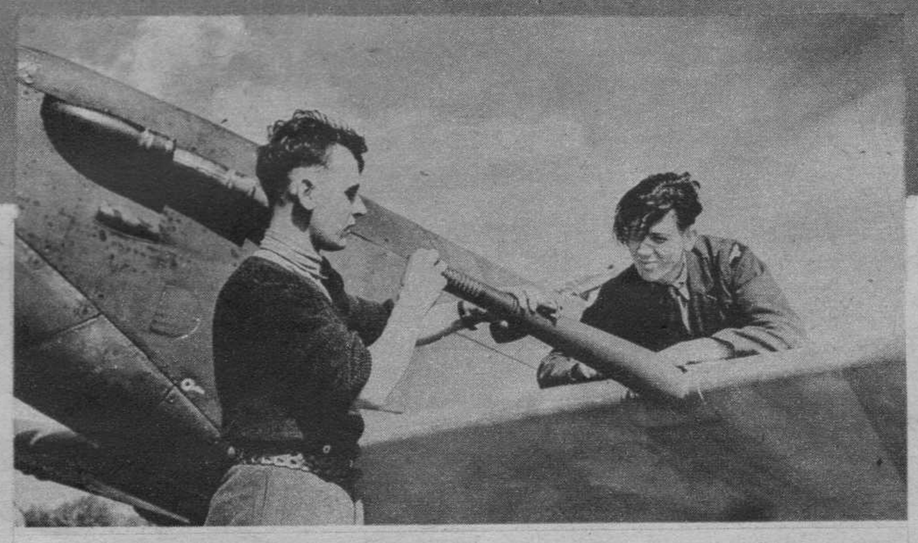
is what the Royal Air Force is out to test. It is the first full-scale test in war of a new theory. Two years of war have so far only served to reveal the magnitude of the task.

Throughout these two years, bombing raids have for the most part been carried out by small medium bombers of the British Blenheim class. Their bomb loads have been limited to four 250-pounders or two 500-pounders. A number of heavier bombers in the Wellington, Whitley and Hampden class were used last winter. They carry loads of a ton or more, also divided into small-category bombs.

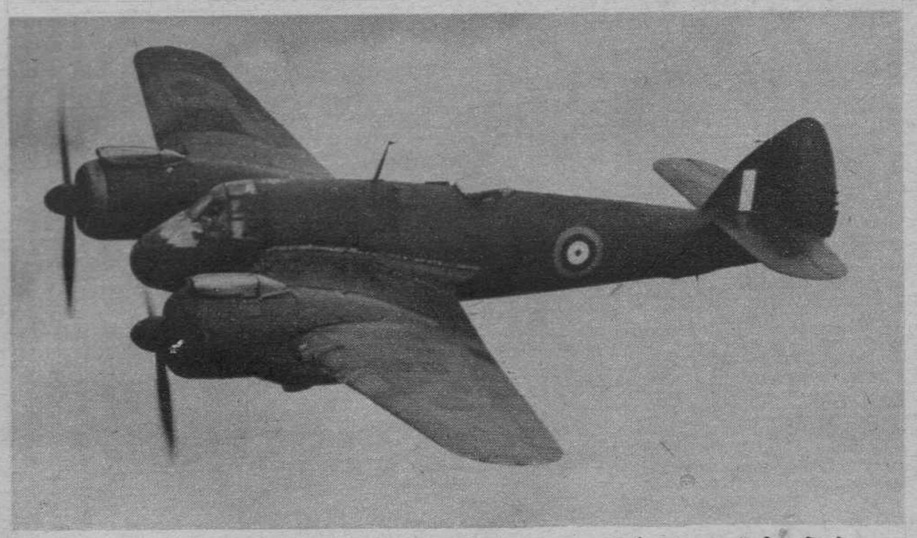
In recent months, however, we have developed bombs weighing 2,000 pounds and 4,000 pounds. These are the "big beautiful bombs" to which Lord Beaverbrook referred in a recent broadcast from England. They are the bombs which at last are beginning to do serious and worth-while damage. The fact is that all past experience suggests that the casualties incurred on long-distance raids merely to drop 250 or 500-pounders are not worth while. The damage they inflict is, of course, not inconsiderable: it can never be decisive. Britain is therefore wedded henceforth to a policy of bombing Germany hard and bombing her with bombs of such caliber and destructive power that every raid will show an appreciable advance toward the goal of the collapse of the Nazi regime. This is one of the outstanding lessons of the air war, and this is the new policy of which the first steps are already discernible.

Two things are required to implement this policy. One is the development of the worth-while bomb of immense destructive power. The other is the development of the bomber capable of carrying a fair load of them. The only bombers for the future, therefore, if strategic bombing is to help to bring decision, are the four-engined ships able to carry loads of up to five tons or even more.

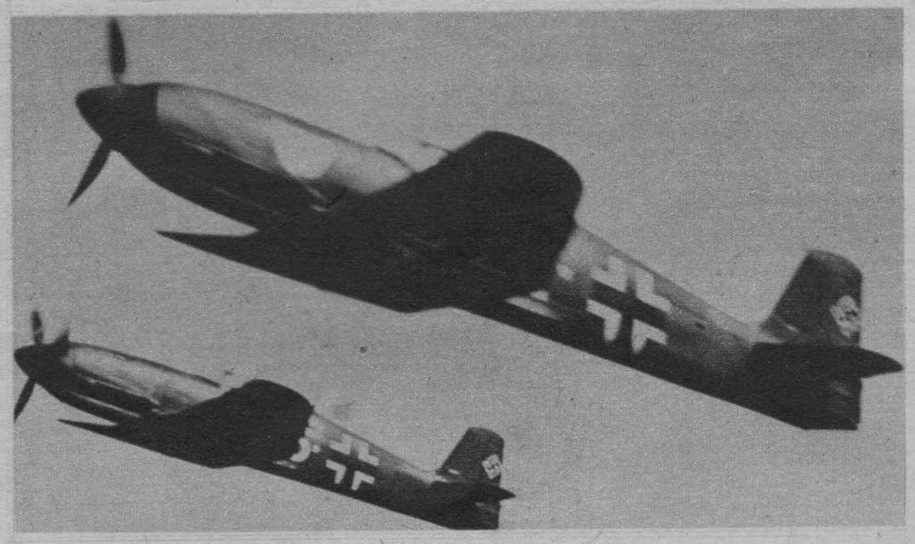
Britain's task in bombing Germany is in many respects considerably handicapped compared with Germany's task in bombing Britain. Nazi air squadrons are based on the coast of northern France, only a hundred miles from London, and within easy reach of all British cities. They are able to carry limited fuel loads and big bomb loads. The raiders can easily be recalled by wireless at night if weather deteriorates over their landing fields and a quick return in the dark



Armorers sealing Spitfire wing cannon against rain. New models carry wing cannon in connection with multiple machine guns.



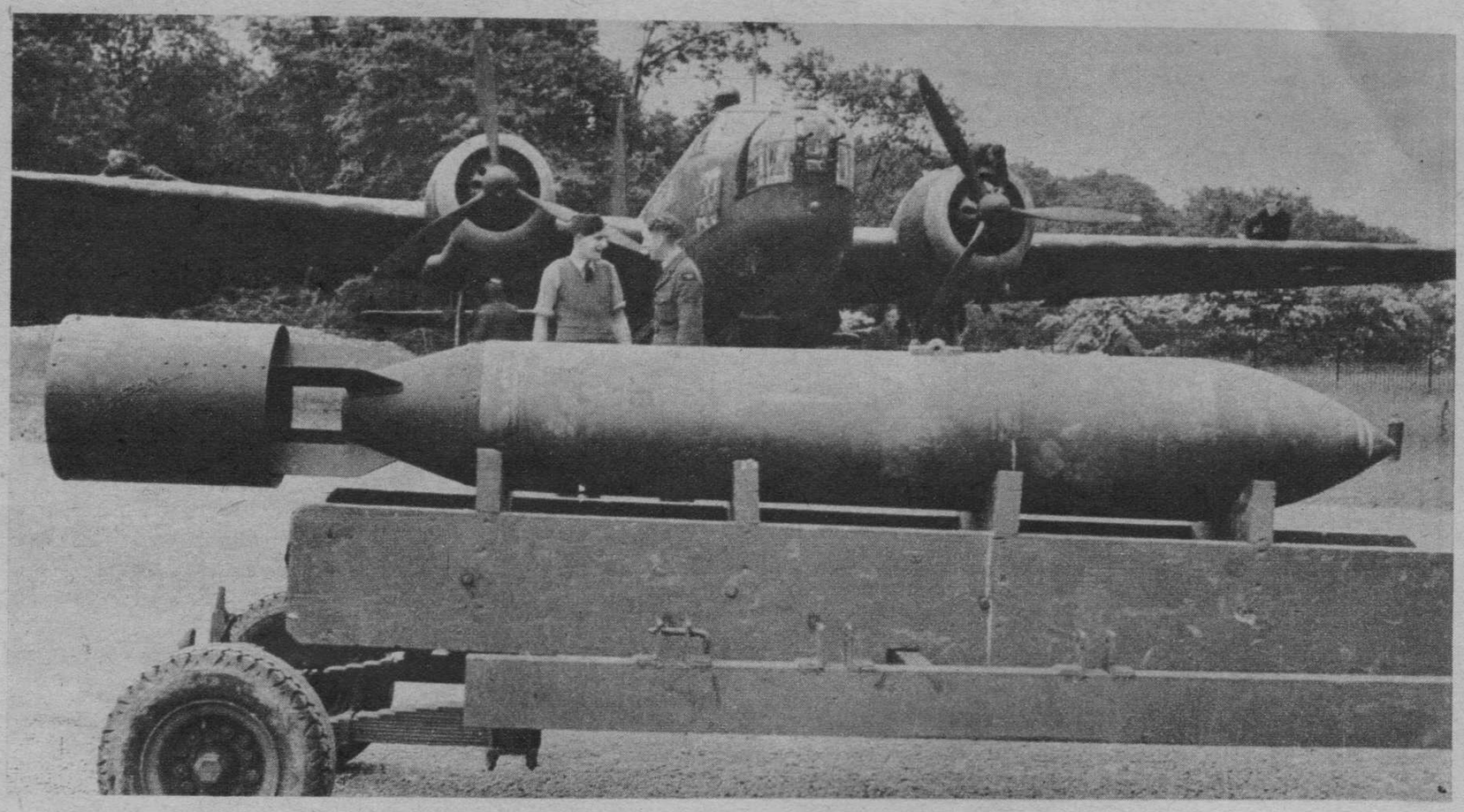
High patroller. The Bristol Beaufighter, popular as night fighter, may prove effective as stratoguard against high-flying invaders.



German reception committee. These Heinkel He 113 night fighters are cleaned-up version of earlier models used against British.

BRITAIN WILL ATTACK!

Continued from preceding page



This two-thousand-pound armor-piercing bomb is small compared to others now being perfected.

is essential. This often happened last winter, when I was in London and raids were canceled at midnight although another eight hours of darkness still lay over Britain.

The R. A. F. airmen, on the other hand, have 1,200 miles to fly from British air bases to Berlin and back, and 800-mile round trips to visit Rhine or Ruhr target areas. They have to carry heavy fuel loads, and consequently the bomb loads are lighter, unless the ships grow in size and carrying capacity. When bad weather closes in round Britain's coasts on winter nights, it is too late to recall the bombers. They may be three hours' flight from home. They must fight their way back through fog to safe anchorage.

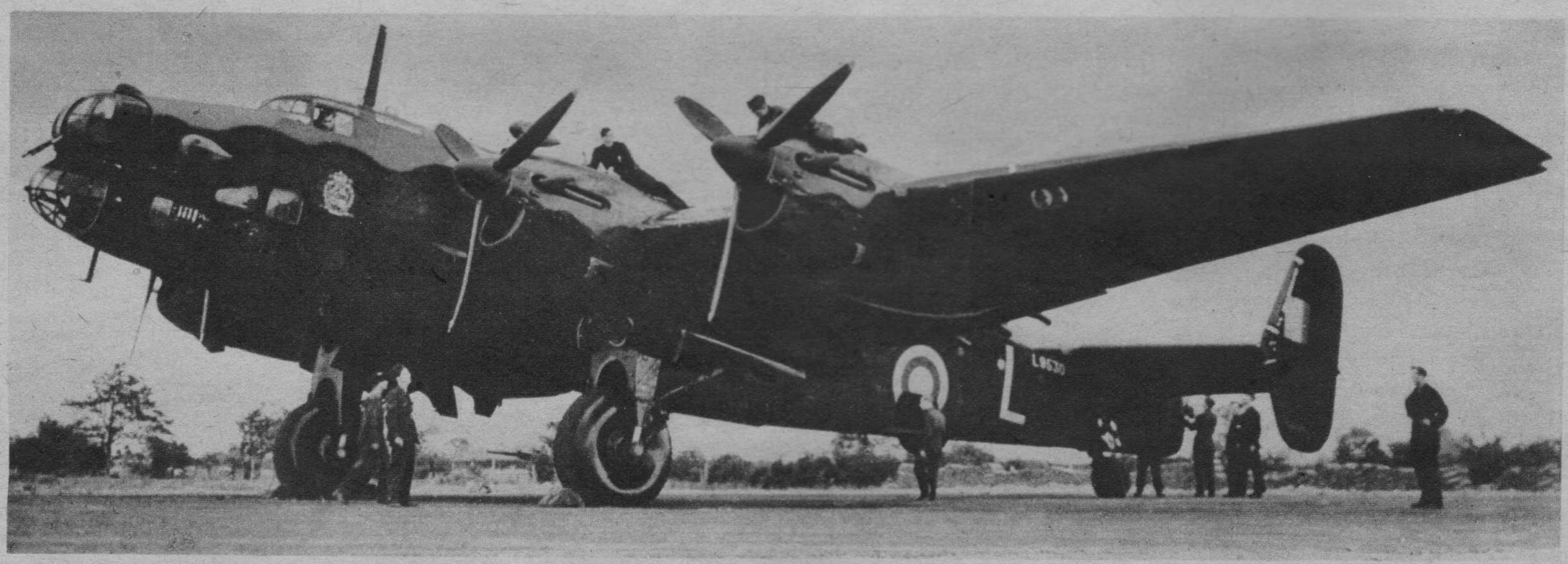
Since fog and low clouds may often obscure view of the targets, British pilots are always given three pinpoints on their maps. First is the primary target which at all hazards the pilot is expected to reach and to bomb if it is humanly possible. This target is selected not necessarily by the air staff. In many cases it is chosen by the minister of economic warfare, who learns from his secret agents that Germany is short of a certain commodity; that blockade is effectively keeping it out; that without it her war effort will flag; and that her own production of it is centered at only a few given points. The destruction of them is obviously a good military prize.

