AIR TRAILS

SEPT. '42

SEPTEMBER
1942

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Pictorial

A STREET & SMITH PUBLICATION

BUY WAR BONDS AND STAMPS FOR VICTORY

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12 Ships in Detailed Three-View.

PARKS

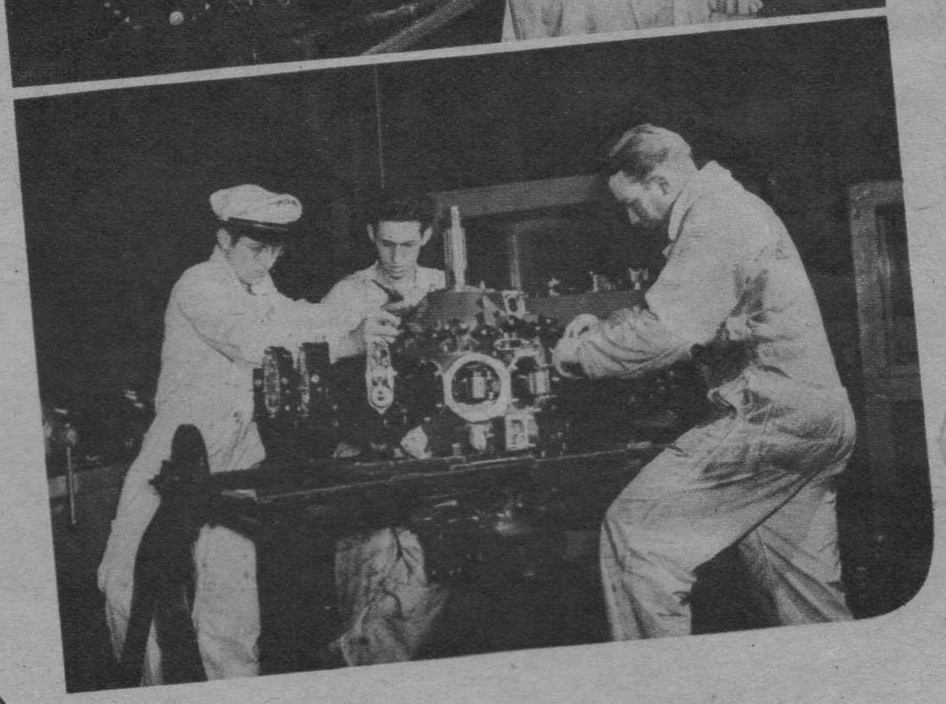
TRAINING FOR LEADERSHIP

Prepares You to Serve Your Country at War AND Equips You for a Successful Post-War Career

★ Today, with our country at War, you, as a Parks graduate, can serve America better because of your specialized training in the vitally important field of aviation. At the same time, your Parks education equips you to rise to leadership in the great expansion of commercial aviation which is certain to follow the peace.

Military air superiority is a major essential of victory, and this requires men who are specially trained for their jobs. Hundreds of Parks graduates today are helping America to achieve this goal.

Nearly 100% of Parks graduates are going into work of strategic importance to our War Effort. Some—more than 10%—are themselves flying in the Air Corps or Naval Air Reserve. Others are giving flight training and instruction or are engaged in maintaining, manufacturing, designing, and engineering more and better planes for our armed forces. These men are worth tremendously more to their country than if they had offered themselves untrained.



Just as Parks prepares you to play your part in today's Fight for Freedom, your Parks education also equips you to take advantage of the vast opportunities in commercial aviation after the War.

You'll be in a position to serve your country best if you plan *now* to prepare for leadership at Parks Air College. Remember, too, that Parks *college education majoring in aviation* trains you for a peacetime career in one of the world's greatest industries.

Time is short — never before has the trained man been so valuable to his country. As entrance to Parks is restricted and selective, send the coupon at once for the new 64-page Parks catalog containing full information on each of Parks four courses.

PARKS AIR COLLEGE was founded August 1, 1927. Has enjoyed full Federal approval longer than any other aviation school.

Is accredited in its Aeronautical Engineering School by the Illinois Superintendent of Public Instruction.

Included since 1938 in The Directory of Colleges and Universities, issued by the United States Office of Education.

Has a capacity enrollment of 325 commercial aviation students, also detachments of U. S. A. Air Corps Aviation Cadets and Mechanics. Has its own airport with a school plant of 25 buildings devoted to school purposes entirely, also a group of satellite fields for military flight training.

Has a faculty of 104, each especially qualified for his particular field of instruction.

Open to high school graduates with a ranking in the upper two-thirds of their classes.

PARKS AIR COLLEGE East St. Louis, Illinois

PARKS AIR COLLEGE Section AT-9
East St. Louis, Illinois

Please send me details of four major courses in commercial aviation training.

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Address.....

City..... State.....

AIR TRAILS Pictorial

A STREET & SMITH PUBLICATION

SEPTEMBER, 1942 **VOLUME XVIII NO. 6**

15 CENTS PER COPY **$1.50 PER YEAR**

CONTENTS

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IS THE *INDISPENSABLE* FACTOR

. . . in building America's war planes
. . . in building YOUR aviation career

The wealth of the world's greatest industrial civilization is ready to fulfill President Roosevelt's far-sighted demand for 185,000 war planes, but it is only a vast heap of material until skilled craftsmen can mould it into long-range bombers and swift pursuit ships. While the aircraft industry has been forced to accept thousands of single-phase workers from cheap "quickie" courses, the vital supervisory positions can only be filled by men with the thorough, long-range training to reach any objective to which they may be assigned. They are the only men of this huge production army who are INDISPENSABLE to America's war effort, and who will continue to be indispensable when the aircraft industry steps down from war to peace schedules.

The executives who have made aviation THEIR career know that there is no substitute for thorough, experienced training, and they know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fill the industry's exacting requirements.

Located in the very center and a very important part of Southern California's great aircraft industry, with its more than two billion dollars in unfilled orders, Curtiss-Wright Tec has come to be recognized as the nation's leading institution for the training of Aeronautical Engineers and Master Mechanics. Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training, which pointedly indicates the high standing Curtiss-Wright Tec has attained in the aircraft industry since its establishment in 1929.

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

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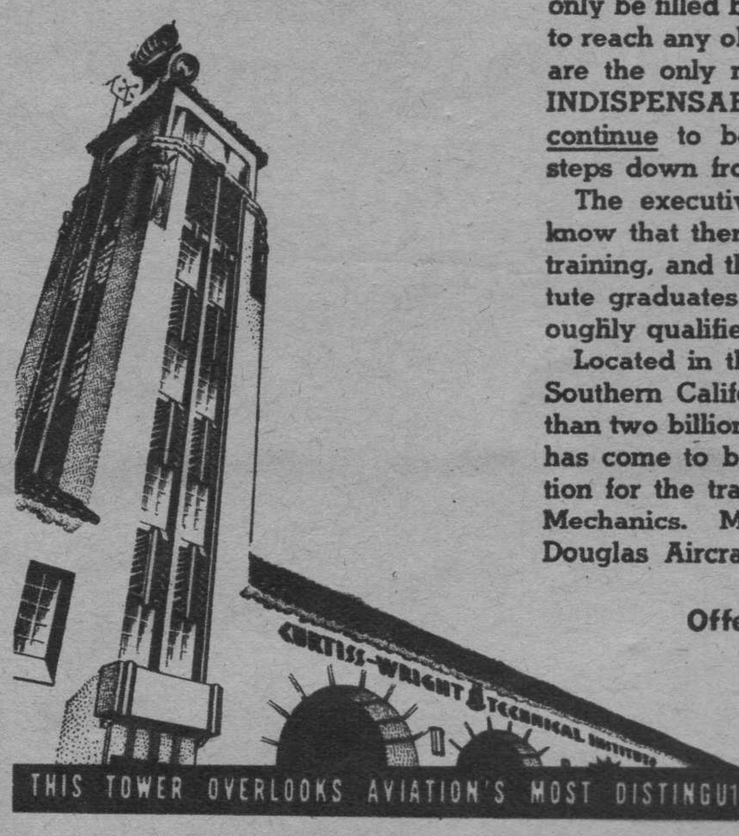

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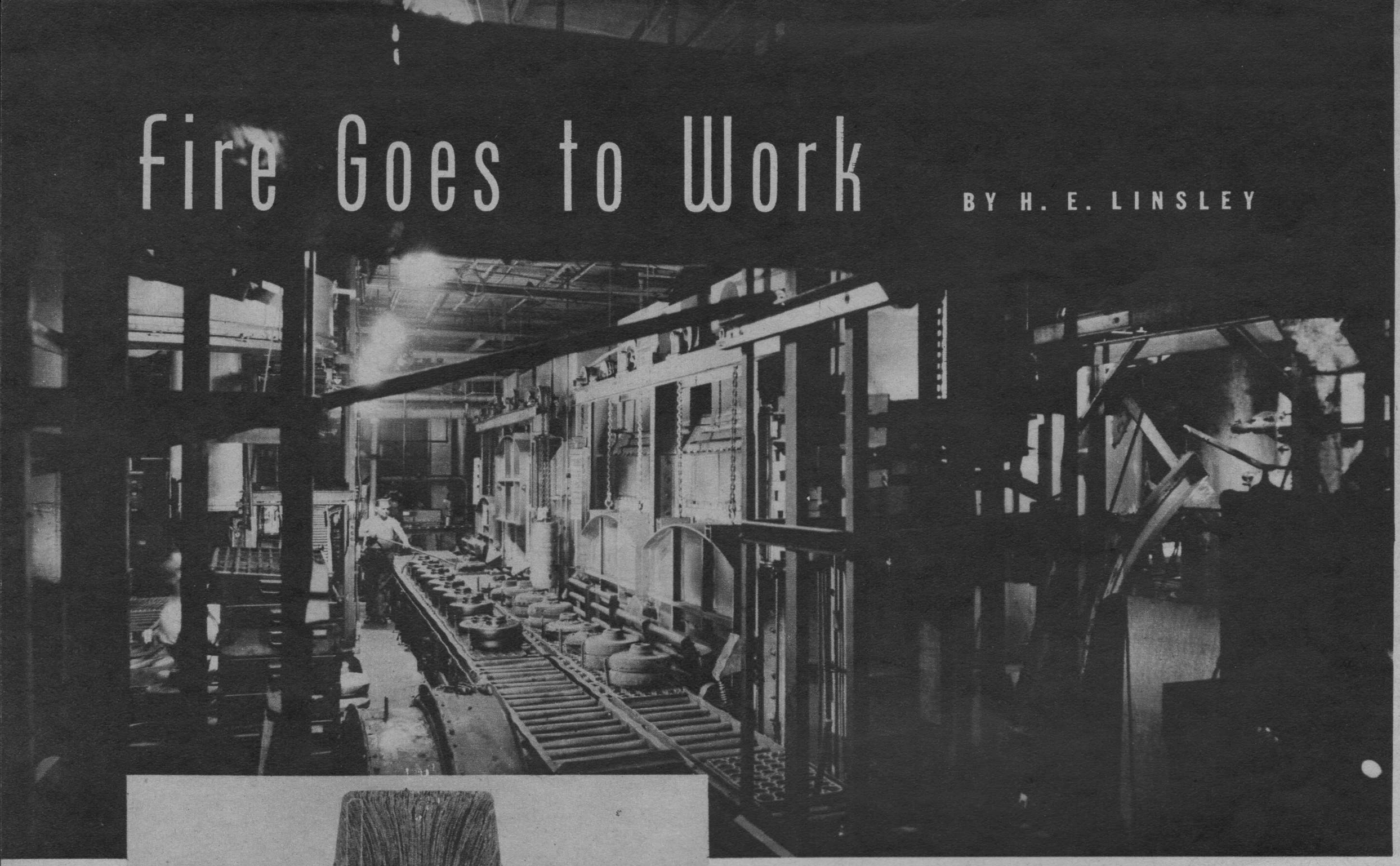
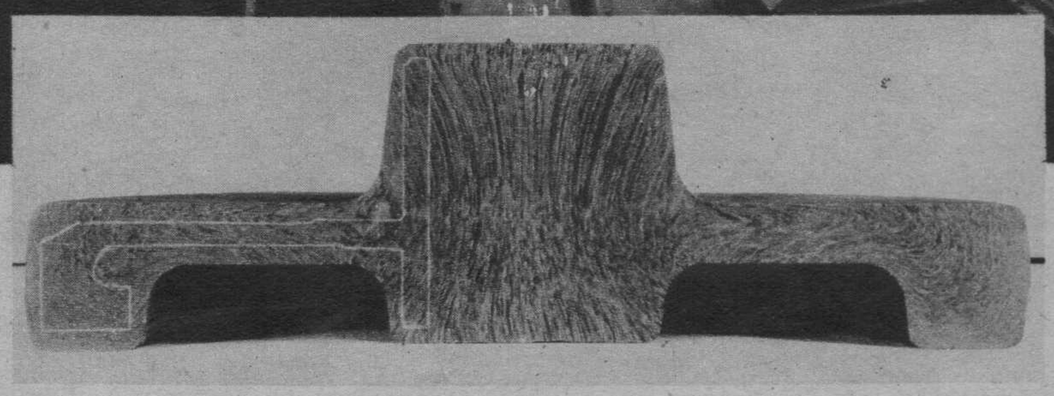
CITY STATE AT-9