The pilot has a secondary target of military value in case he cannot locate the first, or in the event bad weather or enemy opposition from ground or air prevent him from getting through. And finally he has a "last resort" target. If all else fails, he can unload his bombs on this third objective, which is never quite as important as the first two. But it does at least mean that he does not hazard a valuable aircraft and a crew of perhaps five on a perilous 1,200-mile return trip only to jettison his bombs in the North Sea after an unsuccessful sortie.

The planning of bombing raids involves the most intricate staff work on both sides. Not only must supplies of fuel and bombs be "laid on" at the various starting grounds, but every squadron warned for duty must learn to work to a split second of timing. The operational side of the job is very similar to the routing of airliners. Imagine a force of a hundred airliners which must leave La Guardia Airport within a period of say three hours at night; with the airport darkened; with enemy aircraft known to be overhead waiting to pounce on the slightest glimmer of light; with the pilots and crews strangers to the field and to each other; and with the knowledge that while they are leaving, a vast force of aircraft will be homing from other compass bearings for the same airport for landing in the dark.

In such circumstances the whole problem depends on perfect discipline and perfect timing to avoid collisions and to assure that traffic-control systems will work. No radio messages will be received from the pilots during the long flights. No friendly stations will send signals of aircraft passing on time and on course. No friendly weather reports come out of Europe to correct forecasts made some hours earlier. "Wireless silence" must be maintained by pilots until near their own coast on the homeward run. And the homeward-bound bombers will contain wounded men who will need urgent attention in the groping darkness amid the mass of other aircraft arriving.

This gives a fairly good picture, I think, of how the air raids must be launched and controlled. And while pilots *(Turn to page 24)*



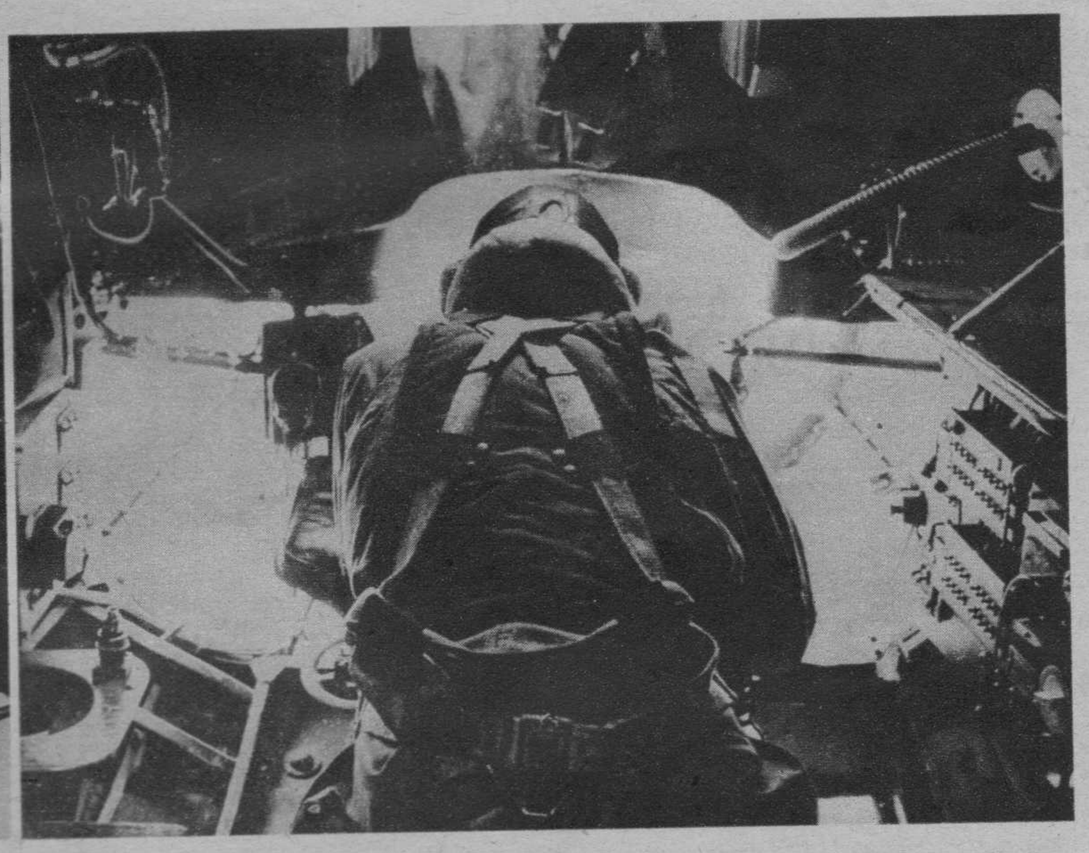
The new Handley-Page Halifax designed for use in Britain's planned long-range attack raids. Trend is toward four-engine heavy-duty bombers.

STIRLING CREW

We now take you inside one of Britain's Stirlings, her latest long-range bomber.

Left, R. A. F. means Range and Firepower when applied to new British Stirling. Above, Pilot and copilot of the giant four-engined heavy bomber.

Stirling navigator plots course and position with aid of complicated gadgets. Ready for any emergency, he wears life jacket and 'chute.



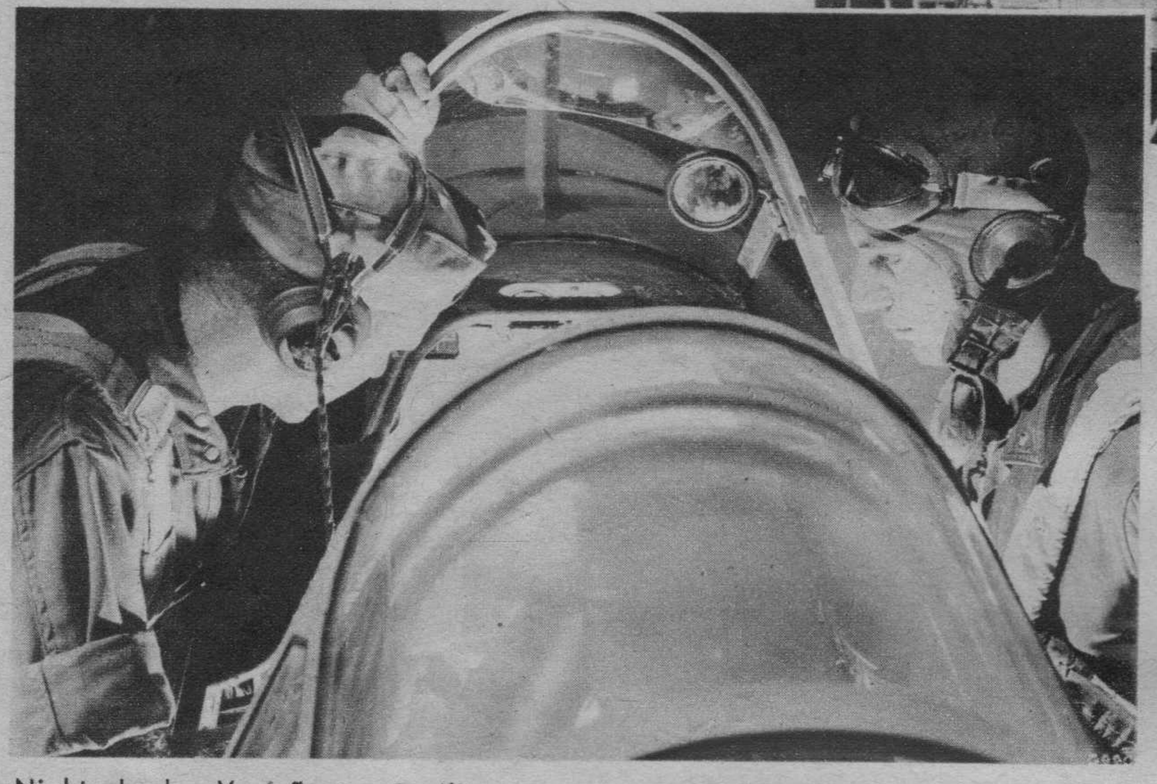
The bombardier in the nose of the Stirling lies amidst a maze of switches, bomb releases, sights and levers. His is the all-important job.

Looking for trouble, this nose gunner sits in the big ship's nose turret and keeps eyes ahead for enemy opposition. Note oxygen bottles overhead.

Power-and-speech department. The engineer, left, and radioman, right, are at their posts the entire flight. Phones keep all crew men in touch.

JOBS
AFTER THE WAR

Lots of work ahead. Post-war expansion in air freight and passenger carrying will call for more trained maintenance men.



Night check. Vast fleets of military planes now and in the future will demand thousands of skilled aviation workers.

Are you hesitating to train for aircraft work because of fear the "boom" will end when peace comes? Read this!

BY JAMES ROLLINS

The future for the trained aeronautical worker is always bright. Here a skilled technician is checking the automatic pilot.

A LOT of young men are wondering today if aviation jobs really offer a good future.

"This boom can't last forever," they say. "What about the lay-offs that will come when the war is over?"

The answer to that question can be quite simple and direct: The lay-offs will not come for several years, and when they do come, they will affect only a part of the aviation industry. Several kinds of aviation work will actually expand rapidly after the war, rather than shrink in size. There are ways to get around the lay-offs even if you are working in a job where most of the depression will occur.

Before going into these points in detail, one underlying statement must be emphasized. Aviation is closely tied up with national defense. Any young man who is preparing for a job in aviation or who takes a job in any kind of aviation work is serving his country. In England today it is fully recognized that men building Spitfires and Hurricanes are serving England in their way fully as well as the men in uniform who service and fly those ships. The same is true here. In any job connected with national defense, the interests of the country should come first. The immediate task is to "Get 'em into the blue!" as the signs in the Vultee factory urge, rather than worrying about lay-offs that may not come for a long time.

It is natural, however, for anyone to be concerned about his future. It is safe to say that, entirely aside from the patriotic angle, aviation jobs offer a good future. The present boom in building airplanes will continue for several years. The war will not be a short one. It has already gone on for over two years, and every indication points to a continuation for several years more. If the worst happens, and Germany defeats Russia and then takes England, the war would still go on. This country, either in or out of the war, would continue its airplane building. If Germany eventually loses, the war will still be a long one, and we will continue to build airplanes. If some type of truce is made, it is a certainty that we will continue to build up our air force. It will never again be allowed to decline to the state it was in a few years ago. All this means that jobs in plane factories will go on for several years. *(Turn to page 26)*

AVIATORS PASS IT—CAN YOU?

By making these simple tests right at home you can find out—whether you'd pass the standard physical exam for army or navy flying. Highly revealing and a lot of fun besides.

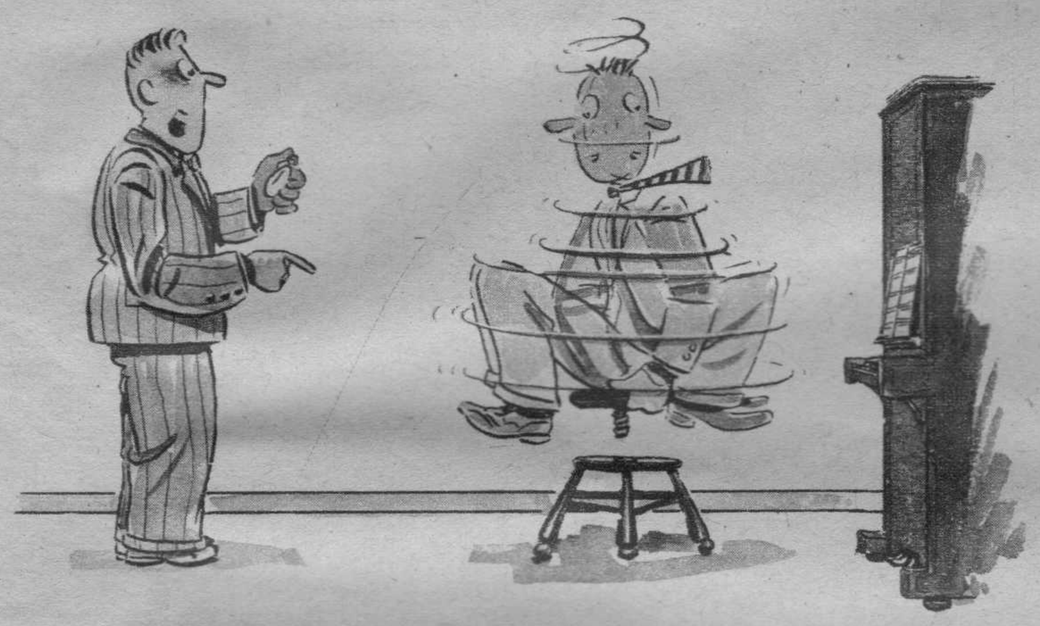
BY JOHN R. HOYT

THE young men who fly the complicated airplanes of 1941 pass a strenuous physical examination twice a year. Before being admitted to the army or navy flying schools, they pass an even stiffer preliminary examination, a hurdle that prevents thirty-two percent to fifty percent of otherwise qualified men from becoming military pilots.