Fire Goes to Work

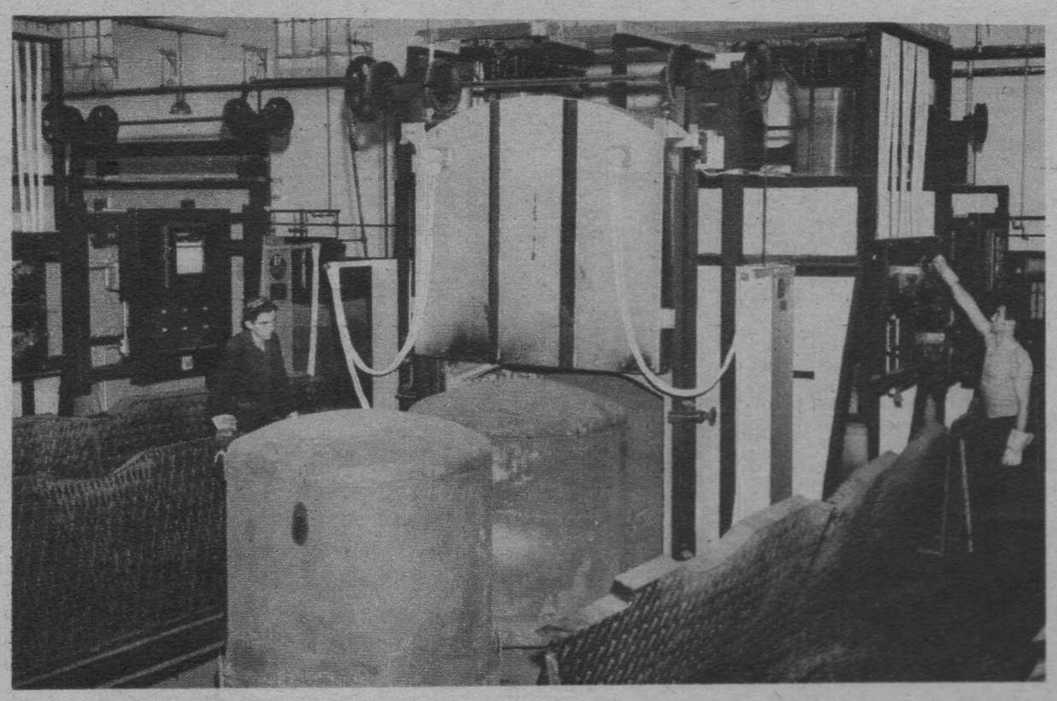
BY H. E. LINSLEY



Forgings travel along conveyor for loading into furnace: Wright Aeronautical.



Cut in two and etched with acid, this forging for gear clearly shows how the grain of steel is bent to follow shape of finished part (white lines).



A modern 50-ton electric furnace for nitriding cylinder barrels to produce a glass-hard bore. One furnace consumes 150-kilowatt-hours of electricity.

Crankshaft sections being loaded into carburizing furnace. Right, a furnace in operation; left, a press holds parts for quenching, prevents distortion.

How an age-old process, heat treatment, is used to toughen and harden metals required for powerful aircraft engines.

THE manufacture of a fourteen-cylinder, high-power, radial, air-cooled aircraft engine requires over 80,000 machining operations, not to mention some 55,000 inspections. Of all these myriad precision operations, however, none is more important than heat treating, for even the finest workmanship will be worthless if the material upon which it is performed is so soft that it will bend or wear rapidly, or so hard that it will break under the repeated shocks of service.

In its simplest form, heat treatment has been practiced through the ages, but it is a far cry from the blacksmith's heating to red heat in a forge fire and dipping in a tub of water, to the modern scientifically controled heat treatment in automatic furnaces as practiced in the aircraft-engine industry.

The entire process may be divided into five main sections, namely, normalizing, annealing, carburizing, hardening and drawing, any or all of which may be applied according to the type of material and the purpose it is to serve.

Many parts of an engine are made from forgings, pieces of metal heated and hammered or pressed into the approximate shape of the finished part. Such a process not only saves a great deal of time and material, but also results in a much stronger part than would be produced if it were carved from a solid block. Metals, like wood, have a definite grain, and in the forging process this grain can be bent and formed so as to follow the general shape of the part, and thus produce an infinitely stronger job. This forging process, however, sets up severe stresses within the metal, and when the part is machined, some of these are relieved while others remain, with the result that the part twists and warps out of shape. Fortunately this condition can be remedied by exposing the parts to the weather and allowing them to age. Such a process, however, requires considerable time, often as much as six months, and in these days of mass production such delays cannot be permitted. To overcome this difficulty, science has discovered that forgings can be aged artificially by a process known as *(Turn to page 44)*

FIRST AND FINEST ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

In these historic days when the borders of the world are re-shaping, literally overnight, domination of the skies means the difference between conqueror, and conquered. ☆ ☆ ☆ *Supremacy in the air begins with efficiency on the ground, and neither sun, nor rain, nor enemy fire halts the Air Forces' nimble-fingered mac's in their task of "keeping the boys upstairs."* ☆ ☆ ☆ *From Pursuit and Interceptor Units — from Bomber Groups — from their eagle nests aboard swift carriers, these service crews put 'em in the air and — send 'em back again — again — and again.* ☆ ☆ ☆ *Aeronca is proud of its responsibility for delivering to our Armed Forces planes to their specifications, built solely to standards of "First and Finest." But for minor adjustments or major overhaul, we depend on and salute, the lads who "keep 'em flying."*

The Aeronca Aircraft Corp., Middletown, Ohio, U. S. A.

AERONCA

The Aeronca Victory Award

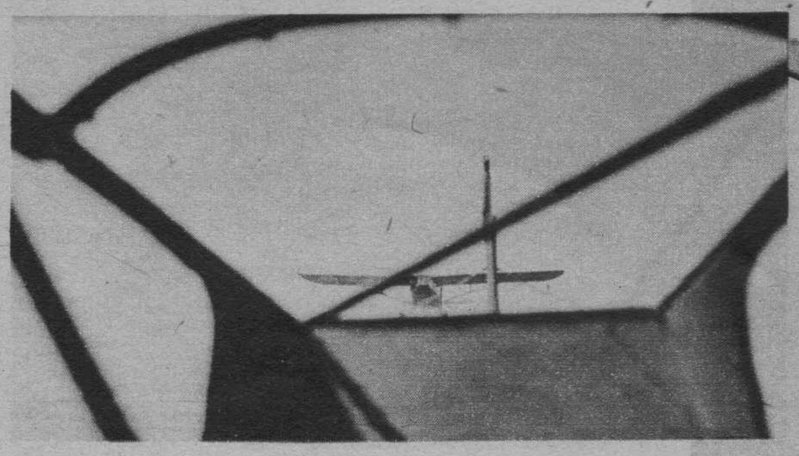
The Aeronca Aircraft Corporation pledges its entire resources of equipment and experience to produce only the finest in material and manufacture for the men who are privileged to fly for their country. ☆ ☆ ☆ ☆ *The — Aeronca Victory Awards — presented to employees for skill that develops better products or creates time-saving operations — are our dedication of an "all out" pledge to win the war in the shortest space of time.*

AERONCA

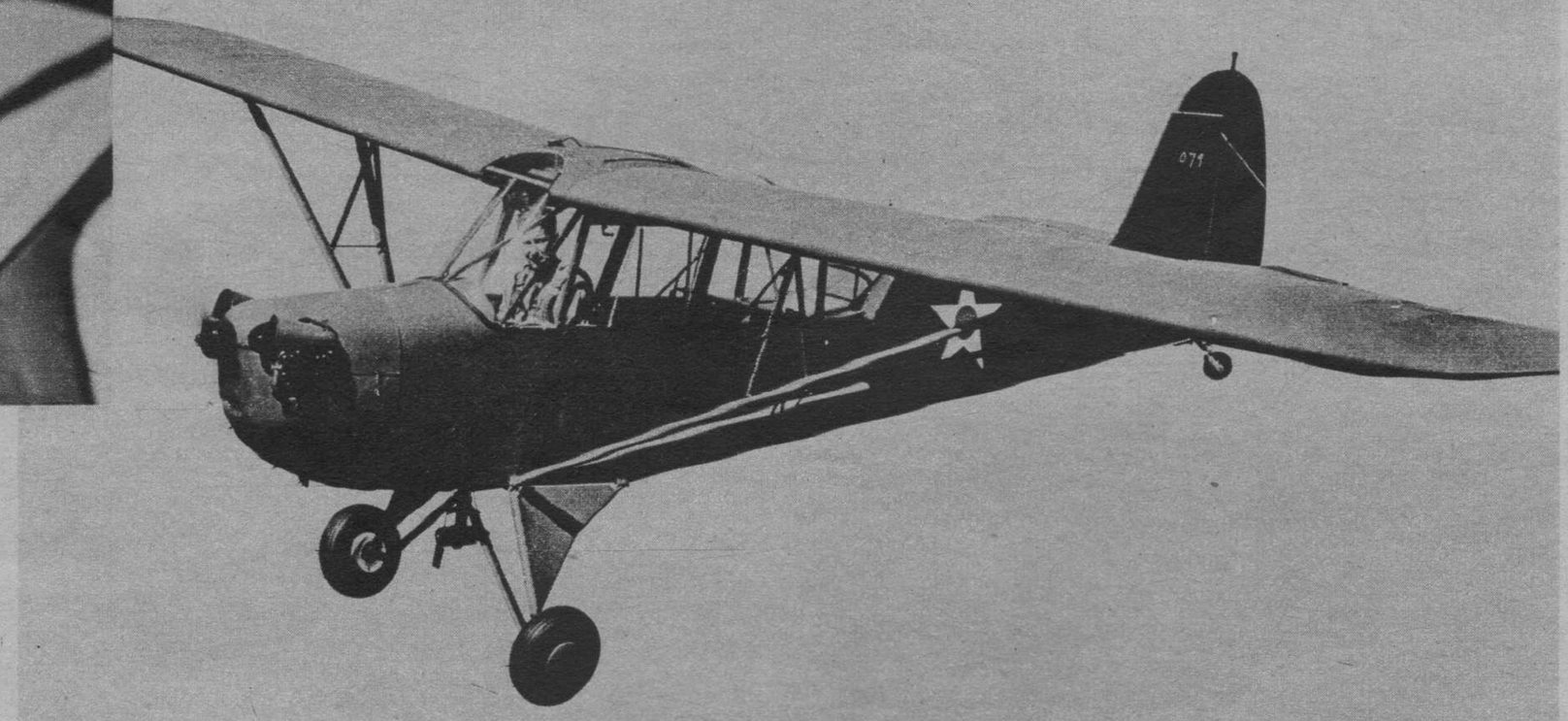
Aeronca At War

This well-known light-plane company now presents this trio of service ships.

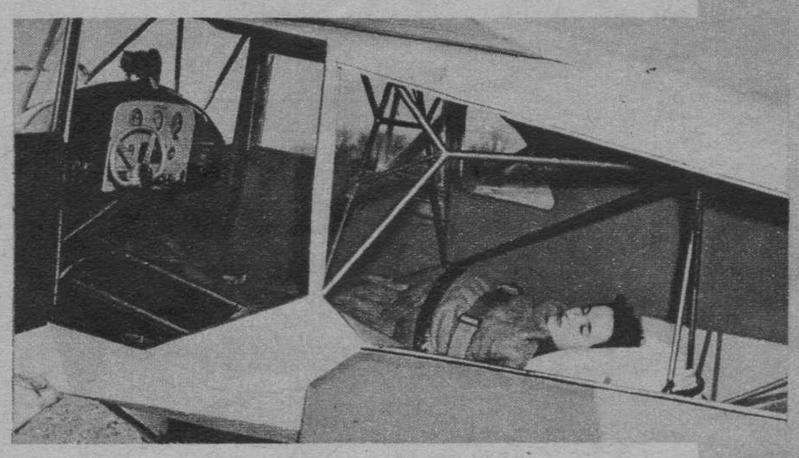
OBSERVATION



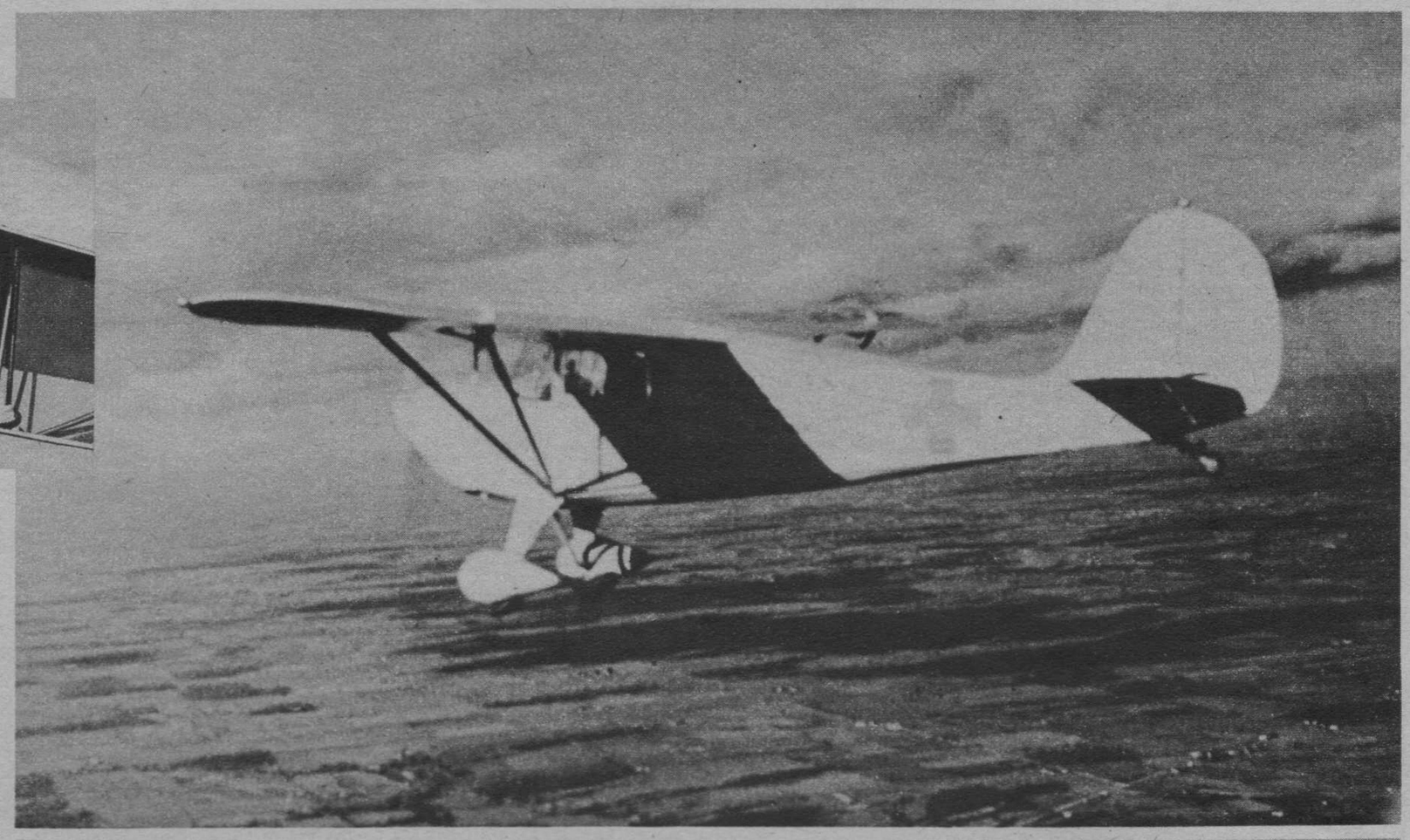
New L-3-B liaison plane can land and take off from smallest and roughest of fields. It is used for artillery spotting and messenger work. Above: unusual rearward visibility.



AMBULANCE



This special ambulance plane has large side door, first-aid equipment, and removable stretcher. Ideal for evacuation of wounded troops from small fields near the front.



GLIDER

To help in training much-needed glider pilots, Aeronca developed training glider out of standard light plane. Nose seat replaces engine, landing gear has been lowered.

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.

FALL CLASSES START SEPT. 28, 1942

AVIATION TRAINING AT ITS BEST

SIGN AND MAIL COUPON TODAY

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at Roosevelt Field, Mineola, Long Island, N. Y.

Without obligating me, send details of course checked:

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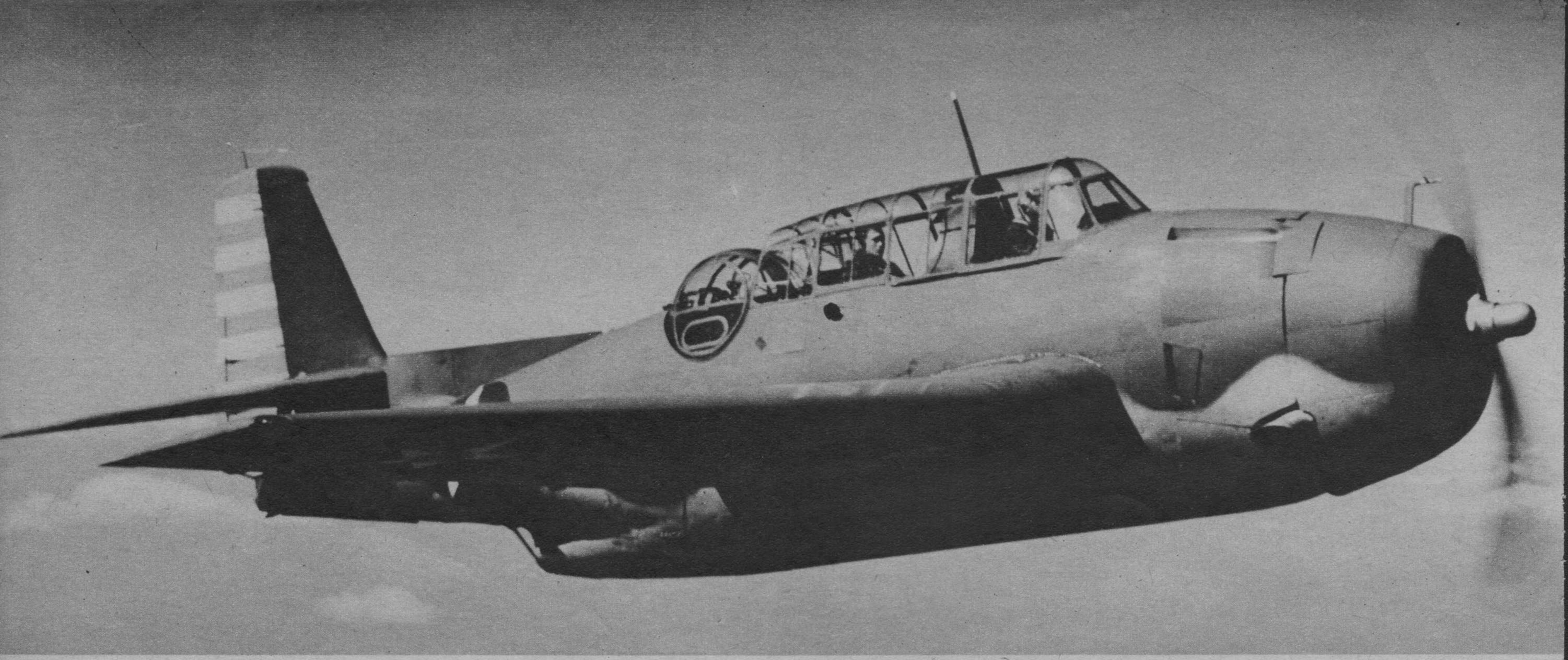
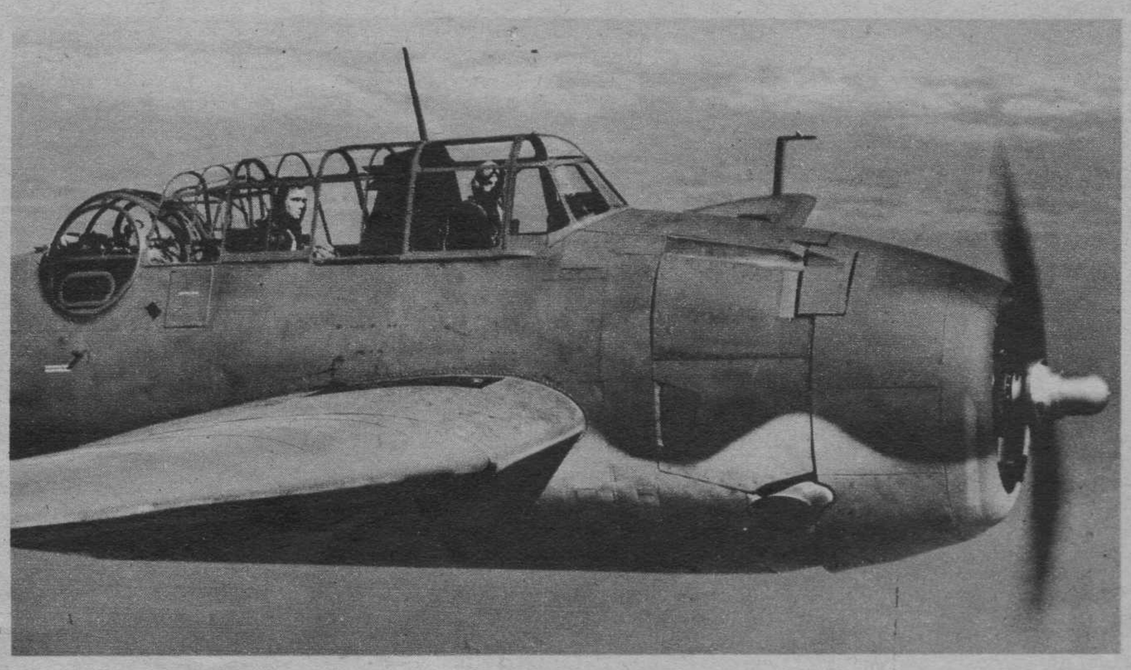




GRUMMAN AVENGER

When the Japanese tried to seize Midway they found more than a handful of Marines. In particular they discovered the three-place Avenger torpedo plane with its power turret, belly gun, and numerous forward-firing fixed guns. The Avenger, or TBF, contributed more than its share to the sinking of four carriers, two heavy cruisers, and three destroyers, as well as damaging heavily various other ships, including battleships. In Grumman's language, "the way to sink a ship is to let water into it not air." The TBF's full-size submarine torpedo hits where it hurts most—under the water line. Confusing the Avenger with the better known Grumman fighters, the Zero pilots got a tough reception when they did close in. The Avenger doubles as a high-level bomber, carrying a 2,000-pound bomb load. Method of sighting is secret but provision is made for a bombardier. Wings fold hydraulically for quick handling aboard carrier. Engine is a 1,750 h. p. Wright, speed 270, range 1,400.

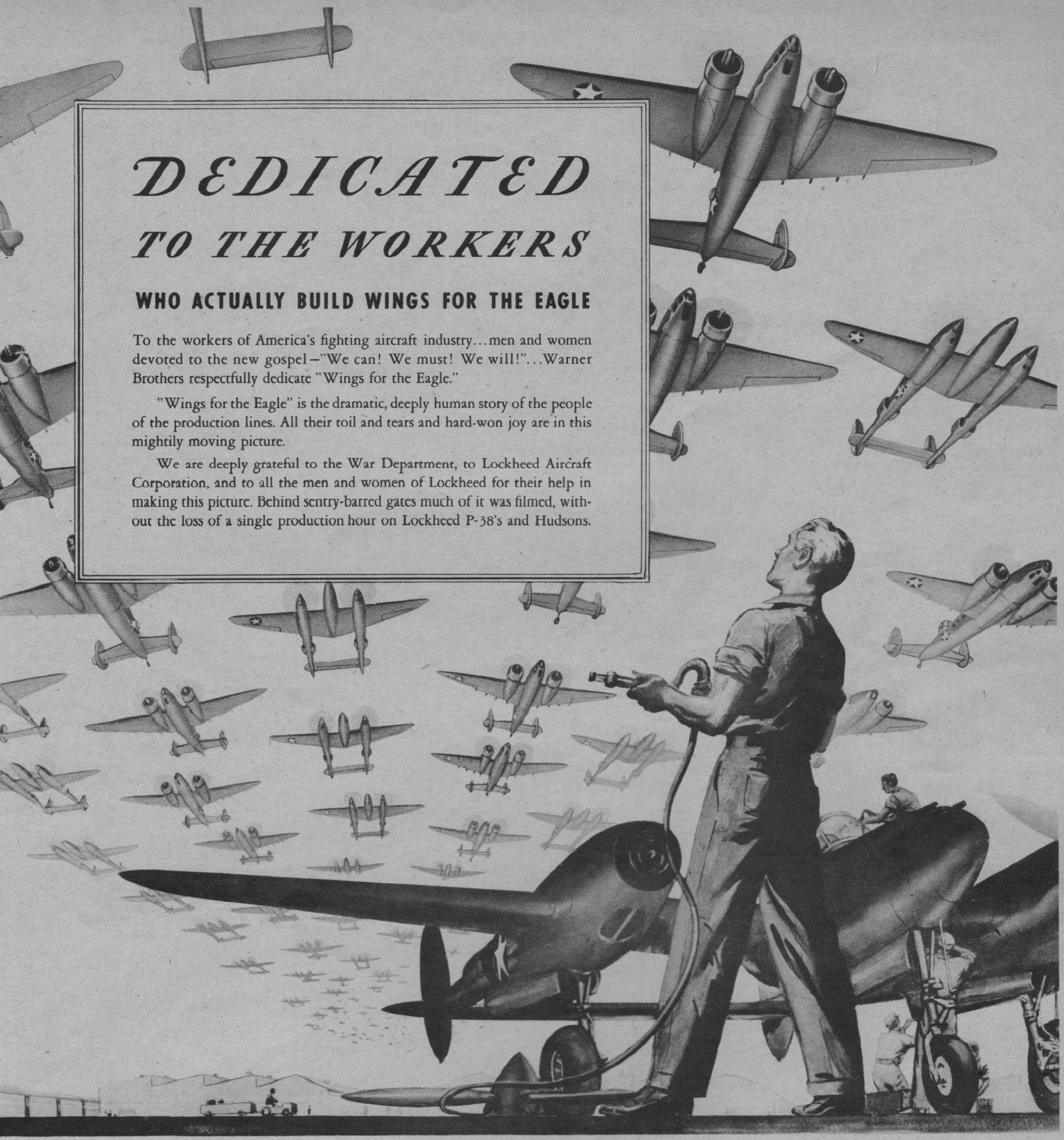
DEDICATED
TO THE WORKERS

WHO ACTUALLY BUILD WINGS FOR THE EAGLE

To the workers of America's fighting aircraft industry...men and women devoted to the new gospel—"We can! We must! We will!"...Warner Brothers respectfully dedicate "Wings for the Eagle."

"Wings for the Eagle" is the dramatic, deeply human story of the people of the production lines. All their toil and tears and hard-won joy are in this mightily moving picture.

We are deeply grateful to the War Department, to Lockheed Aircraft Corporation, and to all the men and women of Lockheed for their help in making this picture. Behind sentry-barred gates much of it was filmed, without the loss of a single production hour on Lockheed P-38's and Hudsons.