Everyone wonders why a few get by while some husky college athlete is turned down. What do the doctors fail them on—what are the tests they give that are so terrible? Is there any rhyme or reason in holding such a high standard? And finally everyone wants to know:

"Can *I* meet those standards?"

Anyone who *can* meet them is physically above par, and barring some chronic ailment or systemic deficiency, would be a good risk in any insurance agency. It is rather simple to go through



the fundamental tests, as you'd find if you'd walk into a flight surgeon's office and ask to be given a "flight physical examination."

The emphasis is on eyes in aviation, so the first test is an eye examination, conducted with a complicated apparatus and completed with a pupil dilation that leaves almost every applicant owlish and starry-eyed. The apparatus, called a pharometer, consists of lenses that measure the accommodation of the muscles and the amount of divergence of the eyes. But it isn't absolutely necessary to have these lenses in order to test eyesight. It can be done fairly well with an eye chart.

To make an eye chart, obtain ten letters one half inch square, ten three eighths inch square, and ten nine thirty-second inches square. The half inchers should be read from thirty feet, the next from twenty feet, and the smallest from fifteen feet. Test yourself by covering one eye and reading the letters from the specified distance. Cover the other eye and read the line backward; if each letter is read without a mistake, your vision may be termed "20-20." If from thirty feet you can read the smaller letters, your vision is probably very good so far as far vision is concerned.

Now test the near vision just as a pilot is tested—that is, holding some fine print a half inch from the eye and moving it slowly away from the eye until it becomes perfectly legible. Print from the want ads of a newspaper will do, as it is quite fine; at the age of ten, one should read fine print at a distance of one inch; aged twenty, four inches; thirty, five and a half inches; forty years, about a foot. Of course, the distance will vary according to the print used, but the net result will indicate whether or not your near vision is good or if hyperopia (farsightedness) exists.

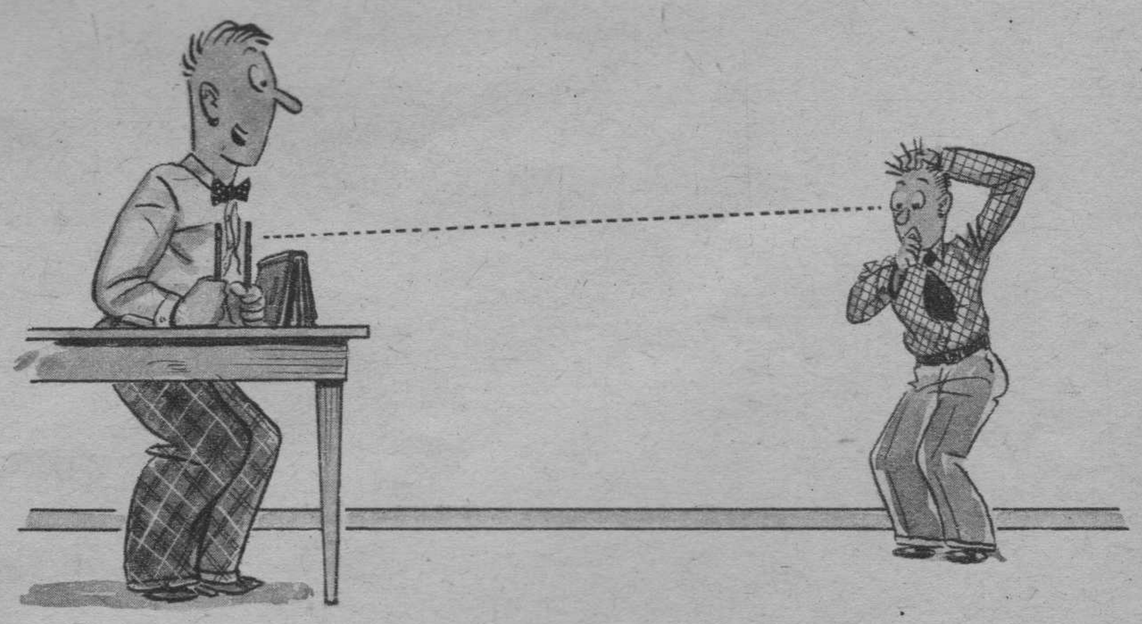
Just because one's eyesight is neither myopic (short-sighted) or hyperopic (farsighted) does not mean it is perfect. The muscular accommodation must be excellent, too, and a pilot must be able to shift his eyes from the distant horizon to his instrument panel countless times during each flight. A test has been devised to determine the strength of the muscles, and this test can easily be conducted in the home. Take an ordinary ruler and a lead pencil. Place one end of the ruler on the bridge of the nose so that the ruler measures distance directly ahead and away from the eye. Now hold the pencil vertically and move it toward the eyes. If someone is available to assist in the examination, it will be evident that the eyes go out of focus at a point varying from one half inch to two and one half inches. (This is a good eye exercise if done moderately, and will bring weak eye muscles up to normal within ten days.) A "normal" distance varies according to the distance between the eyes, measured from pupil to pupil; that is, the eyes should focus on the pencil until it is as close (or closer) than the distance between one's eyes.

So far the tests have not measured performance, but now comes a test that is very essential to fliers. In making landings, a pilot must be able to judge depth and distance, and so a *depth-perception* test was worked out that is not only valuable, but simple. It can be done in one's living room with nothing more than a couple of pencils, a table, and a stack of books. Try it on your friends!

Have someone seated at a table hold two pencils, preferably similar in shape and color, upright in each hand. His hands should be hidden behind a pile of books so that only the pencils are visible to the person taking the test, who is seated about twenty feet away. Thus two uprights, three inches apart but exactly abreast of each other, are all that the applicant sees.

Begin the test by moving one pencil away from the applicant, who should then direct the pencil holder to move the pencil back in position. Direct the movement with orders such as "Up two inches," or "Back half an inch," until once more the pencils are abreast. An error of over thirty millimeters (about one and a quarter inches) is disqualifying; in fact, with normal vision, anyone should be able to place the pencils on a line with each other with a little practice.

Practice, however, will do little good on the color test. The air services now use a Stilling chart to test color blindness, and the chart is foolproof. It consists of hundreds of dots, so arranged that if one is green-red blind, he sees a figure such as "77." If



you are blue-yellow blind, you may see no number at all, while still another page will have a number for *normal* people, designed to trip up cheaters.

However, unless you are aiming at self-deception and are willing to fool yourself, some colored yarns will do. Mix them up, separate the green, red, blue, yellow and brown. A friend can check your choice if there is any doubt in your mind!

The last of the eye tests are very simple. Have *(Turn to page 28)*

AEROBATICS

MAY NOT BE PERFORMED BELOW A MINIMUM ALTITUDE FIXED AT 1500 FEET ABOVE GROUND OR WATER

INSTRUMENT FLIGHT THRU THE OVERCAST

1,000 FEET ABOVE THE TERRAIN AT ALL TIMES

1000 FT.

CEILING FOR CONTACT FLIGHT MAY NOT BE LESS THAN 1000 FEET

1000 FT. *500 FT.*

2 MILES - NIGHT

1 MILE - DAY

500 FT. *REQUIRED VISIBILITY*

MINIMUM ALTITUDE DAY AND NIGHT OR DURING PRECIPITATION

CONTACT FLIGHT BELOW THE OVERCAST

ORDER OF RIGHT OF WAY

FREE OR MOORED

APPROACHING AND PASSING

"B" AND "D" EACH ALTERS COURSE TO THE RIGHT IN TIME TO ENSURE THAT A DISTANCE OF AT LEAST 500 FEET EXISTS AT MOMENT OF PASSING

INTENDED COURSE

REQUIRED COURSE

CROSSING FLIGHT COURSES

PLANE TO THE LEFT GIVES WAY "A" HAS RIGHT OF WAY OVER "C"

NOTE:- *PILOTS FLYING WITHIN A THREE MILE RADIUS OF ANY DESIGNATED "CONTROL AIRPORT" MUST HAVE AT LEAST THREE MILES VISIBILITY AT ALL TIMES UNLESS OTHERWISE AUTHORIZED BY THE AIRPORT CONTROL TOWER OPERATOR*

UNDER CONTACT FLIGHT RULES ONLY IF VISUAL REFERENCE TO GROUND OR WATER IS POSSIBLE AT ALL TIMES

ABOVE TERRAIN MUST HAVE 3 MILE VISIBILITY

ABOVE OR THROUGH CLOUD FORMATIONS

2000 FT.

HORIZONTAL DISTANCE TO NEAREST CLOUD IF FLYING THROUGH CLOUD LEVELS UNDER CONTACT FLIGHT CONDITIONS

2000 FT.

SAFE GLIDING HEIGHT

OVER CITIES & ALL CONGESTED AREAS

PLANES MUST FLY AT LEAST 1000 FEET ABOVE THE GROUND BUT ACTUAL ALTITUDE SHOULD BE DETERMINED BY AREA OF CONGESTION AND ALLOW FOR SAFE GLIDE TO LANDING OUTSIDE THE CONGESTED AREA IN EVENT OF ENGINE FAILURE.

NOTE:- PLANES FLYING 1,000 FEET OR LESS ABOVE THE GROUND MUST HAVE A MINIMUM DAYTIME VISIBILITY OF ONE MILE, — 2 MILES AT NIGHT, IN ORDER TO OPERATE LEGALLY UNDER "CONTACT FLIGHT" REGULATIONS

DOUGLAS ROLFE

NC 27710

500 FEET

REQUIRED COURSE

A

OVERTAKING AND PASSING

OVERTAKING CRAFT "A" ALTERS COURSE TO PASS "B" ON RIGHT

NC 1090

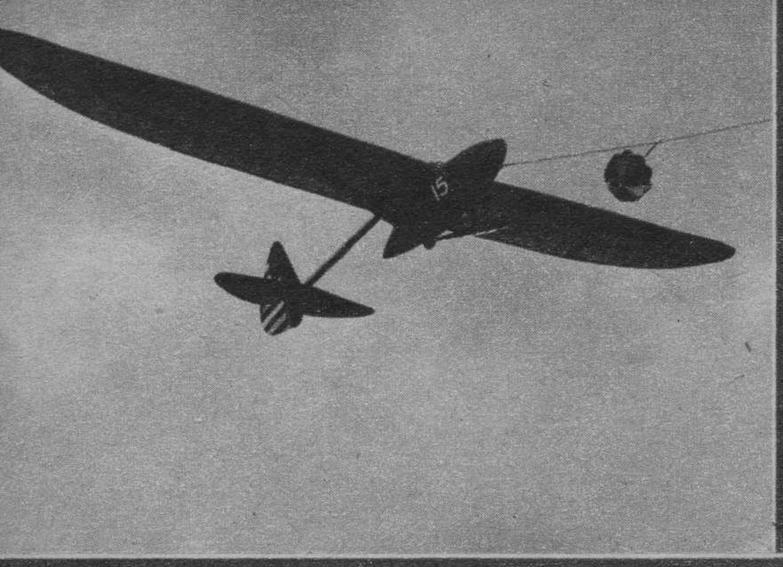
A

NORMAL COURSE FOR SHIP "A"

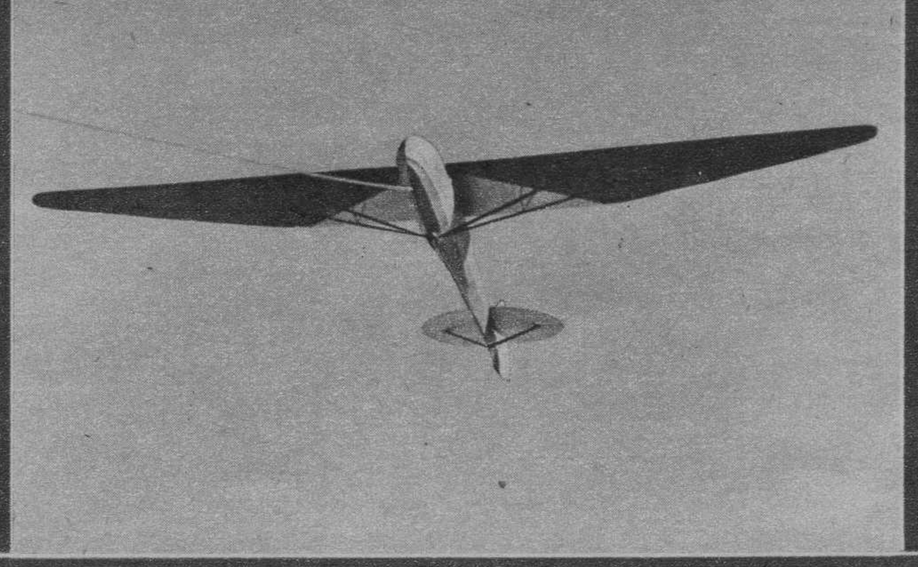
OVER OPEN TERRAIN

PLANES MUST FLY AT LEAST 500 FEET ABOVE THE GROUND OR WATER UNDER "CONTACT FLIGHT" CONDITIONS — SEAPLANES AND AMPHIBIANS TO OBSERVE A MINIMUM ALTITUDE OF 300 FT. OVER OPEN WATER