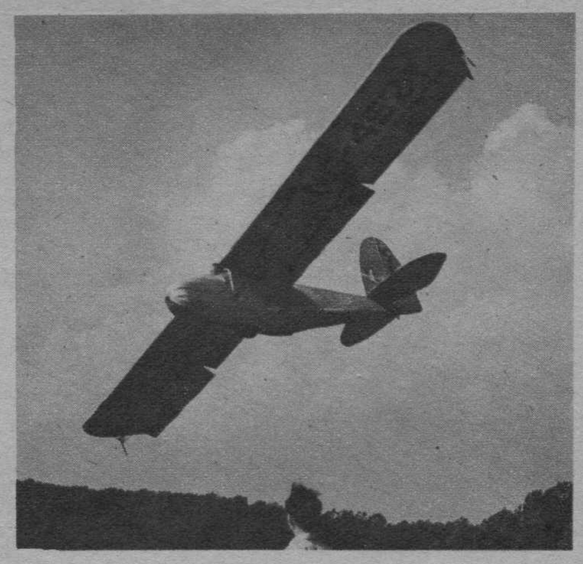


WARNER BROS. HAVE THE HONOR TO OFFER AS THEIR NEWEST CONTRIBUTION TO THE AMERICAN SCREEN AND WAR EFFORT

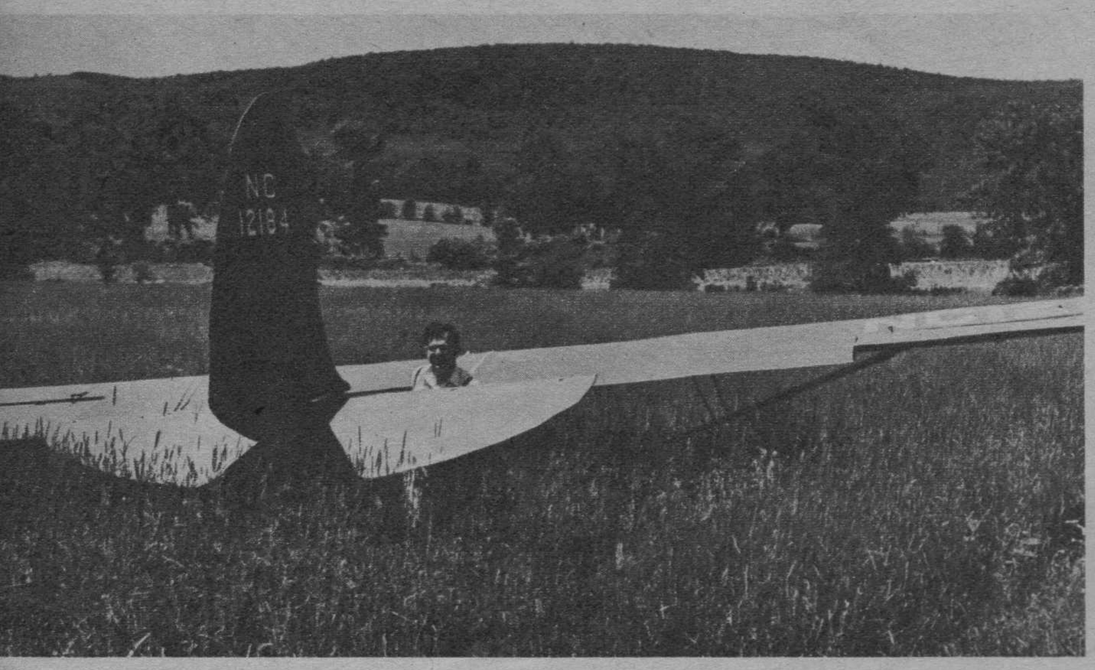
WINGS FOR THE EAGLE

WITH ANN SHERIDAN ★ DENNIS MORGAN ★ Jack Carson ★ Geo. Tobias ★ Directed by Lloyd Bacon

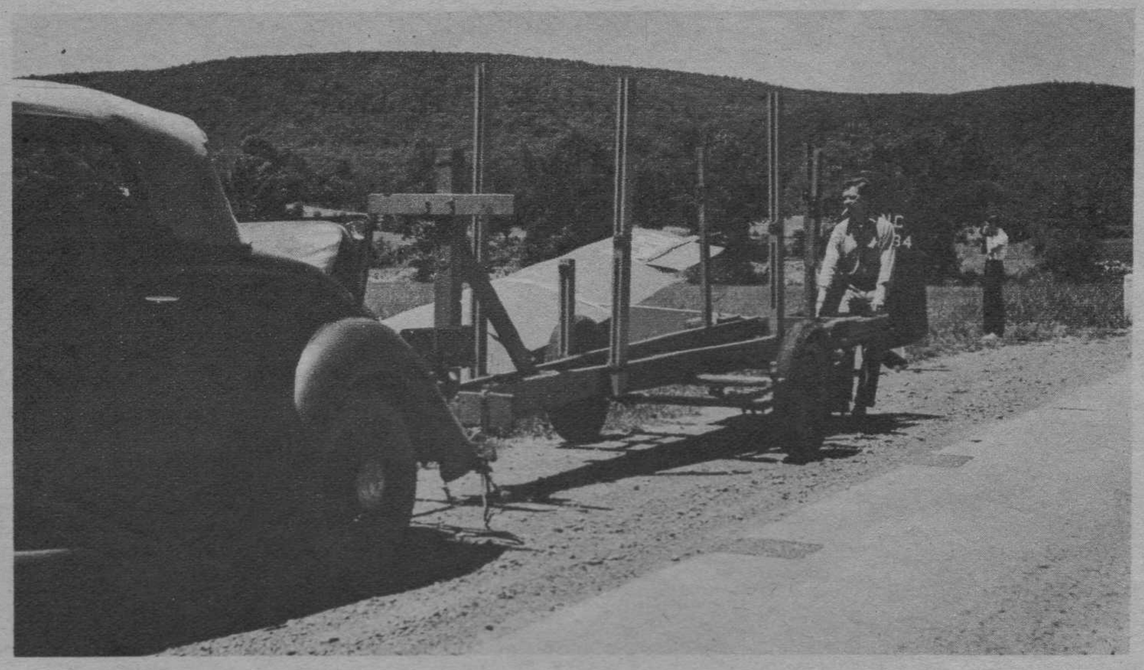
After A Glider Lands



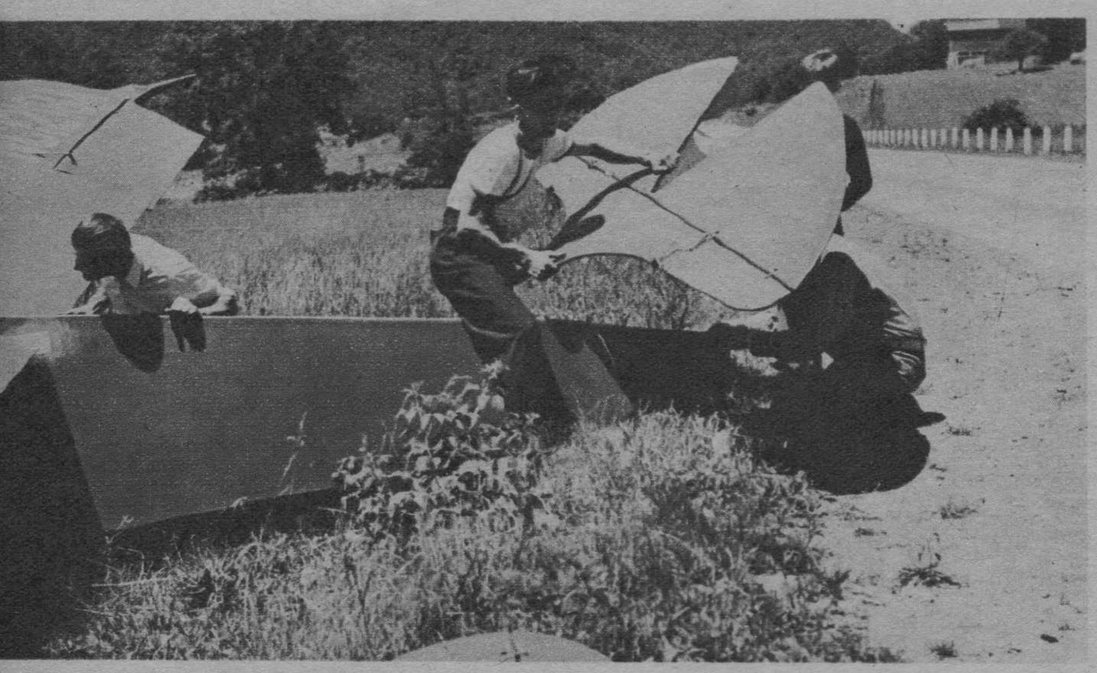
Once a soaring plane lands it has to be dismantled and put in its trailer in order to get back. Here's a play-by-play account of what happens.



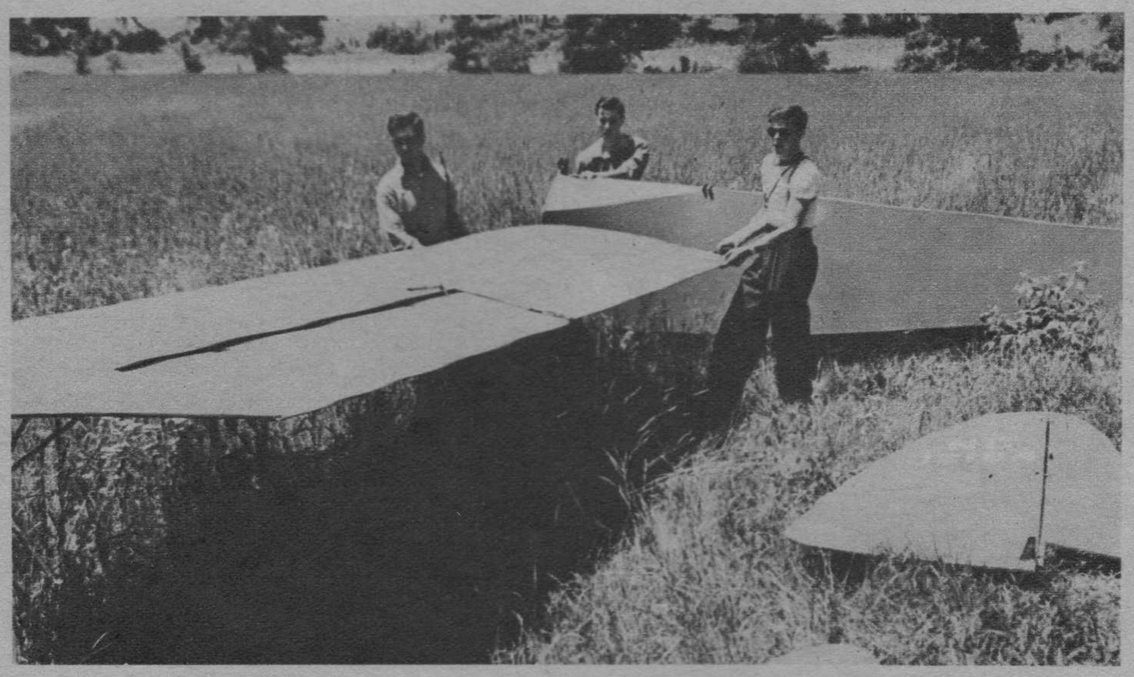
Running out of thermals, the glider pilot lands in a wheat field. To make it easier for trailer crew, he pushes ship close to nearest road.



A phone call brings the ground crew and trailer. The trailer is placed close to the edge of the field and made ready to receive the glider when it has been dismantled.

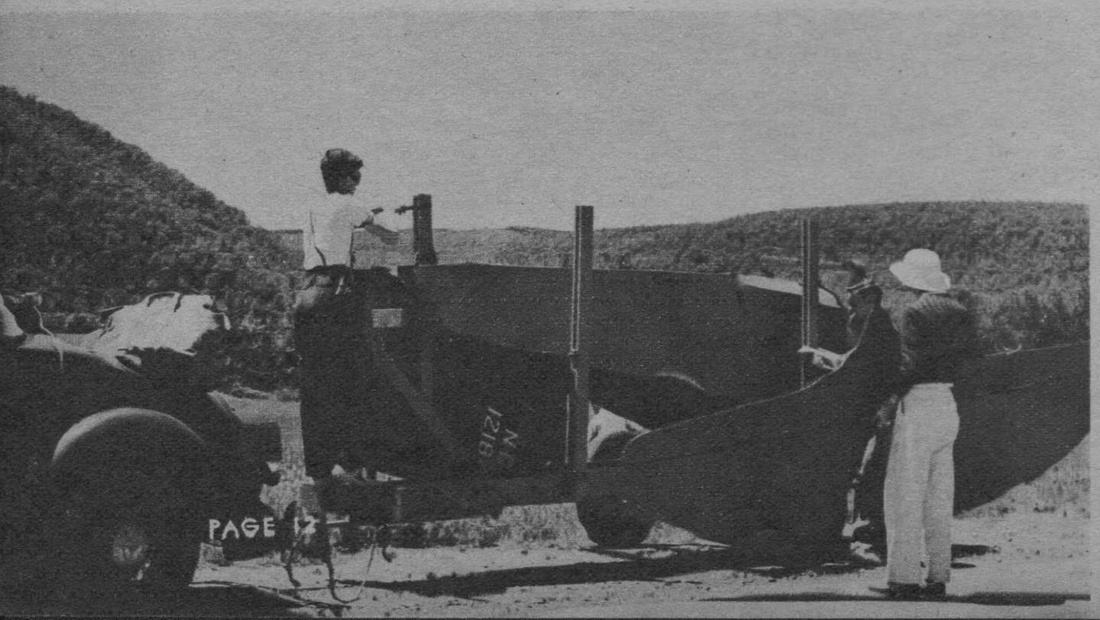


First to be dismantled are rudder and elevators. These are designed, as are the wings, to be quickly dismantled for the return trip.

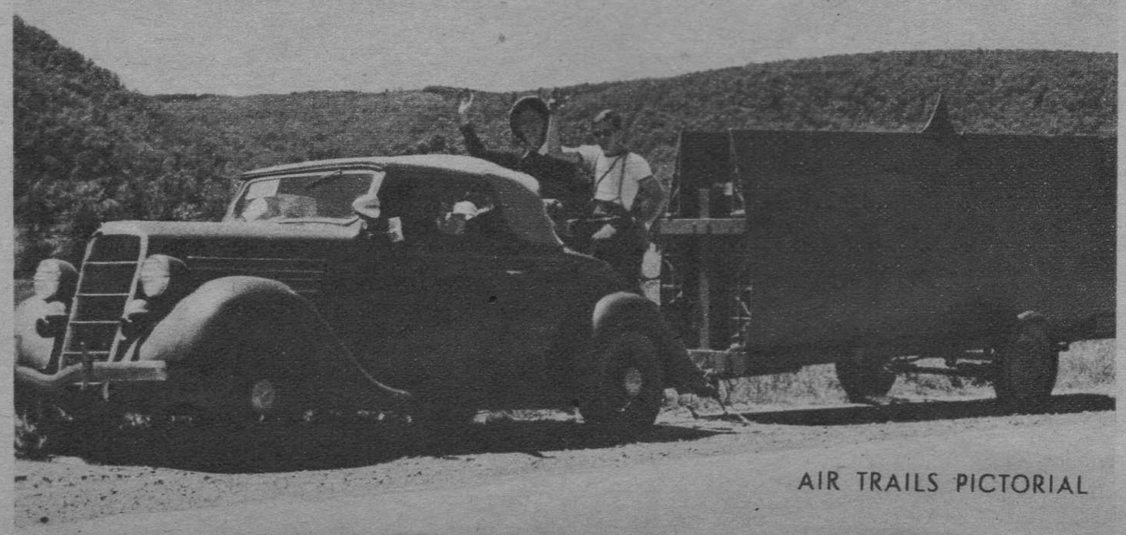


The wings are taken off after aileron push-pull rods have been disconnected and struts removed. An especially ticklish job is that of removing the wings in a really high wind.

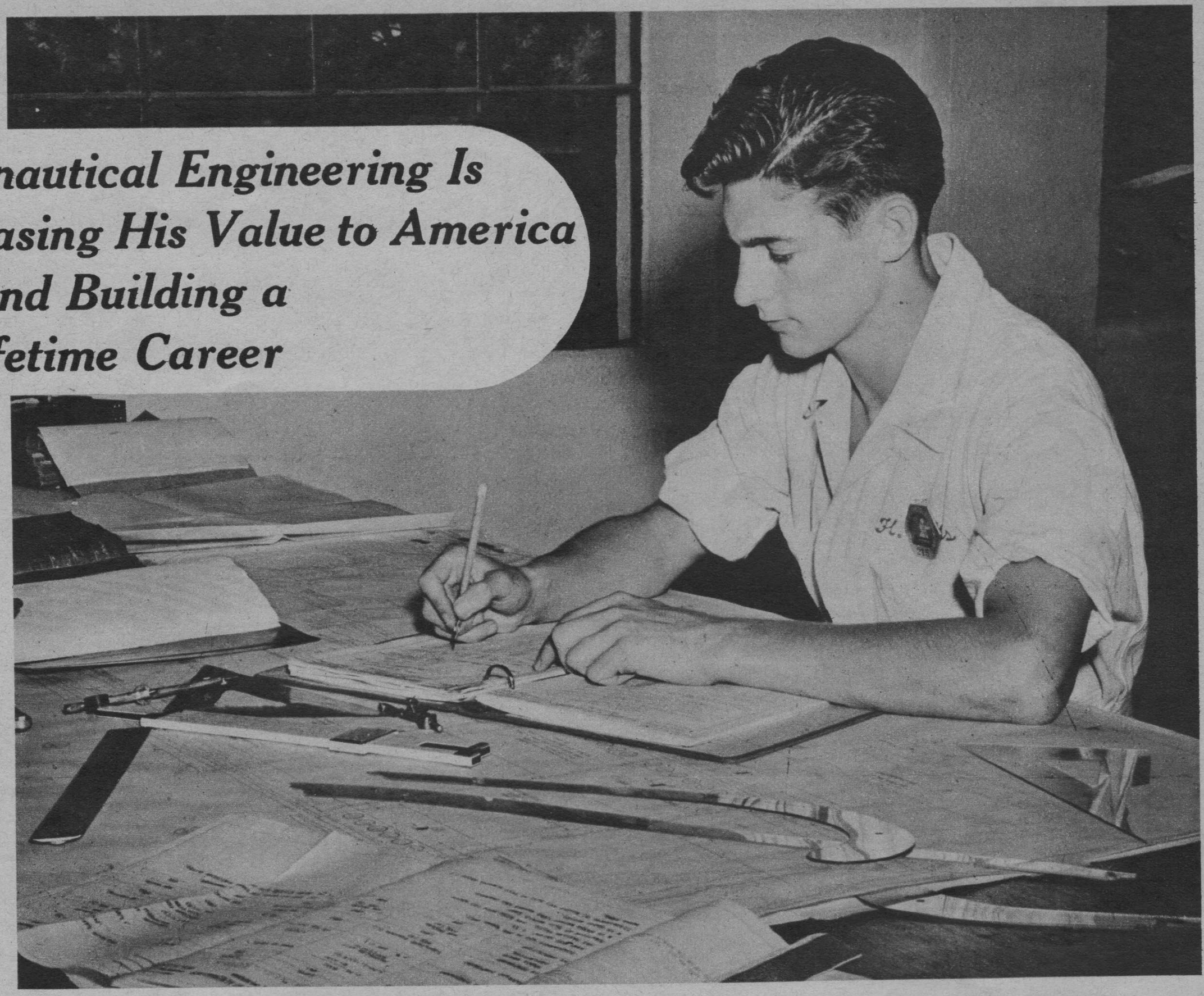
Fuselage is loaded into trailer, fitting into special pads and clamps to prevent chafing and shifting. Other parts fit special trailer racks.



On go the wings and we're off to the starting point again. Ground crew takes turns flying so all get training. Army needs hundreds of glider pilots for new program.



Aeronautical Engineering Is Increasing His Value to America . . . and Building a Lifetime Career



★ *YOU are invited* to join the many young men who are taking advantage of SPARTAN'S complete aeronautical engineering training—young men who will enter and serve America's vital war industry as skilled technicians—and who will be in an excellent position to transfer their specialized knowledge and experience in engineering to a greatly expanded post-war aviation.

SPARTAN has taken the lead among all private aviation schools in the training of Aeronautical and Airline Maintenance Engineers. New modern buildings, fully equipped shops and laboratories, and Government licensed instructors provide highest type training. High school graduates particularly are urged to continue their education and become leader and officer material.

SPARTAN school is a division of the Spartan Aircraft Company, contractor to the U. S. Army and Navy, and sub-contractor to many large aircraft firms. This association enables students to gain a valuable conception of actual aircraft designing and production.

Expansion of the aircraft industry has created a tremendous demand for engineers. Even brighter opportunities lie ahead for specially trained aviation engineers as America gains and holds world supremacy in the great commercial air industry to follow the war. Act now. Mail the coupon for the new SPARTAN 64-Page Catalog. Next Semester starts October 12th.

SPARTAN SCHOOL OF AERONAUTICS

DIVISION OF SPARTAN AIRCRAFT COMPANY

SPARTAN SCHOOL OF AERONAUTICS—
Captain Maxwell W. Balfour, Director, **Address Dept. AT-92, Tulsa, Oklahoma**

Send me your new Catalog, describing in detail the SPARTAN courses I have checked, also stating tuition and living expenses.

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CHECK COURSES YOU PREFER

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- ☐ Airline Pilot
- ☐ Commercial Flight Instructor
- ☐ Airline Maintenance Engineering
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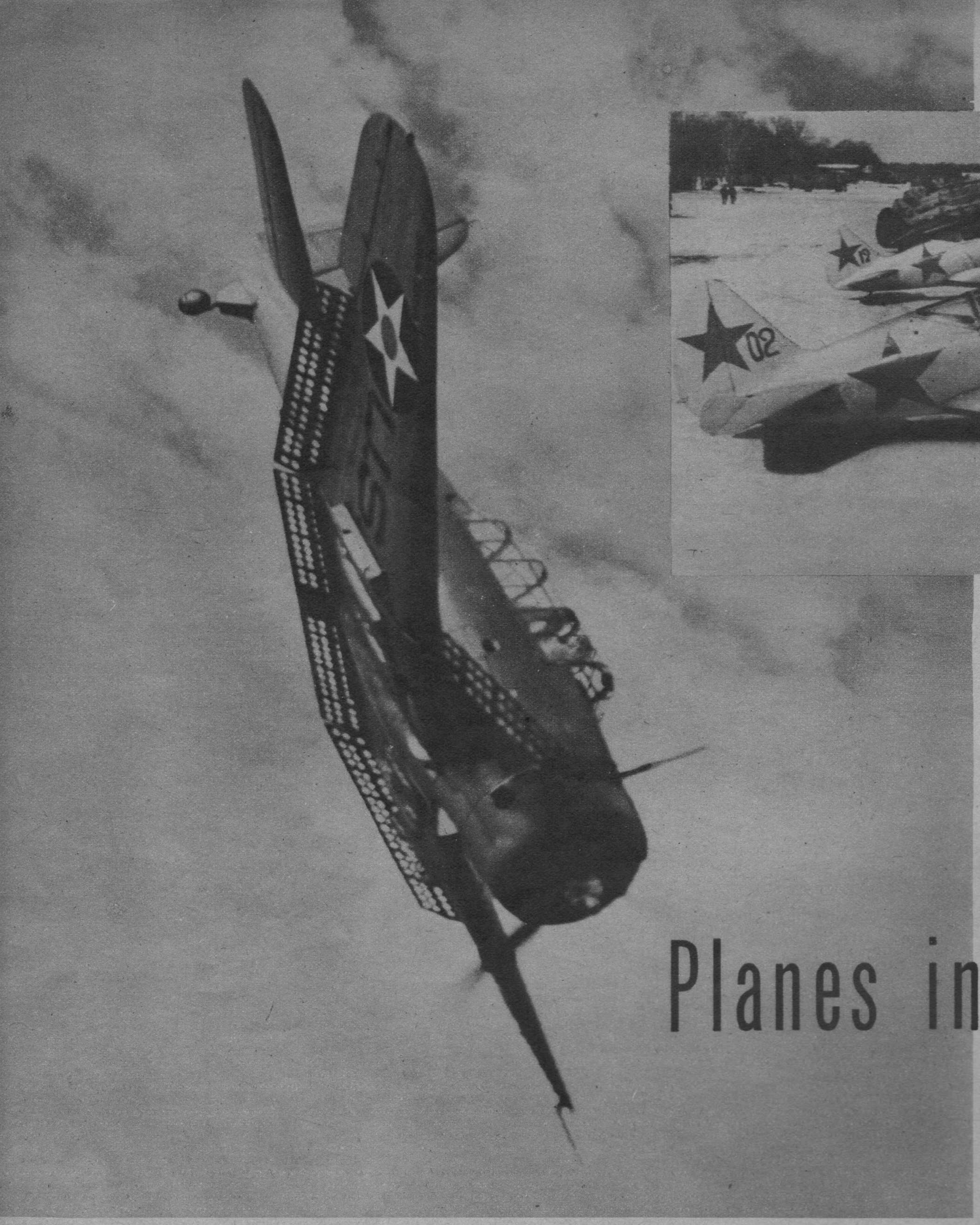
- ☐ Airline Service (A&E) Mechanic
- ☐ Airline Communications
- ☐ Private Pilot Course
- ☐ Weather Forecasting
- ☐ Instrument Technician
- ☐ Women's Instrument Technician

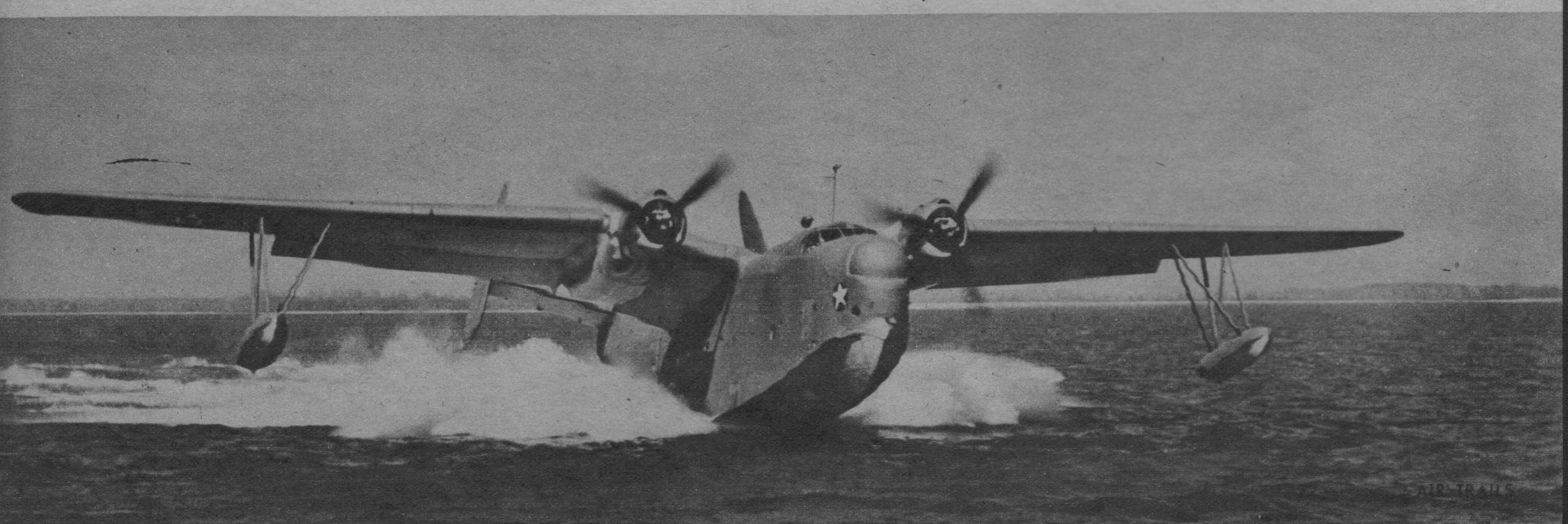


Resembling our own P-37, this Russian I-18 has a 1,250 h. p. Mikouline engine, heavy armor.