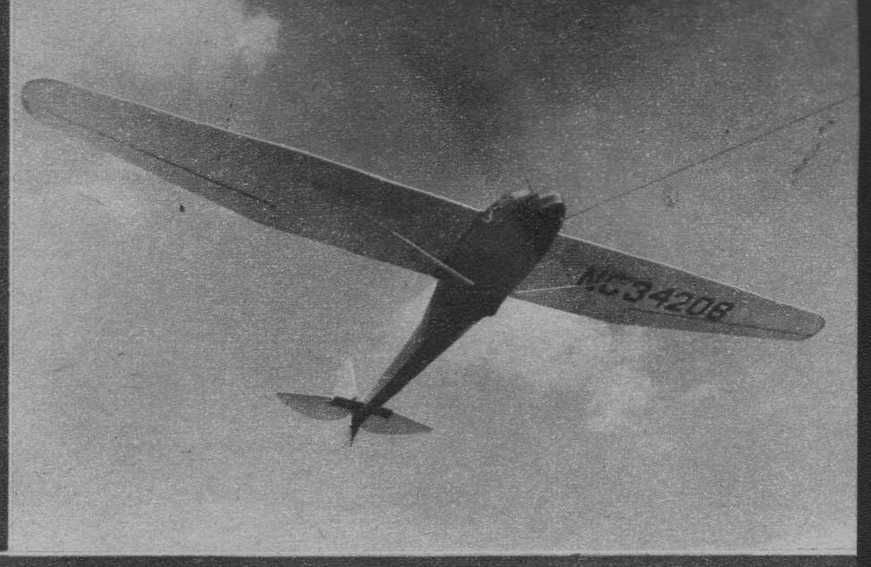
C.A.A. AIR TRAFFIC RULES



1. BOWLUS BABY ALBATROSS BA-100

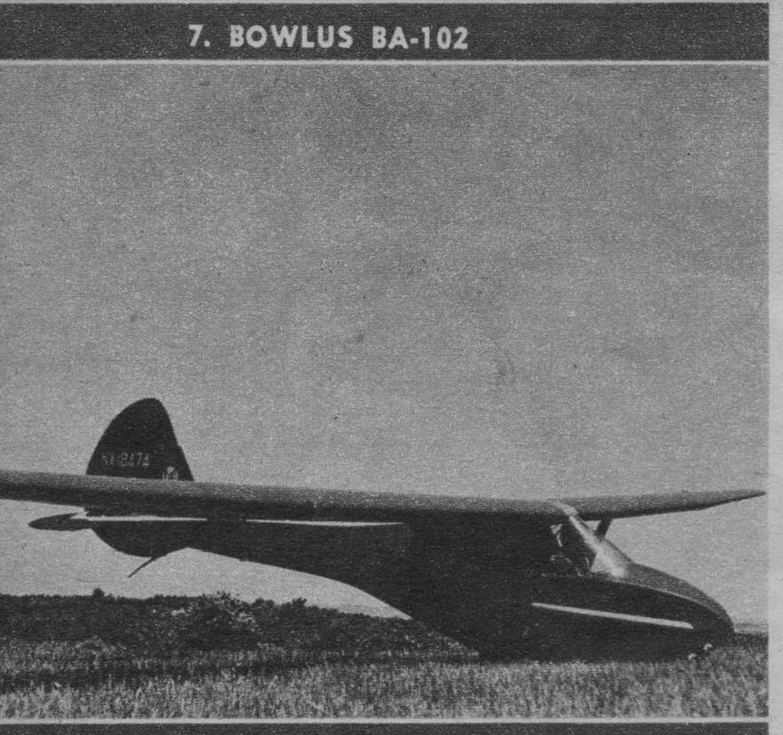


2. BRIEGLEB BG-7



3. CINEMA II

7. BOWLUS BA-102



8. MIDWEST MI-1

9. FRANKLIN PS-2

10. STEVENS FRANKLIN

GLIDER PARADE

BY ALEXIS DAWYDOFF

THE spotlight which World War II events have turned on gliding has brought us a flood of inquiries regarding types of ships built and flown in this country. On these pages we present the aristocrats of motorless craft, most of them designed and made in the U. S. A few "foreigners" have crept in among them, but even they were constructed over here from plans purchased abroad. The prices listed by the various manufacturers are subject to change.

1. BOWLUS BABY ALBATROSS BA-100

Sailplane manufactured by Bowlus Sailplanes, Inc., San Fernando, Calif. A. T. C. pending. Construction: wooden pod fuselage; wings, single spar wood structure; leading edge, plywood covered, remaining portion of wing fabric covered; tail boom, dural-spun tube; tail surfaces, wood, fabric covered.

Span	44 ft. 8 in.	Gross weight	505 lbs.
Length	19 ft. 4 in.	Gliding angle	20:1
Wing area	155.6 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	12.85	Maximum placard speed	65 m. p. h.
Weight, empty	310 lbs.	Stalling speed	28 m. p. h.

Standard equipment: wheel and brake, air-speed indicator, safety belt. Spoilers optional. Price complete, around $900. Ship comes in kit form almost complete, requiring only an assembly job. Kit, $425.

2. BRIEGLEB BG-7

In order to achieve a high-performance sailplane at low cost, a set of tapered wings has been designed by the Briegleb Co. to fit the standard BG-6 utility fuselage.

Span	40 ft. 3 in.	Gross weight	465 lbs.
Wing area	123 sq. ft.	Gliding angle	20:1
Aspect ratio	13.1	Sinking speed	2.8 ft. per sec.
Weight, empty	250 lbs.	Maximum towing speed	81 m. p. h.
		Stalling speed	34 m. p. h.

The ship has the same equipment as the BG-6, and in addition has spoilers built into the wings to facilitate landing. Price of complete sailplane, $750. Kit from $255. Tapered wings and struts finished for converting BG-6 to BG-7, $395. Conversion kit, including plans and instructions, $180. Plans for complete BG-7, $25. Plans and instructions for converting BG-6 to BG-7, $15.

3. CINEMA II

Two-place sailplane manufactured by Frankfort Sailplane Co., Joliet, Ill. A. T. C. No. 7. Construction: metal-tubing fuselage, wooden wings, fabric covered.

Span	46 ft. 3 in.	Gross weight	790 lbs.
Length	24 ft. 8 in.	Gliding angle	22:1
Wing area	188 sq. ft.	Sinking speed	3 ft. per sec.
Aspect ratio	10.96	Maximum towing speed	80 m. p. h.
Weight, empty	410 lbs.	Stalling speed	30 m. p. h.

This ship is stressed for normal aërobatics Standard equipment consists of air-speed indicator, wheel, brake and safety belt. Price, $1,250 at factory. No kits or plans available.

4. SCHWEIZER SGU 1-7

Single-place utility glider manufactured by Schweizer Aircraft Corp., Elmira, N. Y. No A. T. C. Fuselage construction: metal tubing, fabric covered. Wing structure: metal spar and ribs, leading edge covered with duralumin up to spar, fabric from there on to trailing edge: tail surfaces, dural and tubing structure, fabric covered.

Span	36 ft. 6 in.	Gross weight	430 lbs.
Length	18 ft.	Gliding angle	17:1
Wing area	132 sq. ft.	Sinking speed	3.5 ft. per sec.
Aspect ratio	10	Maximum towing speed	72 m. p. h.
Weight, empty	230 lbs.	Stalling speed	32 m. p. h.

Standard equipment: wheel and brake, air-speed indicator, safety belt. Price, $850 at factory. No kits or plans available.

5. SCHWEIZER SGS 2-8

Two-place sailplane manufactured by Schweizer Aircraft Corp., Elmira, N. Y. A. T. C. No. 5. Construction, same as the SGU 1-7.

Span	52 ft.	Gross weight	860 lbs.
Length	25 ft.	Gliding angle	23:1
Wing area	214 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	12.6	Maximum placard speed	72 m. p. h.
Weight, empty	460 lbs.	Stalling speed	35 m. p. h.

Standard equipment same as the utility, plus spoilers. Ship is stressed for all normal aërobatics. Price, $1,800 at factory; kit, $1,400. No plans available.

6. BRIEGLEB BG-6

Utility glider manufactured by Briegleb Aircraft Co., Inc., Van Nuys, Calif. A. T. C., No. 6. Construction: metal-tubing fuselage and tail surfaces, wooden wings, fabric covered.

Span	32 ft. 3 in.	Gross weight	425 lbs.
Length	18 11/16 ft.	Gliding angle	16:1
Wing area	117 sq. ft.	Sinking speed	3 ft. per sec.
Aspect ratio	8.9	Maximum towing speed	72 m. p. h.
Weight, empty	235 lbs.	Stalling speed	32 m. p. h.

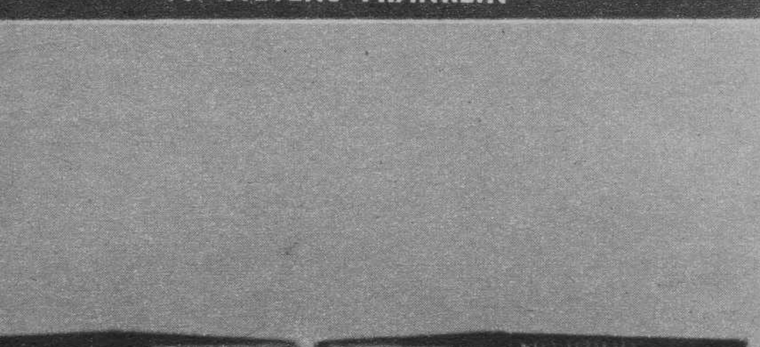
The standard equipment consists of air-speed indicator, landing wheel and brake, elevator trimming device, additional wing-tip skids and safety belt. Price, $650. Can be purchased in kit form from $235 up. Plans, $25.

7. BOWLUS BA-102

Two-place sailplane manufactured by Bowlus Sailplanes, Inc., San Fernando, Calif. No A. T. C. Construction same as Baby Albatross.

Span	44 ft. 8 in.	Gross weight	750 lbs.
Length	19 ft. 4 in.	Gliding angle	20:1
Wing area	155.6 sq. ft.	Sinking speed	3 ft. per sec.
Aspect ratio	12.85	Maximum placard speed	65 m. p. h.
Weight, empty	350 lbs.	Stalling speed	32 m. p. h.

Standard equipment same as Baby Albatross. No price on this ship quoted by the Bowlus Co.



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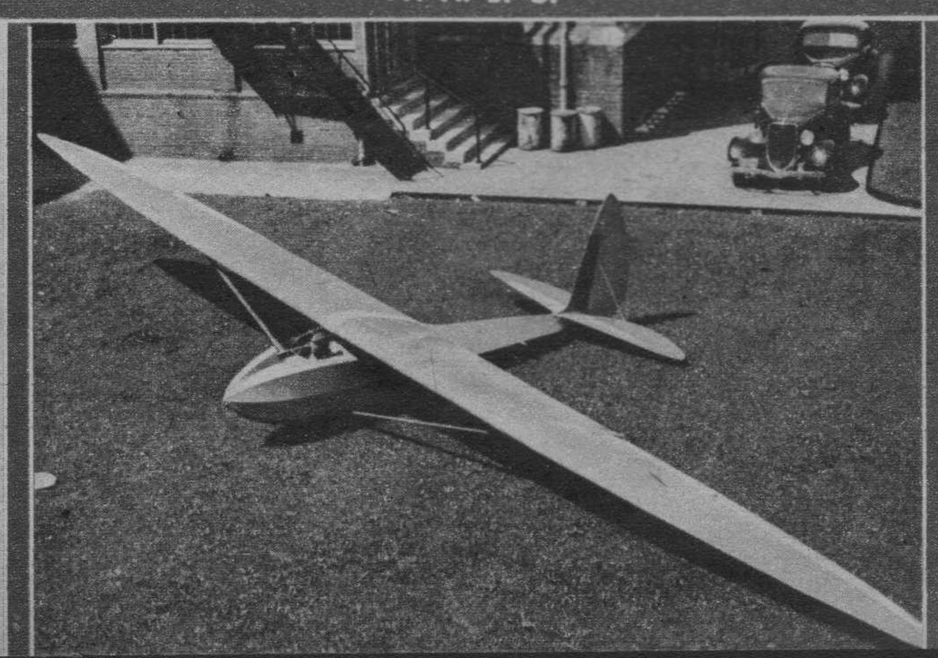
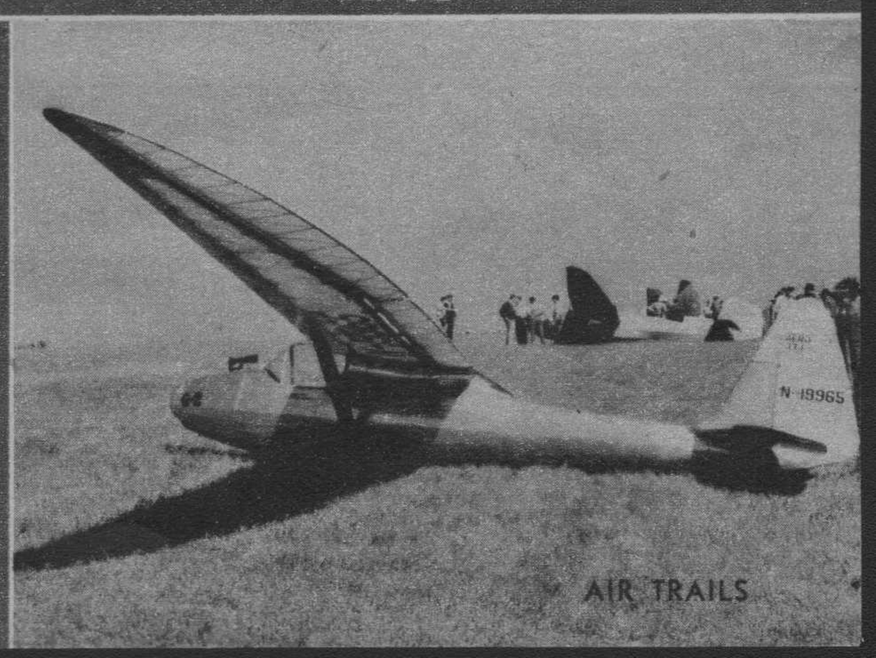
11. A. B. C.