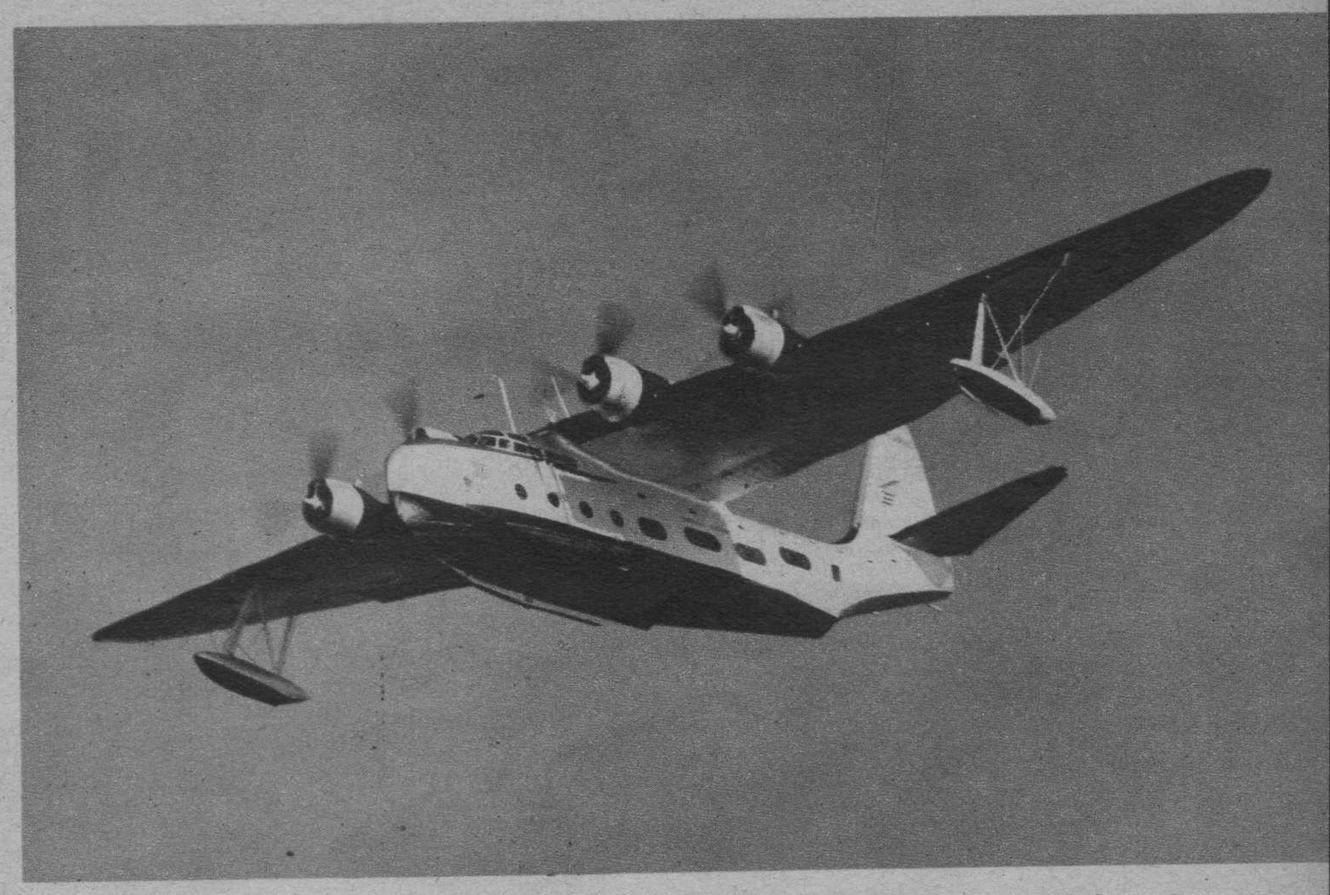
Planes in the News

This shows the famous Douglas SBD-3 Dauntless dive bomber in action with perforated dive flaps opened to retard speed. Bomb is dropped at 1,500 feet. Considered by many most powerful dive bomber in any navy service.

Off on a patrol flight goes this Martin Mariner. This gull-winged flying boat is now in mass production for the navy. Reputed to carry a heavy bomb load, protected with many well-gunned turrets. Weight, loaded, is 40,000 lbs., span 118 ft., unusual for twin-engine ships. Has crew of 7. Tip floats are no longer retractable.



This Curtiss-Wright Seagull SO3C-1 scout observation plane for navy is for either wheels or floats and can be used from catapults. Inverted in-line engine is air-cooled.



To span the ocean in peace. This Vought-Sikorsky Excalibur is the first of three for use in nonstop transoceanic service by American Export Airlines.

For low attacks on ground targets and shipping, the new Hurricane fighters are fitted with racks for two heavy bombs. Bombs do not affect maneuverability of the plane.

P-40F Warhawk, latest member of the Curtiss P-40 family, is first plane to be powered with U. S.-built Rolls-Royce engine. Gas tank below may be dropped.

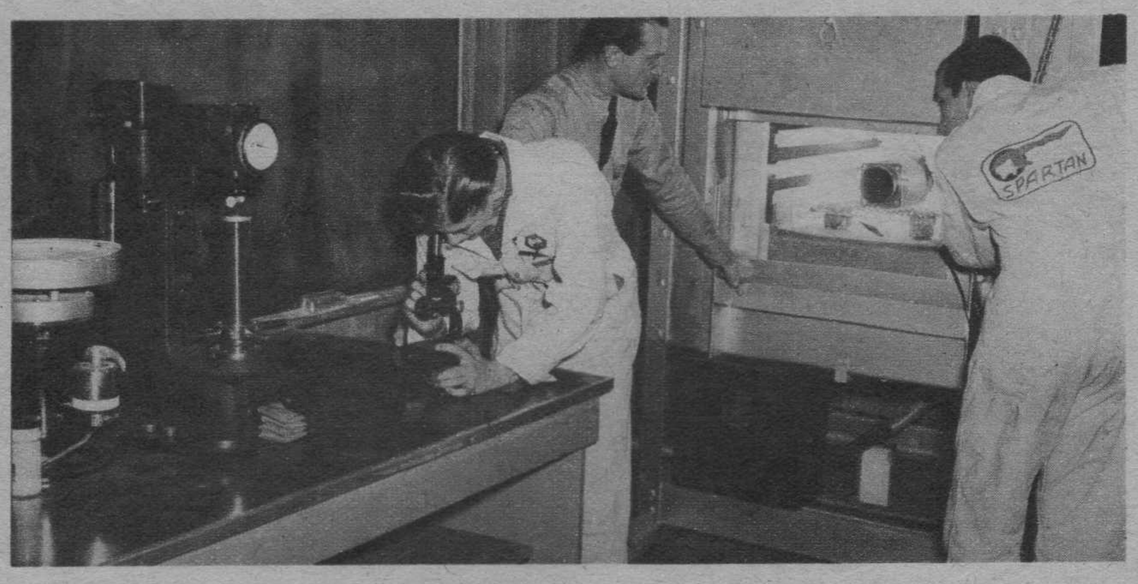
Crew trainer for bombing missions. This Boeing AT-15 is complete with powered turret, bomb racks and instruments. Mostly wood. Span is 59 ft., length 42 ft.

This transitional trainer by Beech, known as the AT-10, is used to familiarize cadets with twin-engine bomber flying. Fuselage is wood monocoque, cabin metal.

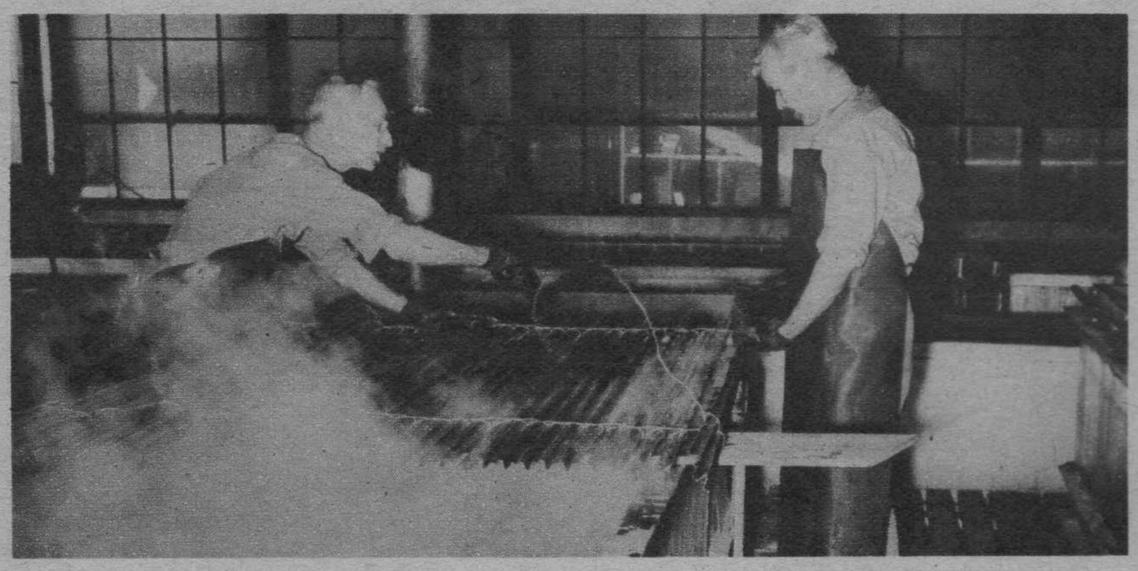
It Takes Equipment

Up-to-the-minute machines and instruments at a large-scale aeronautical school like Spartan duplicate what the student will use in actual work outside upon graduation.

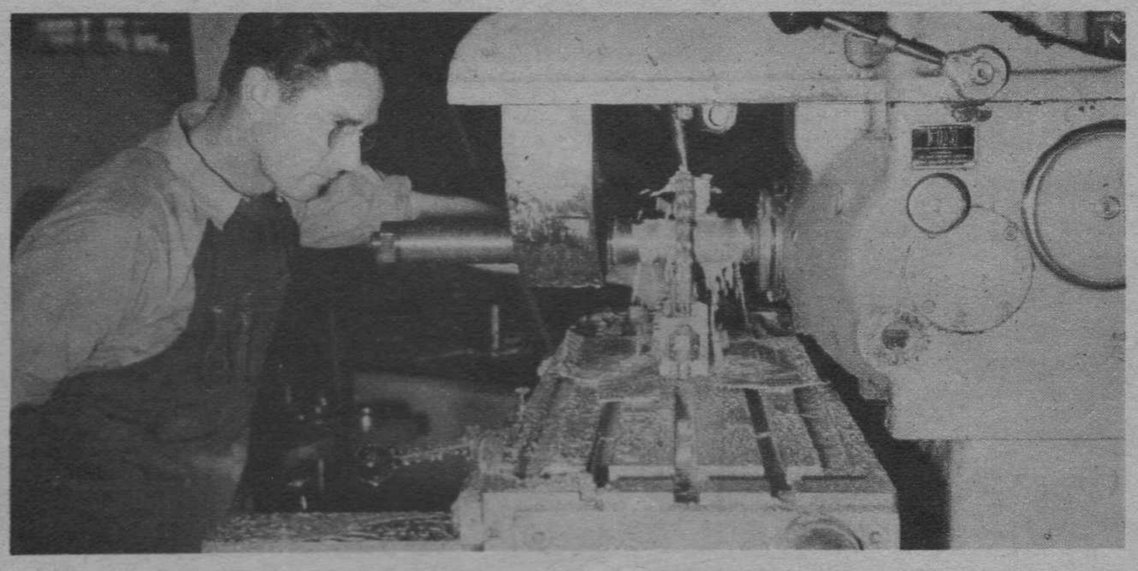
Extensive radio equipment is an important part of a modern aviation school. Student is learning radio operations procedure on school's 900-watt ground station.



Heat-treating studies of student engineers require electric furnaces and microscopes to learn of metal structure. Spartan has full Rockwell test equipment.