12. G-2



AIR TRAILS

4. SCHWEIZER SGU 1-7

5. SCHWEIZER SGS 2-8

6. BRIEGLEB BG-6

8. MIDWEST MI-1

Intermediary sailplane manufactured by Midwest Sailplanes, Highland Park, Mich. A. T. C. pending. Fuselage of metal tubing, fabric covered; wing of wood construction monospar with a stressed plywood leading edge, braced by a single strut.

Span	46 ft.	Gross weight	480 lbs.
Length	23 ft. 10 in.	Gliding angle	21:1
Wing area	172 sq. ft.	Sinking speed	2.4 ft. per sec.
Aspect ratio	12.3	Maximum placard speed	80 m. p. h.
Weight, empty	290 lbs.	Stalling speed	28 m. p. h.

Standard equipment: altimeter, air-speed indicator, wheel and brake, safety belt. Ship is stressed for normal aërobatics. Available also with utility wing for training purposes.

9. FRANKLIN PS-2

Single-place utility glider designed and built by R. E. Franklin, Ypsilanti, Mich. This ship, the backbone of American gliding, is still the most popular training ship with clubs and schools. Although not manufactured any longer, used models are occasionally available. It features a metal-tube, fabric-covered fuselage with wings of wood construction.

Span	36 ft.	Weight, empty	220 lbs.
Length	22 ft.	Gross weight	400 lbs.
Wing area	180 sq. ft.	Gliding angle	14:1
Aspect ratio	7.2	Sinking speed	3.5 ft. per sec.

Another modification of this ship was equipped with a wing of forty-foot span which considerably bettered its performance.

10. STEVENS FRANKLIN

Intermediary sailplane that has a standard Franklin fuselage fitted with gull wings designed by Stevens Institute of Technology, Hoboken, N. J.

Span	46 ft.	Weight, empty	325 lbs.
Length	22 ft.	Gross weight	550 lbs.
Wing area	180 sq. ft.	Gliding angle	16:1
Aspect ratio	11.5	Sinking speed	3 ft. per sec.

11. A. B. C.

Sailplane designed and built by Arthur B. Schiltz, Berkley, Mich. Construction: fuselage, metal tubing, fabric covered; wings, wood construction, fabric covered.

Span	48.5 ft.	Weight, empty	300 lbs.
Length	19 ft.	Gross weight	470 lbs.
Wing area	175 sq. ft.	Gliding angle	18:1
Aspect ratio	13.2	Sinking speed	2.8 ft. per sec.

Ship not in production. Plans available, $35.

12. G-2

Sailplane manufactured by Aero Industries Technical Institute, Los Angeles, Calif. This ship was built by the students of the Aero I. T. I. It has a metal monocoque fuselage covered with stressed skin Alclad. Wings are of single-spar wood construction.

Span	48 ft.	Gross weight	450 lbs.
Length	20 ft.	Gliding angle	17:1
Wing area	170 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	13	Maximum placard speed	75 m. p. h.
Weight, empty	280 lbs.	Stalling speed	24.5 m. p. h.

Model not available for sale.

13. KIRBY KITE

Sailplane built by Herman Kursawe and Frank Schellhorn of Airhoppers Gliding and Soaring Club, New York City. Plans for this ship were obtained from Slingsby Sailplanes, Ltd., Kirbymoorside, England.

Span	47 ft.	Gross weight	500 lbs.
Length	20 ft.	Gliding angle	18:1
Wing area	157 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	14	Best cruising speed	35 m. p. h.
Weight, empty	300 lbs.	Stalling speed	22 m. p. h.

Plans for this sailplane can be purchased from Slingsby for $40.

14. KESTREL

Sailplane built by Leslie Barton, T. Nilon, and S. Hruslinsky of Newark, N. J. Plans were purchased from Dunstable Sailplane Co., England. Construction is entirely of wood.

Span	40 ft.	Weight, empty	245 lbs.
Length	20 ft.	Gross weight	415 lbs.
Wing area	150 sq. ft.	Gliding angle	18:1
Aspect ratio	11	Sinking speed	2.9 ft. per sec.

15. LAWRENCE YELLOW PERIL

High-performance sailplane designed and built by Donald Lawrence, Caldwell, N. J. Fuselage of metal tubing, fabric covered; wings, all wood, fabric covered; equipped with spoilers.

Span	53 ft. 9 in.	Gross weight	700 lbs.
Length	21 ft.	Gliding angle	24:1
Wing area	171 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	17	Maximum placard speed	120 m. p. h.
Weight, empty	500 lbs.	Stalling speed	32 m. p. h.

Ship not being manufactured. Full complement of instruments.

16. ROSS-STEPHENS RS-1 ZANONIA

High-performance sailplane manufactured by Ross-Stephens Aircraft Co., Montebello, Calif. All-wood construction; monocoque fuselage, plywood covered. Spoilers operated individually by heel pressure on rudder pedals.

Span	46 ft.	Gross weight	500 lbs.
Length	20 ft. 10 in.	Gliding angle	29.3:1
Wing area	124.4 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	17	Maximum placard speed	80 m. p. h.
Weight, empty	330 lbs.	Stalling speed	48 m. p. h.

Ship not in production. Above model owned by National Soaring Champion John Robinson, and with which he established a new American distance record of 290 miles. Equipped with full complement of instruments; altimeter, air-speed indicator, electric turn indicator, venturi bank-and-turn indicator, pellet and dial-type variometers, compass and clock.

17. YANKEE DOODLE DLS-3

High-performance sailplane built by Lawrence Institute of Technology, Highland Park, Mich. Construction; metal-tubing fuselage, fabric covered; wings all wood, fabric covered; equipped with dive brakes. Data for A. T. C. has been submitted.

Span	46 ft. 6 in.	Gross weight	540 lbs.
Length	20 ft.	Gliding angle	30:1
Wing area	142 sq. ft.	Sinking speed	2.7 ft. per sec.
Aspect ratio	15.25	Maximum placard speed	125 m. p. h.
Weight, empty	340 lbs.	Stalling speed	45 m. p. h.

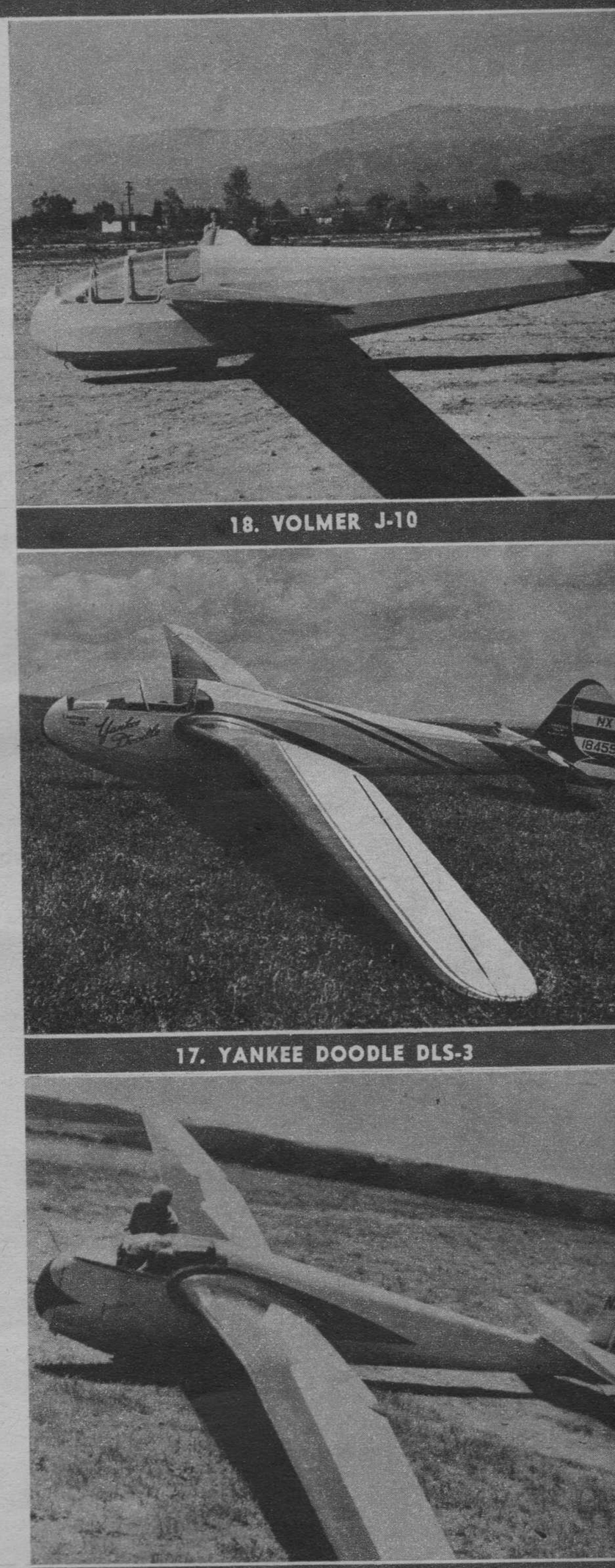
Ship stressed for unlimited aërobatics. Instruments consist of air-speed indicator, altimeter, compass, variometer, turn and bank and gyro-driven pitch indicator.

18. VOLMER J-10

Two-place sailplane manufactured by Volmer Sailplanes, 1010 Mariposa Ave., Glendale, Calif. A. T. C. pending. Fuselage of mixed metal tubing and wood construction, fabric covered; wings, all wood, fabric covered.

Span	55 ft.	Gross weight	800 lbs.
Length	25 ft.	Gliding angle	25:1
Wing area	180 sq. ft.	Sinking speed	2.5 ft. per sec.
Aspect ratio	17	Maximum placard speed	100 m. p. h.
Weight, empty	430 lbs.	Stalling speed	40 m. p. h.

Ship is equipped with both spoilers and flaps. Price, $1,500 completed, at factory. Kits, $800. Plans will be available soon.



18. VOLMER J-10

17. YANKEE DOODLE DLS-3

16. ROSS-STEPHENS RS-1 ZANONIA

13. KIRBY KITE

14. KESTREL

15. LAWRENCE YELLOW PERIL

Britain Will Attack!

(Continued from page 16)

and airmen, many hundreds of them for a big raid, are mobilized at starting points and have to be housed and fed during their wait, the air officer commander-in-chief of the bomber command may deem it advisable to cancel the whole show if weather forecasts indicate that while the hundreds of aircraft are homeward bound in the small hours of the morning, fog will roll up to cut them off from safe landing. For it is the weather over the airdromes to which the bombers must return which governs the night's operations, much more than weather conditions over the target areas.

But when all is ready, the ceremony known as "briefing" takes place. Pilots, navigators, air gunners and wireless operators repair to a given center at the airfield. The station commander presides at this conference on the night's operations. Intelligence officers with reports from all over Europe give pilots information concerning the target; position of enemy "flak"; obstacles to avoid; landmarks to look for; special objectives to identify the target. At this powwow the whole technical problem of the operation is discussed and canvassed, and pilots arrange how they will approach the target and how they will make good their getaway.

Thus, when engines are warmed up in the dark and each in turn takes off according to the predetermined timetable, every man knows the exact compass course he will steer; the height at which he will fly; when he will commence his "run in" to the target area; how many seconds he will remain over it exposed to danger; the course to steer for the homeward run; and the time he is due to circle his station preparatory for landing. If all goes with clockwork precision, the whole operation should end successfully, barring the gaps caused by the casualties.

Obviously, then, all this intricate staff work and the hazard of the long flight are only really worth while if worth-while results are to be secured. And to secure them, the big bomber carrying a big load is required. That is the lesson.

I lived in London through all the seven months of last winter's bombing raids and spent many nights with the fighter and bomber squadrons. I learned that when Germany put forward her maximum effort and sent raiders over every half minute from many directions for twelve hours or more through the night—using perhaps 400 aircraft—that this appeared to be saturation point. Damage was done to streets and utilities enough to cause serious inconvenience to traffic next morning, apart from the casualties caused to people and buildings. But the Nazis never seemed able to keep the bombing up with this intensity for as many as seven nights running. And therein lay our good fortune. The fact is that the weather is never dependable for seven nights in succession over Britain in winter to enable a vast effort like this to be mobilized and kept in action night after night.

The big bomber like the Boeing Flying Fortress led the way to something new. That is the exploitation of the stratosphere. I saw these bombers going into action at 31,000 feet to bomb the German battleships *Gneisendu* and *Scharnhorst*, and with the uncanny Sperry bomb sight the bombs found their targets. I saw them go off to bomb targets at Cologne in broad daylight, without fighter escorts. They rose to 37,000 feet with full war load and were still climbing. They dropped their bombs while seven miles from the targets. One and a quarter minutes later they passed over Cologne to see the bombs bursting with accuracy.

It was essential for Britain to indulge in a daylight bombing policy last summer. There are up to eighteen hours of daylight between May and September each day. If we had relied only on night bombing, then throughout the summer Germany would have escaped almost scot-free in the west, because after deducting two hours for flights to the Rhine and two hours for the homeward run, British bombers could only have been over German targets for two hours out of the six. The Boeing Fortress pioneered the way to daylight bombing and has shown that where the protection of altitude and of good fire power are obtained, it is safe to send bombers unescorted hundreds of miles from their bases into the heart of enemy territory. Thus last summer we were able to bomb by day and by night.

The Flying Fortress has taken bombing to over 30,000 feet. Where is the limit? I shall come to that point presently. In all the years between the two wars in which I have flown with the R. A. F. on maneuvers and in defense exercises, no effort was made to achieve high altitude. But the Germans sought it with the Messerschmitt and now all sides see its importance.

A few days before I flew across the Atlantic to America, I was invited by the British Air Ministry to take a look at Germany's latest Messerschmitt, the Me.109F2 single-seat fighter. We had captured one intact. I sat in the cockpit and tried the controls and noted all its points with a pilot's eye for the gadgets. The earlier Me.109E lacked good maneuverability. So the Nazis tried to improve on it by taking the guns out of the wings, lightening the wing loading, increasing the wing area slightly, and by concentrating the guns around the engine and the center of gravity. The four machine guns or two machine guns and two cannons in the wing have given place to one cannon gun firing through the air-screw hub and two machine guns aligned closely to the engine. The new cannon is of 20-mm. caliber, and not 15-mm., like its predecessors. It fires at the astonishing rate of 900 rounds per minute. This aircraft is formidable, without doubt, and it can climb to 39,000 feet.

Our aim in the new Spitfire has been to place two cannon guns in the wings; keep six of the machine guns there also, out of the original eight; and while preserving superior fire power to the Nazi, operate at an altitude higher than he can. Upon the whole, we have succeeded, but it is the Nazi who has set the pace for the race to the stratosphere with the fighter.

Obviously, there is tactical advantage in altitude. The fighter able to operate at a higher ceiling than a rival is able to dive at higher speed over the tail of his opponent to shoot him out of the sky. He is able also to dive on the bomber, choosing the "blind spots." So the bomber is forced by competition to seek high altitudes to give itself a sporting chance from attack by fighters in daylight.

Much has been written about the escort fighter. We have been using vast umbrellas of Spitfire fighters to protect small formations of that class of British bomber which could not venture over Germany in daylight without protection. But the Spitfire is an interceptor of limited range. The ideal fighter for full escort duties must have a range of over 1,500 miles if it is to escort bombers from Britain to Berlin and back in daylight. Even then a wise enemy, knowing that fighters carry limited ammunition supplies, will harass the bomber formations and their fighter escorts from airfields all the way out and back, with the objective of exhausting the ammunition supply of the fighters. When that is achieved, then the fighter becomes easy prey.

For this reason I am more inclined to the view that the new long-range fighters being built in the U. S. A. for Britain may be used for a very different purpose, and that we shall rely on vast fleets of high-altitude bombers for daylight raids. These will not require escorts if well armed.

But Germany also will be exploiting the stratosphere. There is no monopoly. She will send high-altitude bombers to Britain, and if they are able to rise above our fighters and if they possess fire power adequate for their defense, a new vulnerability for Britain will arise. The new fighter may therefore be employed at a new duty on "standing patrol." The high-altitude bomber is able to sneak in unobserved and unheard from the ground at 35,000 to 40,000 feet. The fighter will have to range these skies above the cloud layers on sentry-go all around Britain's coasts to save the time required in the climb and to be at altitude ready to pounce on the stratosphere bomber. This is a new task I foresee, and a vast force of fighters is needed to cope with it.

What, then, is the limit of height? We already know that pilots suffer fatigue over 30,000 feet on long patrols, even where oxygen is sipped under pressure from bottles. The pressurized cabin is of course the answer. It is coming, and I think it is coming for fighters and bombers. Then aircraft will be able to range at 50,000 feet and higher, with crews living in hermetically sealed

(Turn to page 26)

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FLYING

Britain Will Attack!

(Continued from page 24)

cabins where air is drawn in under suction and where living conditions approximate those of sea level to 6,000 feet.

There is still one final problem which faces us in Britain and which faces all air powers. That is the problem of locating the enemy in the darkness. We have achieved some considerable measure of success by devices which pick up the enemy and direct aircraft to the track on which he is flying. These devices began to show promise last March. By May, when a full moon during the first eleven nights tempted the Nazis to fly in large numbers over Britain, they lost 246 aircraft culminating in a loss of thirty-three on May 11th. They have not been back in big numbers since that night.

But that is "cat's-eye" interception. The pilot finally sees the bomber when directed to within a couple of hundred yards of him. On dark nights he cannot see his prey, and unless he can see him he cannot open fire. This suggests that some form of illumination is needed to light up the track of the suspected bomber so that the fighter can find him on dark nights. I believe this is the right solution. Given it, night bombing over Britain can be made too expensive. I should not be surprised if this is not the line of research in several countries.

Britain is therefore crouching to spring on her enemy this winter, now that she has gathered experience of the best methods of attack. She will attack with the ferocity of the lion, using a fleet of powerful big bombers carrying great loads. Night after night, as weather permits, and day after day, we shall see this rising in a crescendo of effort. The pace will depend upon how quickly the big bombers are turned out in Britain and in the United States.

If, therefore, bombing of Germany —what we term strategic bombing— from British bases is to secure decision and cause the complete collapse of the Nazi regime ending in the restoration of liberty to the German people no less than to their victims, then the R. A. F. needs a mighty force of aircraft for the task. If these are supplied to build up the bombing front to the striking power which the magnitude of the task demands, then it is not unreasonable to hope that air power can smash the power of Hitler and break the heart of his Nazi empire.

Jobs After The War

(Continued from page 18)

After the war, aviation will undoubtedly have a slump compared with what it will be, at the height of the present boom, but it will never go back to the size it was in the mid-1930s. That much is agreed by everyone. There will continue to be activity along several lines.

In the manufacturing field there will continue to be orders for replacements. There will be many thousands of American-built airplanes, engines, instruments and other accessories in various parts of the world. Many of these ships will continue to be flown, and replacement parts will be needed. Wing sections, tail groups, landing gear and other parts will have to be built. The building of replacements for airplanes in service will give employment to thousands of men.

There will be new types of airplanes to be built. By the end of the war it is probable that new types of fighters and bombers will have been built that will outmode most of today's crop of planes. If there is an armed truce, or when Germany is defeated and dismembered, the rest of the world is still going to want the latest and best airplanes. It seems a certainty that the airplane factories in this country that can look farthest ahead and build new military designs will continue to get orders.

In the commercial field there will be several new kinds of airplanes. Transport planes do not wear out— they become outmoded by better planes. Ford Trimotors are still flying. The Boeing 247-D's did not wear out on United Airlines. They were replaced by Douglas DC-3s, and the Boeings were sold to other air lines. Today the DC-3 and the Lockheed Lodestar are excellent airplanes, but after the war is over they will be replaced by faster, more comfortable airplanes. The market for new transport planes will be a large one because air-line travel is still in its infancy, both here and abroad. Before the war it was generally admitted that U. S. transports were the best in the world, and this favorable condition will probably remain and keep some of our production men busy.

Building new planes for transoceanic flying will also provide jobs for many men. Pan American Airways has already ordered some of the new four-engined Lockheed Constellations. Undoubtedly other long-range airplanes will be designed for international air routes. The war has provided a great stimulation to transoceanic travel, and many airplanes will be needed for such work after the war.

The building of cargo ships is another field which will be active after the war. A number of factors, including cheap aluminum, available factory space and machines, will bring down the price of airplanes. Other factors will lower air freight costs. It is generally expected by transport experts that the volume of air mail, air express and air freight will grow by leaps and bounds after the war, both in this country and abroad. There is a vast market for cargo planes in South America right now, and this market will be extended after the war.

There has been much speculation about airplanes for the private pilot after the war. It is obvious that the sale of private planes will be greater than at any time in the past. Thousands of pilots are now being trained for the army and navy in addition to those who have learned in the Civilian Pilot Training Program. As it was after the last war, some of these men will give up flying, but the majority will want to keep up their licenses. Some will rent planes, but many more will want their own ships.

It seems probable that new types of private planes will be designed which will outmode all of today's airplanes. When a pilot has been flying fast combat ships it is likely that he will want more speed, range and comfort than is in many of the private airplanes of today. This demand for improved airplanes will build a new market, and give jobs to many factory mechanics.

As commercial and private flying increase, the number of jobs at airports servicing these airplanes will also increase. Under the present military stimulus, airports throughout the country are being improved and many new fields are being built. With new air lines, feeder lines, cargo services and a greatly expanded private flying activity, the number of new jobs at airports will be considerable.

There are now, in round figures, about 500,000 men employed in building airplanes and accessories. This number will probably increase to around 750,000 in the next year or two. A number of new plants are not yet in full production, and other factories are not yet built. Thus there are still many opportunities for jobs. The employment curve is still very much on the way up, and it will go up for some time yet before it levels off and then starts down.

Eventually there *will* be factory lay-offs. They may come in two years or four years—or if the war drags on or if an armed truce is declared, the lay-off period may not come for six years. It is natural that young men planning to go into factory work, or those already at work, should try to analyze their own chances of being caught in the lay-off that will some day come.

There have been lay-off periods in the aircraft industries before. What firms have done before is a good indication of what they will do again. When it is necessary to reduce the number of employees, most firms tend to respect seniority rights and keep their oldest workers. But in aircraft plants, thousands of new men have been hired at about the same time. This means that a large number of men will have approximately the same seniority, and some other method of choice must be decided upon. In such a case, the men who are retained will be those who are most valuable to the firm. This is inevitably the rule in all business firms. If *you* were the manager of a factory and had to lay off a certain portion of your men, it would be natural—and good business, as well—to want to keep the men who were the best producers.

Consequently, the moral is quite clear. If you are helping to build airplanes now, or are planning to get a job in an aircraft plant, learn to do your job so well that your work is outstanding. There are always so many men who are content to do just a fair job that anyone who does a top-notch job is immediately conspicuous. This does not mean handshaking the boss, or currying favors from your supervisors. Such methods may work for a short time, but in the long run are always discovered.

Doing an outstanding job means, in the first place, turning out a good performance. Building and servicing airplanes is a race against time, and there are two basic rules which must be lived up to: Get it done well, and get it done fast. But getting a job done well is often a matter of understanding it, and to understand a complex job requires considerable thought and study. Men in

About the SOLO CLUB and how to become a member

Feeling that there is a definite need for a means of recognizing those pilots who have experienced the supreme thrill of their first adventure alone into the blue on man-made wings, Air Trails has formulated and founded the SOLO CLUB.

This club is open only to those who have actually made a solo flight in heavier-than-air craft, either motorless or powered. It does not matter when or where such flight was made. Applicants must furnish the membership committee with satisfactory proof of their qualification for acceptance. There are no dues. Once a member, always a member.

To obtain your sterling silver SOLO CLUB lapel wings and life membership identification card, comply with any of the following requirements and sign. Send with fifty cents to the SOLO CLUB, Membership Committee, Air Trails, 79 Seventh Ave., New York, N. Y.

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1. Dept. of Commerce license and number if held.....
2. F. A. I. license and number if held.....

Or attach any of the following:

3. Evidence of military or naval air-corps service.
4. A letter from your instructor testifying to your solo flight, giving his rating and license number.
5. A notarized statement, preferably with witnesses, giving all details and data of solo flight and plane used.

In submitting the above for membership in the SOLO CLUB, I certify my willingness for the Membership Committee to investigate my application.

Applicant.....**Age**.....
(please print)

Street.....**City or Town**.....**State**.....

aircraft factories who have the best chance of holding their jobs when the war is over are those who not only do good work, but who are studying and learning more about aviation. A lot of them are going to night schools. Others are reading technical books and magazines. Some are spending considerable time thinking about their work and trying to improve the methods now in use. But whatever method they use, as they improve themselves, they improve their value to the firm they work for.