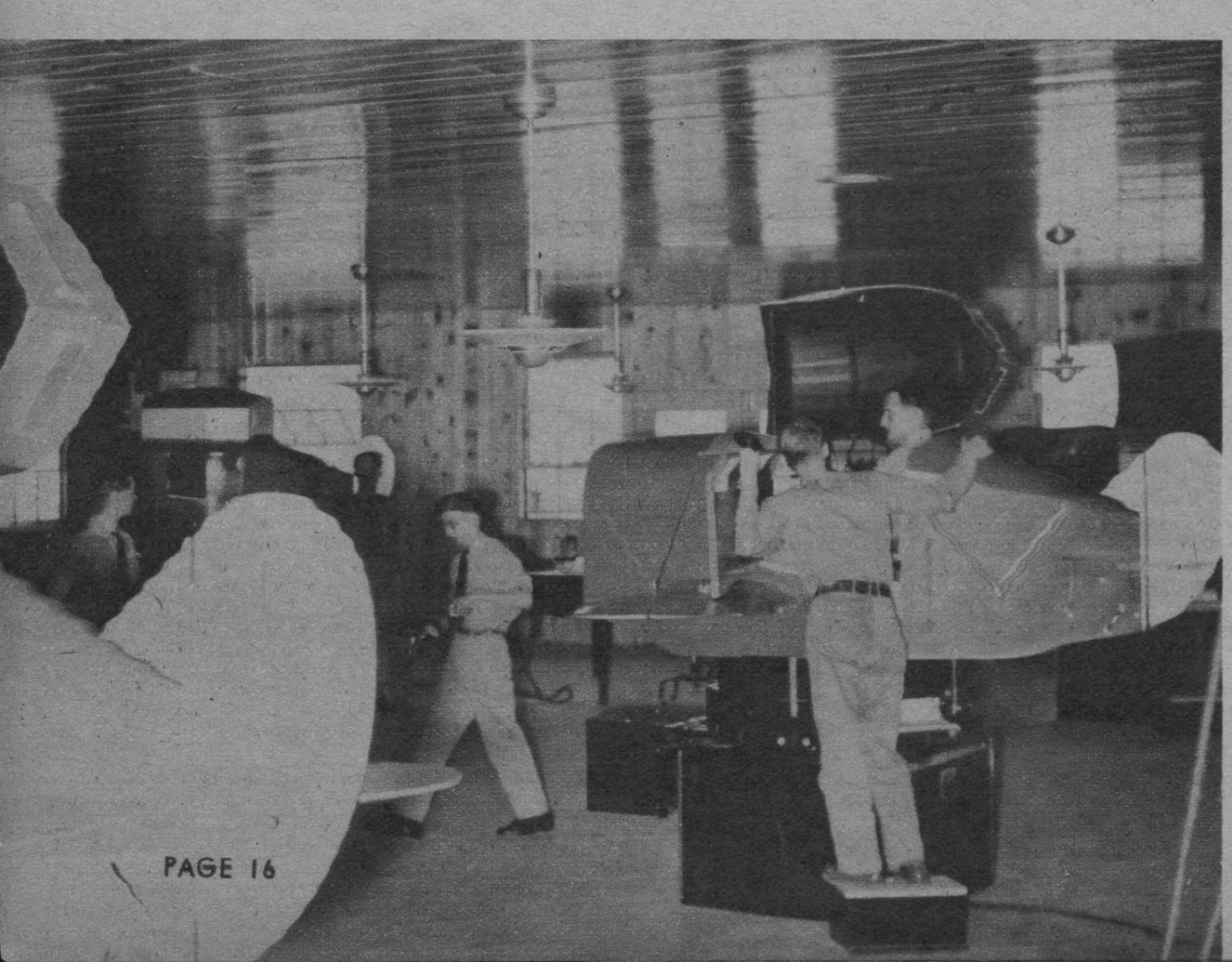
As the modern aviation plant utilizes the science of heat treating and similar methods of preparing metals for aircraft use, Spartan keeps pace with equipment.

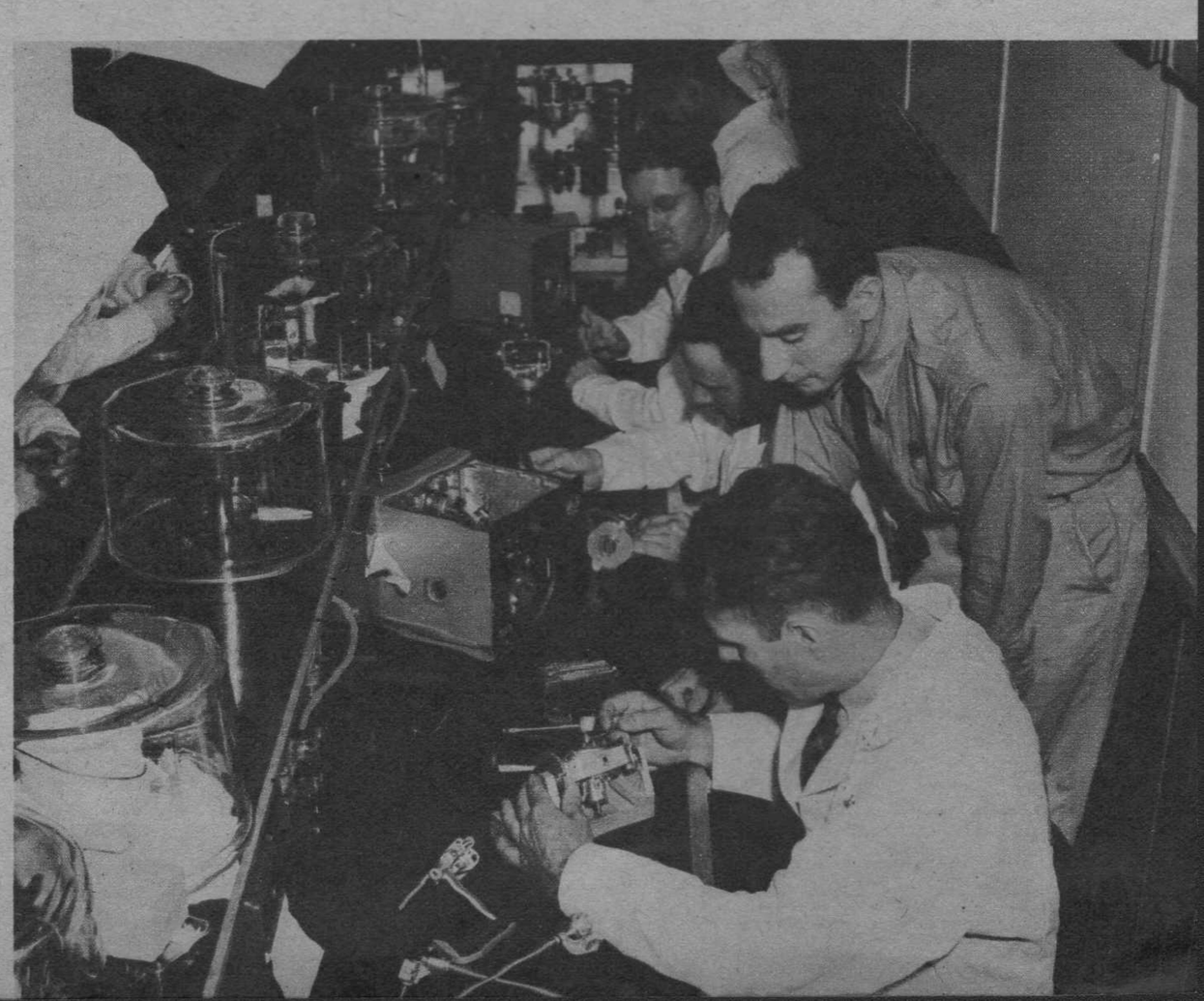


Various routing and planing machines are part of school's equipment. The graduates of a modern school must be able to step right into modern shop work.

The acceptance of Link Trainer instruction for instrument pilots necessitates installation of these complicated units. Spartan has several of the latest types.

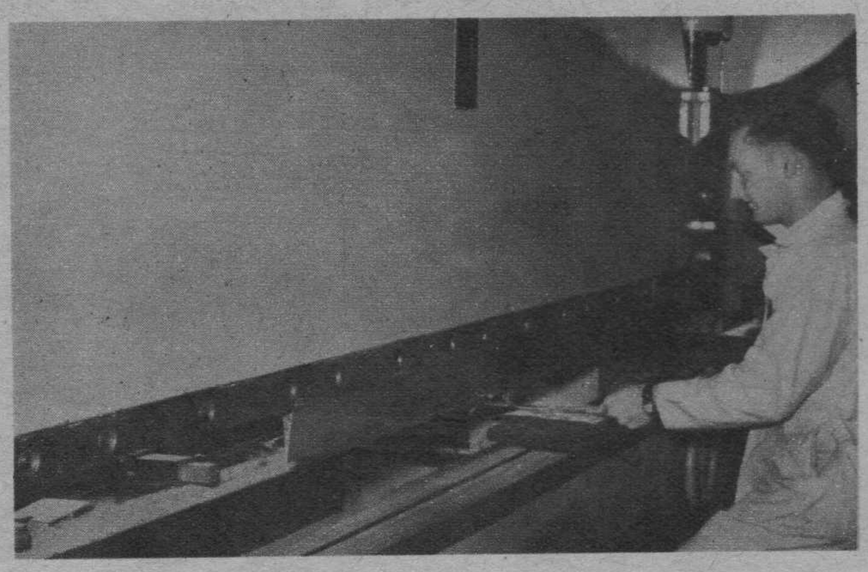
Using every available type of testing and repair equipment, students in the Instrument Mechanic's course work on actual instruments from school's ships.





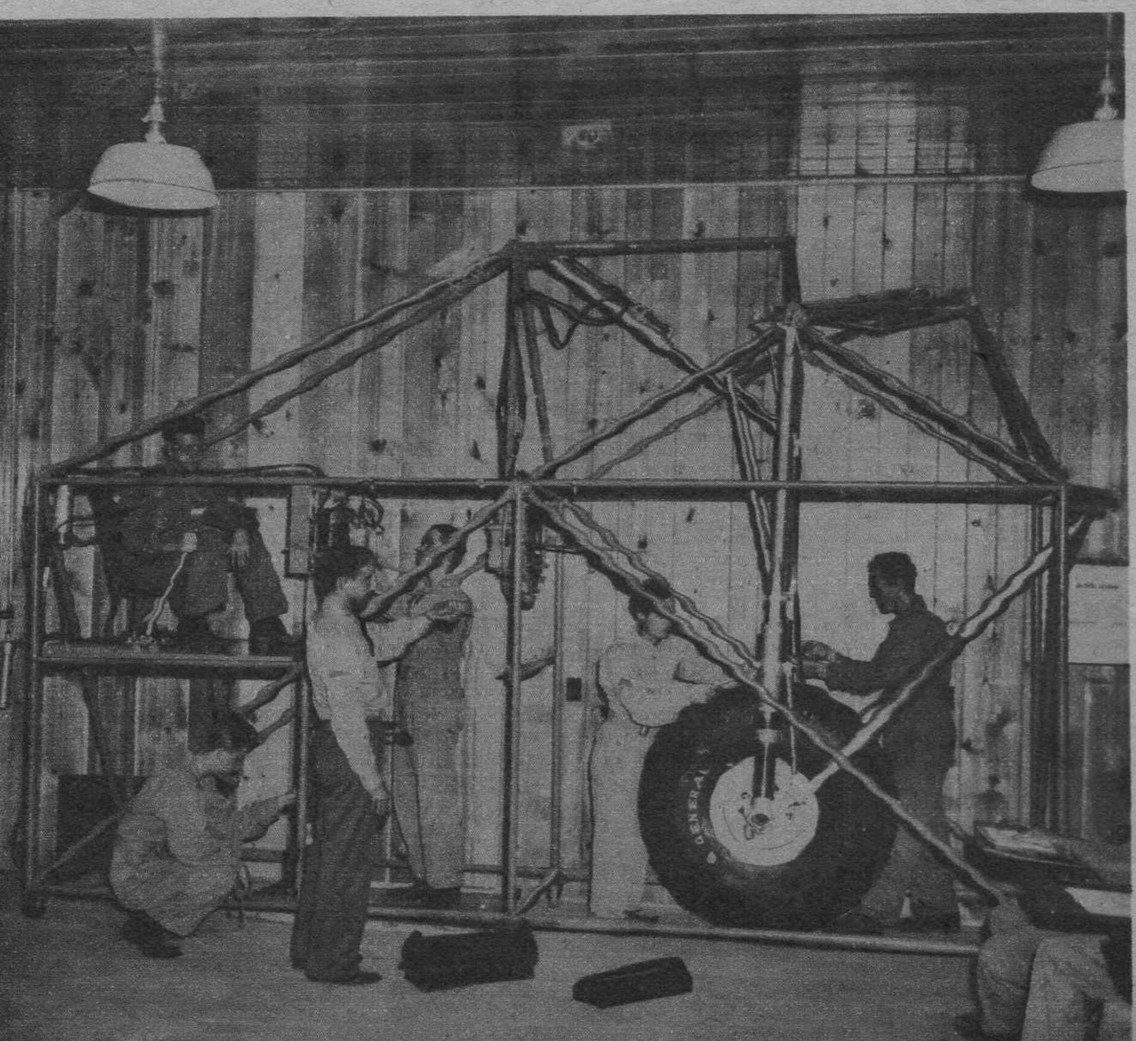
Capt. Maxwell W. Balfour, director, the Spartan School.