Knowing how to read blueprints is one of the first steps in self-improvement. There are hundreds of jobs in an aircraft plant in which a man does not need to know how to read drawings. But if he wants to get ahead, to be of real value to his firm, to understand his job in relation to other jobs around him, and if he wants to protect his own future, he should know how to read drawings. If he is a sheet-metal worker, for example, he should know considerable about the properties of various aluminum alloys, why different rivets are used in different locations, something about heat treating, metal protection, army-navy specifications, and many of the other points covered in basic training courses. Different kinds of aviation work require different kinds of background knowledge. A clerk in an aircraft production department can make himself valuable by one line of study, a beginning draftsman by another line, a stockroom man by still another, and so on. But study and training will improve them all.

If you are not working in aviation now and want to choose a job, the best advice is to get as basic a training as you can. You may be able to take a short course and get a job in two or three months, but you will be better off if you can take a longer course. The more you have learned about aircraft work, the better you will be. The value of sound training has always been emphasized in aviation work. It is of more value today than ever before.

One of the best fields of work open today is in aircraft maintenance and servicing. We are building thousands of airplanes and tens of thousands of gadgets to go on them. All of these airplanes need careful attention if they are to fly efficiently.

The reason that there is such a shortage of maintenance mechanics now is that it takes about a year of training for a man to get a C. A. A. certificate as an airplane and engine mechanic. He must either go to an approved school for a year, or work a year under the supervision of an A. and E. mechanic and then pass a strict examination. Nearly all of the free training offered in national defense schools has been for sheet-metal workers. Because the sheet-metal training has been free, as well as shorter, it has attracted the bulk of the students.

Maintenance men with training now have excellent opportunities in over half a dozen kinds of work. If they enlist in either the army or navy they have a good chance of becoming noncommissioned officers rapidly. The pay and privileges in such jobs are worth careful consideration. Both army and navy also employ thousands of civilian mechanics. The navy uses civilians at its large air stations such as San Diego, Corpus Christi, Jacksonville and elsewhere. These men do overhaul of navy airplanes. The air corps has six huge depots now where it employs civilians in civil service jobs. These are at Middletown, Pa.; Dayton, Ohio; San Antonio, Texas; Sacramento, Calif.; Ogden, Utah, and Mobile, Ala. Other depots are being planned. These are the major overhaul depots for the air corps. Formerly the largest of the depots employed less than 1,500 men. Soon one will have nearly 6,000, which gives an idea of the rapid growth. Qualifications for jobs at these depots can be secured from most post offices or from civil service offices.

There is also a shortage of mechanics at the civilian flight schools where air corps cadets get their primary training. One of the largest of these institutions has about 170 airplanes in use. Naturally, these ships require a lot of attention, and maintenance is done night and day to keep the ships in serviceable condition. There are schools of this type all over the country, and every one of them could use more well-trained mechanics.

There are about 700 operators at airports giving civilian pilot training and private instruction. In fact, there are more light planes in use than ever before, and an increasing number of mechanics are needed to service them. Many of the men who formerly did this kind of work have gone to work for aircraft factories.

Shortages also exist at all air-line bases. A survey of air-line maintenance superintendents reveals that they have practically given up hope of getting as many trained mechanics as they need. They are doing the next best thing, which means getting men with some kind of related experience, such as garage work, and putting them through a training course after they are employed. The field is wide open for maintenance men with the air lines. Despite their difficulty in getting new airplanes, the air lines are adding new routes and flying their ships more hours per day. This means stepping up their maintenance program. After the war there will be a rapid expansion of all air lines and many mechanics will be needed. Specialists, such as instrument men, radio technicians, carburetor specialists and others who are well acquainted with one phase of engine or accessory servicing, are greatly in demand.

Perhaps the most rapidly growing field for maintenance men is in the service departments of airplane companies. These departments receive the new planes from the final assembly department. Service men fill the tanks with gasoline and oil, run up the engines, test the hydraulic system, the instruments, controls and do everything necessary to prepare the ship for the test pilot. If trouble develops in any part of the ship, the service department must overcome it.

Airplanes may be slightly damaged during test hops or in ferry service. If so, they are turned over to the service department rather than sent back to the production line.

The larger U. S. companies today have service men who work closely with the army or navy, and if planes are sold to Canada or abroad, there are service men who are sent along with the airplanes. This is true not only of the airplane firms, but of the engines, instrument and accessory firms as well.

If you are considering aviation work of any kind, secure the best training you can afford. Thorough, basic training in a good school will be a worth-while investment.

Aviators Pass It—Can You?

(Continued from page 19)

someone hold his hand to one side of your face, extending one, two, three fingers. You should be able to count them as far back as a 50° angle from directly ahead. Next, ask him to cover your eyes for a few seconds, then check the pupils: they should contract quickly as the light strikes them. Ask him to hold a pencil in front of you, and then follow it with your eyes as he moves it about; both eyes should maintain a constant focus on the pencil.

If all the above tests are satisfactory and if the lenses and dilations test show no aberrations or astigmatism, the would-be pilot has passed the most difficult hurdle. He is then sent to the heart medico, who gives that organ a test consisting of a series of readings following mild exercise. It is an *index* showing bodily condition, nervous reactions, and expected behavior under varying conditions. And oddly enough, it is so simple that you can administer part of it yourself. (The only part you cannot do is the blood-pressure test.)

Lie down and become completely relaxed. At the end of ten or fifteen minutes, count the pulse for one minute and jot down the number; arise and count the pulse again, jotting down the second number.

Now obtain a chair eighteen inches high and step up on it. Repeat this ten times in fifteen seconds, at the end of that time taking the pulse once more. Check it carefully for *ten* seconds and jot down the figure obtained. Count it for *another ten seconds* and write down the figure. Continue to do this five times, or until the pulse appears to be normal.

Now multiply each figure just obtained by six, which will give the pulse rate per minute. It is now easy to find out just how much the pulse jumped after exercise, and how long it took to become normal. Write down the facts just obtained something like this:

			From	Pts.
Pulse rate lying down	72	Fig. 1A		2
Increase after standing	82	Fig. 1B		2
Pulse rate standing	82	Fig. 1C		2
Increase after exercise	8	Fig. 1D		3
Time for return to normal	45	Fig. 1E		2
			Total	11

Following is the Figure 1 referred to:

FIGURE 1

A Pulse Rate Reclining		B Increase in Pulse After Standing Up				
		0-9	10-17	18-25	26-33	34-60
49-61	...3 pts.	...3	3	2	1	1
62-71	...3 "	...3	2	1	0	0
72-81	...2 "	...3	2	0	–1	–1
82-91	...1 "	...2	1	–1	–2	–2
92-101	...0 "	...1	0	–2	–3	–3
102-130	..–1 "	..–1	–1	–3	–3	–3

C Pulse Rate Standing		D Increase in Pulse Rate After Exercise				
		0-11	12-21	22-31	32-41	42-51
62-71	...3 pts.	...3	3	2	1	0
72-81	...3 "	...3	2	1	0	0
82-91	...2 "	...3	2	1	0	–1
92-101	...1 "	...2	1	0	–1	–2
102-111	...1 "	...1	0	–1	–2	–3
112-121	...0 "	...1	–1	–2	–3	–3
122-131	...0 "	...0	–2	–3	–3	–3
132-150	..–1 "	...0	–3	–3	–3	–3

E Time Required for Pulse Rate to Return to Normal		Score	
0-29	sec....3	0—4	Poor
30 59	sec....2	4—7	Fair
7—10	Satisfactory	60-99	sec....1
100-130	sec....0	10—13	Good
		13—15	Excellent

Eleven points is a very good score on a basis of fifteen being perfect. A score of six or lower would be disqualifying for aviation, so it is easy to determine just how you'd stack up in this portion of the flight physical. If the score is only one or two points there is no cause for alarm, however, because the figure is merely an *index* of the circulatory efficiency of the cardio-respiratory system, which in five-cent words means that the heart reacts favorably to exercise.

A pilot must react promptly to many other stimuli, too. The reflexes are tested by the familiar striking of the knee to see if the patellar reflex causes the leg to jump. Equilibrium is tested by having each applicant balance on either foot with his eyes closed, or by putting him in a revolving chair. This is an interesting experiment to conduct at home with the aid of an interested friend. If no such equipment as a piano stool is available, bend over and turn around to the right, making ten complete turns in twenty seconds. The assistant should then force you into a chair and order you to sit up straight.

The fact is that normal persons cannot sit up straight, nor are their eyes focused on a particular object! A normal person will lean to the right, gradually assuming a normal position as his eyes cease to oscillate. Normalcy should be gained in not less than sixteen seconds and not more than thirty-six seconds; anything else is abnormal, and hence not desired in a pilot.

Pilots must not be nervous, especially of the type indicated by tremors. You can readily ascertain the state of the fingers, eyes, and tongue by observing them yourself: visible quivering of eyelids, tongue, or fingers is called tremors, and excessive quivering is cause for rejection.

Good balance, good reflexes, and good hearing are three items peculiarly bound together. Diseases of the ear have been known to affect stability, and poor hearing often indicates a disease of the middle ear. The whispered voice, watch ticks, or coin clinks from twenty feet are often given as tests—two quarters from twenty feet make an audible sound readily distinguished by good ears.

Lack of hearing is sometimes traced to diseases of the throat or an infection that is involving the Eustacian tubes. The locus of the infection may be in the mouth, either in teeth or tonsils. Although a doctor should be consulted if there is any serious doubt, you can inspect your own throat by means of a flashlight. Gums should be firm, pink, and evenly pointed between the teeth. Any recession, redness, or angry-looking appearance is a sign of an unhealthy mouth. Dark, decayed portions of the teeth called dental caries may easily lead to an abscessed tooth, which can spread infection.

The teeth must be present to the extent of eight molars, or grinders. Locate them by counting from the center to the back of the mouth: there are two incisors or biting teeth, a cuspid or "eye" tooth, two bicuspids, and three molars. The third molar (or wisdom tooth) is not always present, but present regulations call for a *total* of four molars and four incisors in a pilot's mouth.

It is also expected that pilots be within certain weight and height standards. The minimum is 132 pounds, five feet six inches tall. The maximum is 200 pounds, six feet four inches tall. Within these limits there must be adequate proportions; that is, a six-foot man must weigh more than the minimum of 132 pounds. Generally, the correct weight is computed as 110 pounds for five feet, with five pounds added for each additional inch of height.

Thus, most of the flight physical can be given in one's home. Even the mysterious urine analysis is not so hard, and can be made for the expenditure of a few cents. Get some "Benedict's Solution" from your druggist and put four or five c.c. (a little less than a teaspoonful) over a flame. Add a drop of urine and heat until it reaches a low boiling point. There should be no discoloration of the blue fluid; if a light green or heavy orange color appears, the presence of sugar is indicated, and a doctor should be consulted.

A second test may be conducted with "Robert's Reagent" by putting a small teaspoonful in a test tube and overlaying it with the same amount of urine. After standing a few seconds, no change should be noticed; if a white ring forms between the layers, either albumin or an infection is present—and, of course, a doctor should be visited. Either sugar or albumin is disqualifying.

Now summarize the test, just as the flight surgeon might do. Although you have not used a stethoscope or a sphymomanometer or a complicated eye machine, your results will show in a general way how you stack up with pilots. If you saw the letters clearly, followed the pencil on the ruler, recognized the colored yarns, worked the depth-perception pencils properly, your eyes should be good enough to land a plane in any airport. If your balance is normal, you should know a spin from a power dive, and if your heart score added up to seven or more, high-altitude hops needn't necessarily be a hazard. If ears, throat, and teeth are in good shape and there are eight molars present, you ought to hang on for some time to come and put away three square meals a day with the best of them!

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A-24

Lone Star fan, Frank Wright, Texas, did a swell job on a Bombshell and a So-Long from plans in Air Trails.

Shades of 1918 haunt model flying fields when Ray Fagan turns loose his Fokker D-8.

For Scotty Murray, ex-Skyscraper member, models proved stepping-stone to wings in R. A. F.

Model matters

Gordon Light's Dope Can. Moon's On The Field.

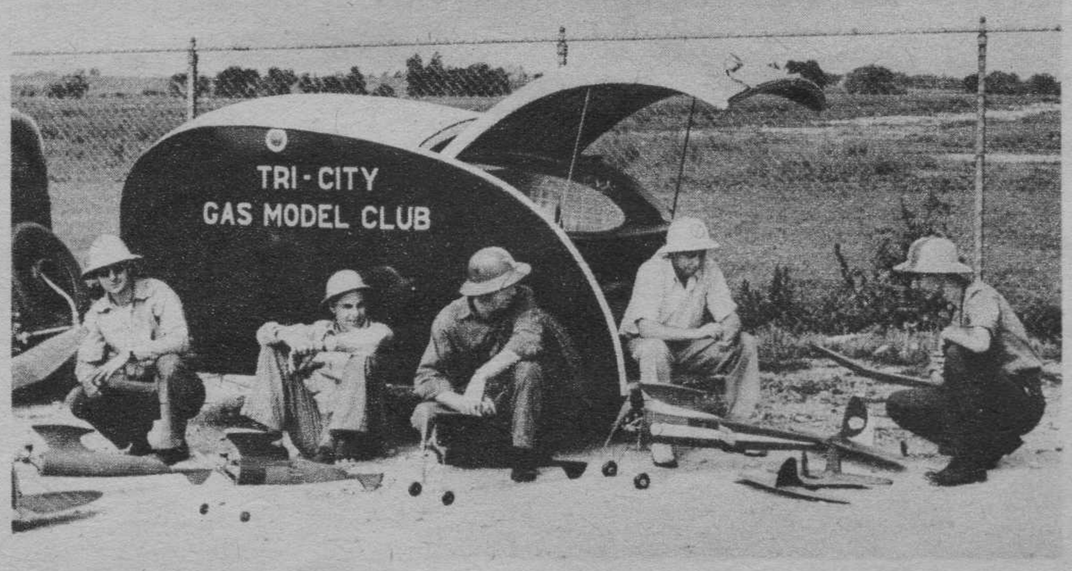
THE DOPE CAN. (By Gordon Light.) Gene Larson, in a recent issue of the Fresno (Calif.) Gas Model Association *News*, recounted the highlights of his Chicago trip. It's a saga of rainstorms, detours, an unhitching trailer, and bruised-and-battered models. The trip back was roughest. Two miles out of Indianapolis the trailer overtook them when the hitch broke, hit a shoulder of the road going sixty, and looped when the tongue dug in. Gene's only flyable model was buried under a tool box and a couple of gallon cans of dope. The trailer behaved from then on until reaching the Arizona desert, when it ran out of a tire. So they piled all equipment possible in the car and abandoned the trailer in the middle of the desert.

Inexperienced builders invariably have a rough time reading plans not drawn full-size. Air Trails' large-page size is a help, but the real answer is full-size plans to spread out over your work table. Keep in mind the new set of full-size plans available monthly for only ten cents (reduced from a quarter a short while ago). One or more sets of each should be in a club's file for member reference. Better still, buy them for yourself as soon as they are announced, as only a limited number are available. Back-issue requests indicate that some builders are several months deciding whether or not to build a model. You won't have to mutilate your magazine if you use these plans. Construction will be easier and more accurate. You just can't ignore the quantity of paper and the complete information you get for only ten cents.

Knowing about our interest in fishing, H. A. Thomas *(Turn to page 57)*

Eddie Price, Aurora, Illinois, combined a Bunch Tiger Aero engine with a slick design for pleasant flying. Weighs 36 oz.

Long Island Luftwaffe. A recent Skyscraper contest near Hicksville brought out this striking line-up of wartime Fokkers.



$52 built this trailer for Davenport, Iowa, boys. L to R—Andrews, Grundy, Pepen, Frederick, Moss. The Cram Airport is their flying field.

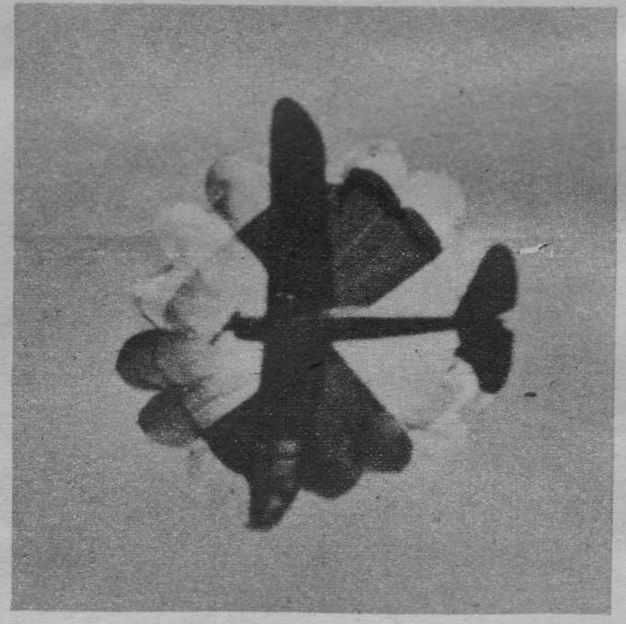
Out-of-sight squawkers look over these spoilers on wing of W. A. Manes Apache. Worked by timer, they kill lift, boost drag, to bring down ship.

Ronald Shepard hangs on as 'chute snaps open. Flight timer cuts ignition, which releases the 'chute.

QUAKER CITY TRICKS

Putting on the most popular contest in the East, the Quaker City club's stunt events bring out a raft of experimenters, much to the delight of the many spectators.

Paper holds down pilot 'chute. Free, paper blows back, releasing small 'chute, which pulls out large one.



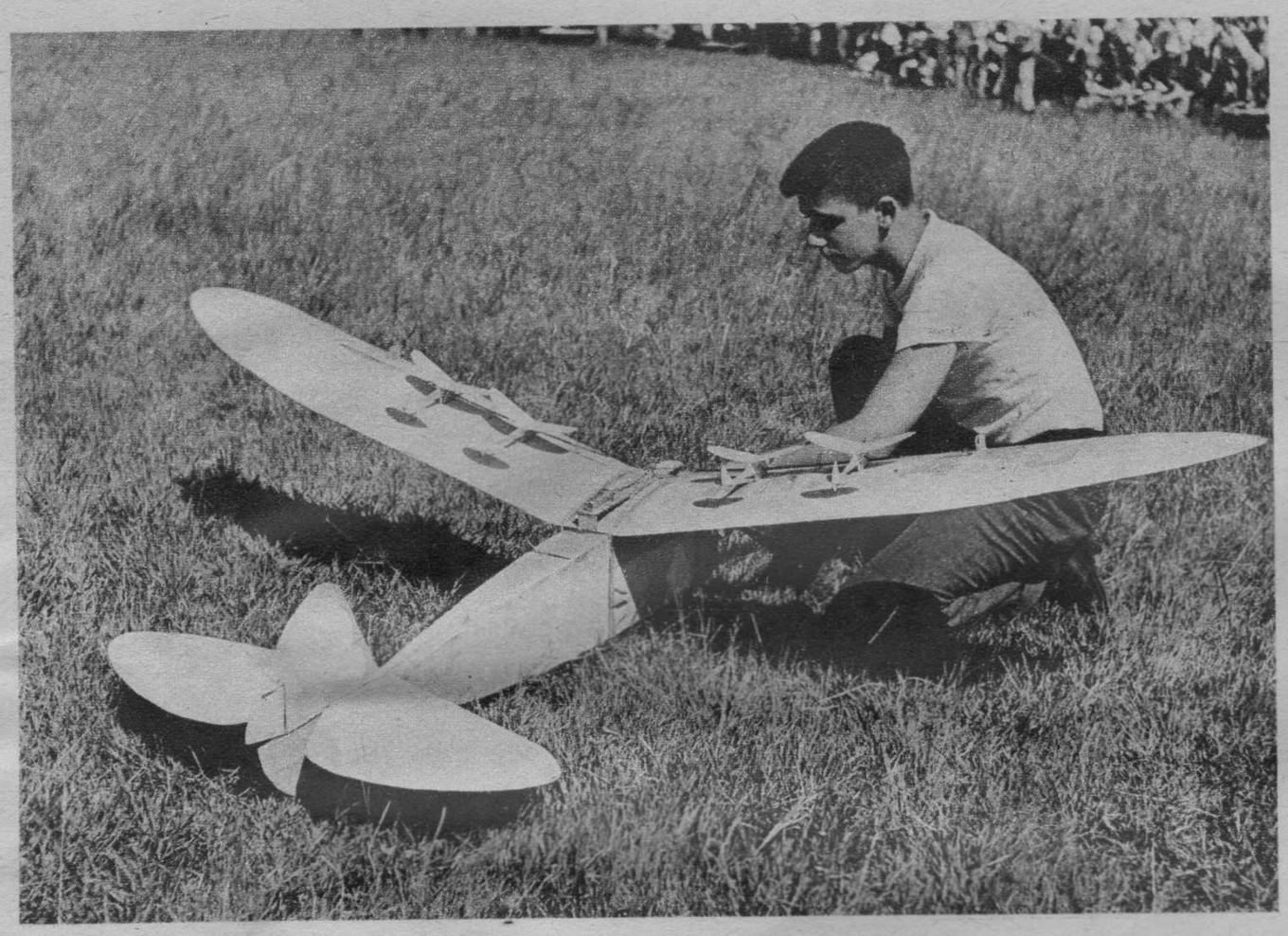
One way to make a three-point landing. This parachute model was one of several.

Hitch-hiker. Tricky pickaback by Van Leys Vincent featured rubber-powered model that went aloft on New Ruler, then flew on its own.

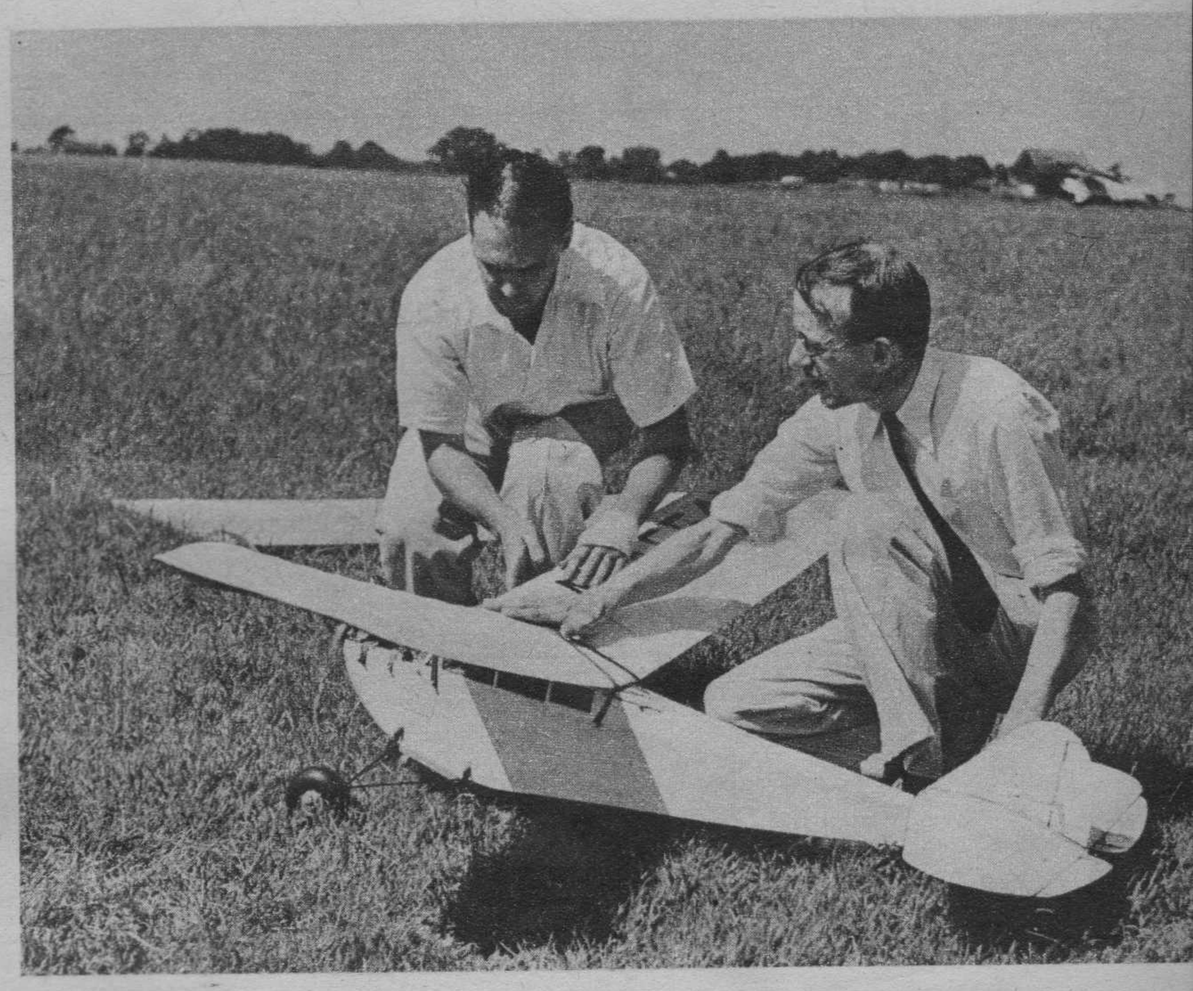
Not to be outdone by Vincent's pickaback, Bill Oberbeck and Tom Green teamed up two gas jobs. Timer on small ship is set for longer motor run than bottom model.

This might be a modified Cavalier; on the other hand, it might be an original design. But who cares? Pretty gals grace all Philadelphia meets. Meet Bunny Gutekunst.

Not a real plane that dropped in at the contest, but a huge 8½-foot Ryan scale model by Kerson Bologh. Motor is an Ohlsson 60. One trainer the army missed.



We'd hate to have to watch all these models at the same time. Timer pulls pin to release two gliders at once. Mother ship carries total of six. Jim Wood deserves a hand.



Even radio-control models were entered in stunt event. This job by Norman Bean. Photo shows control wires from up forward running to elevators, rudder.

A good time was had by all—even the judges. Left to right, Cliff Rogers, Paul Maiwurm, Paul Snyder, Irwin Polk, Walter Eggert, Sr. Add stunt events to your contest!