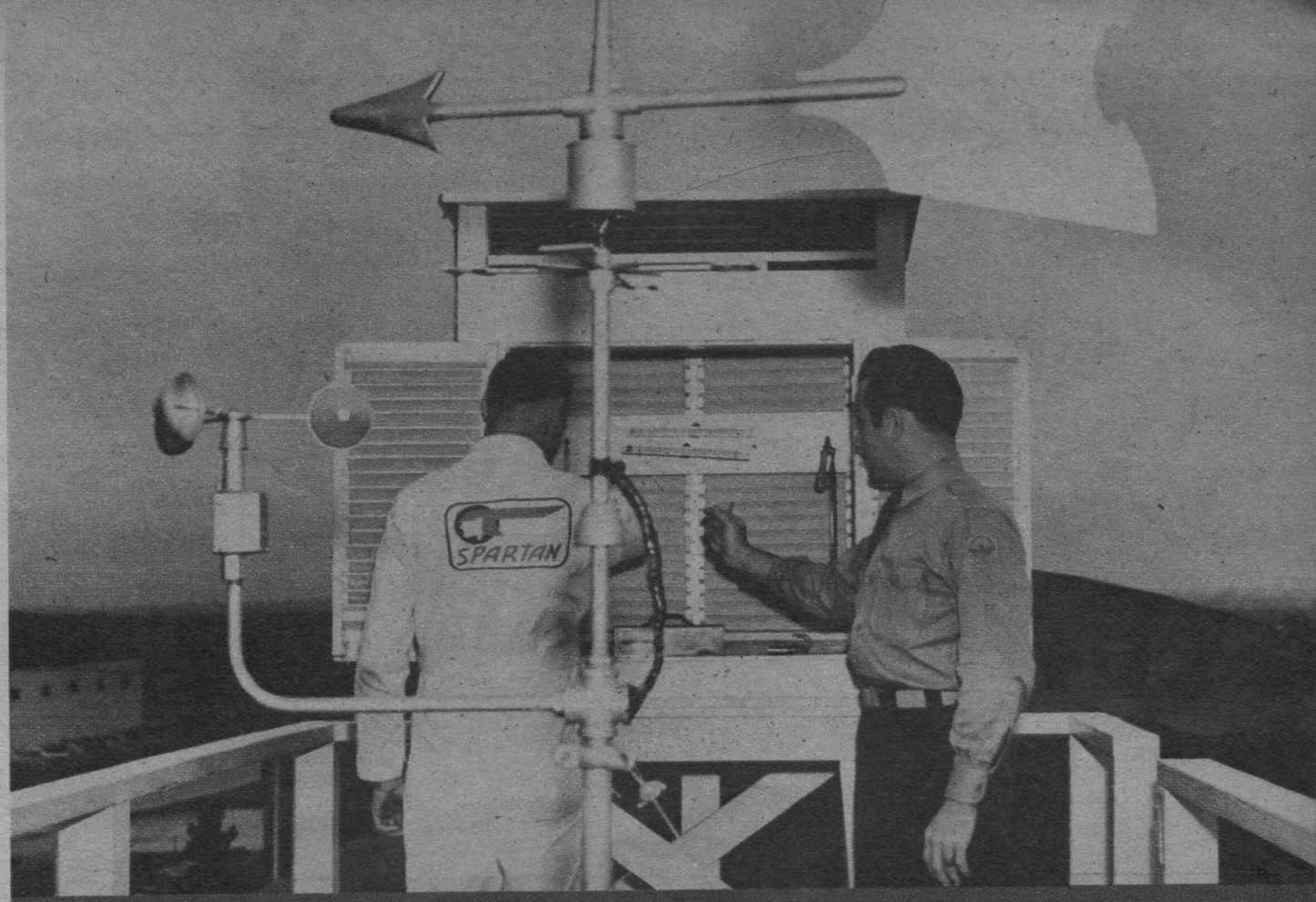
From school to employment in Spartan factory went these graduates of the Women's Instrument Technician Course.



Sheet-metal students learn use of every type of machine in modern sheet-metal work. Here—giant metal shears.

Learning by doing. Students of hydraulics and aviation mechanics test the action of landing-gear construction on special testing apparatus.





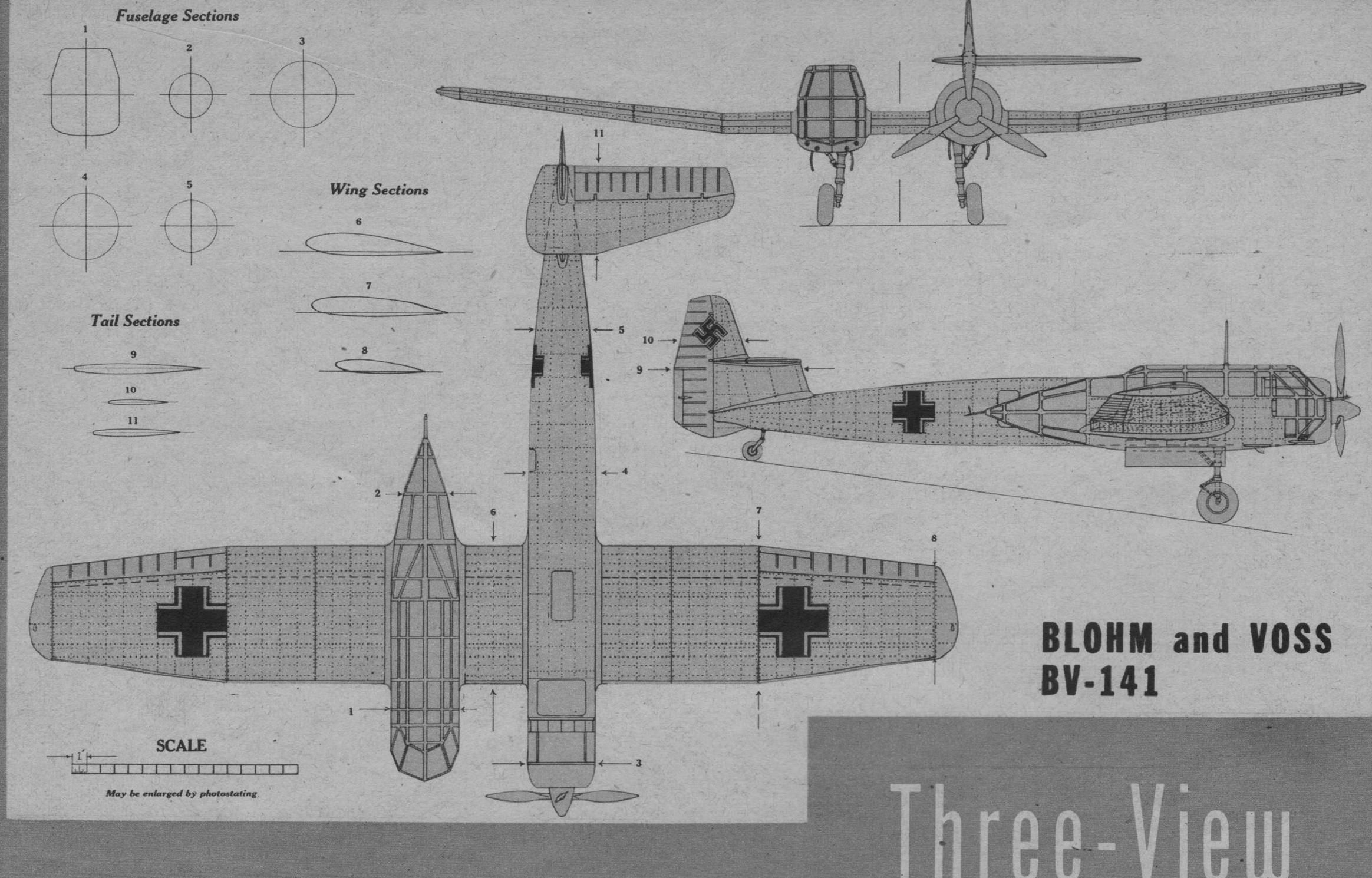
The importance of meteorology and weather study as an aviation career is increasing daily. A complete weather station with all instruments is available to Spartan meteorology students.

The flying side of aviation schools must keep pace with the shop-training program. Spartan's flying units have a splendidly adequate amount of first-class personnel and training ships.

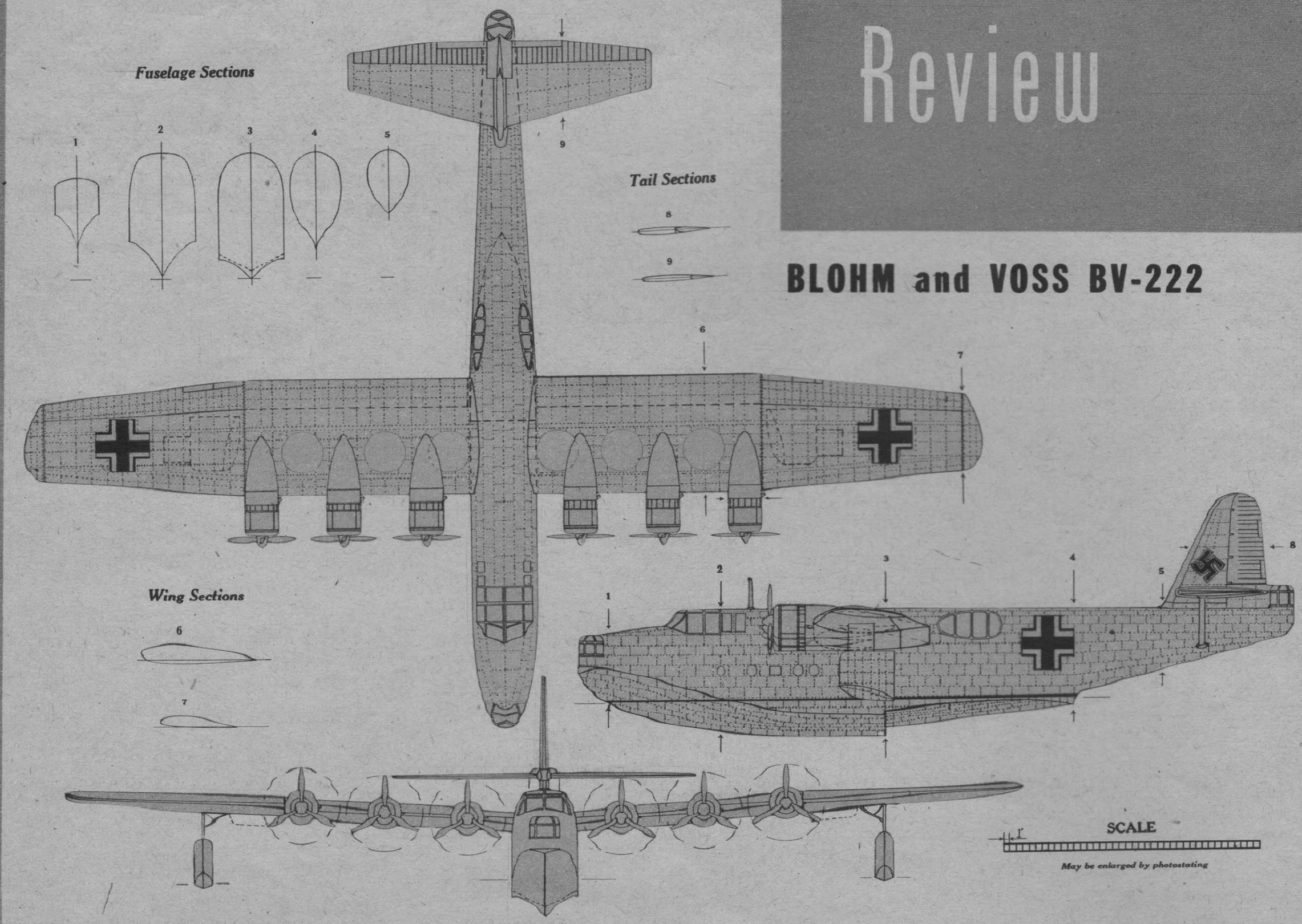
Working under licensed mechanics and instructors, older students overhaul and repair actual aircraft. Pride in craftsmanship plus knowledge of equipment, tools make efficient team.

Three-View Review

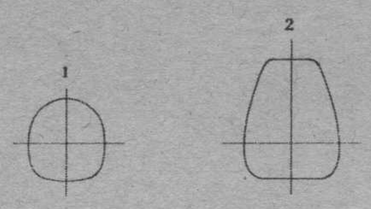
BLOHM and VOSS BV-141



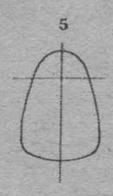
BLOHM and VOSS BV-222



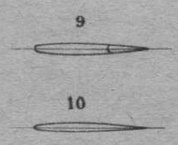
Fuselage Sections



Nacelle Section



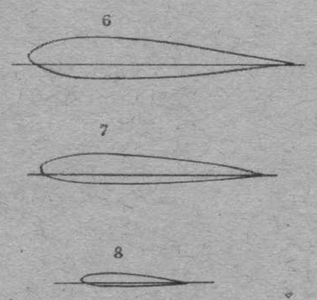
Tail Sections

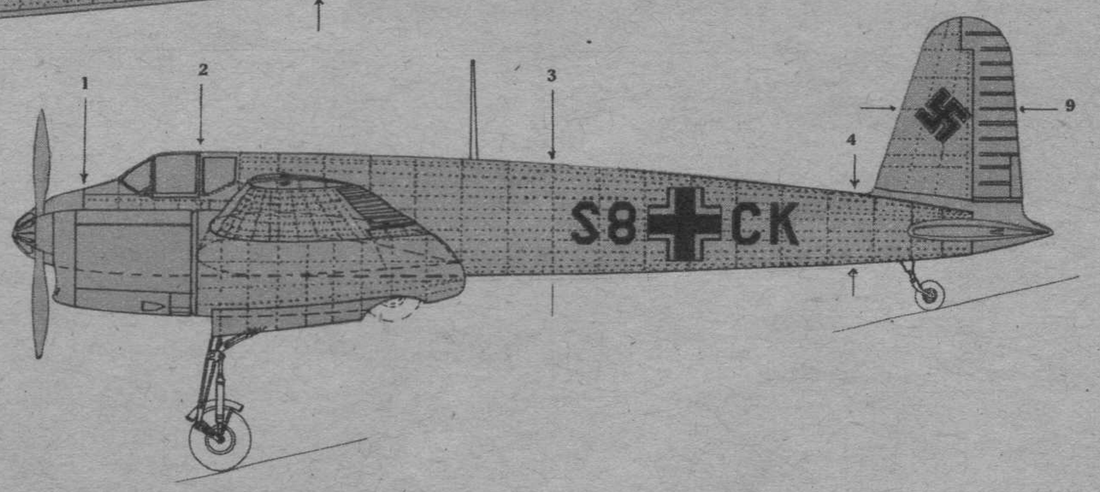


SCALE

May be enlarged by photostating

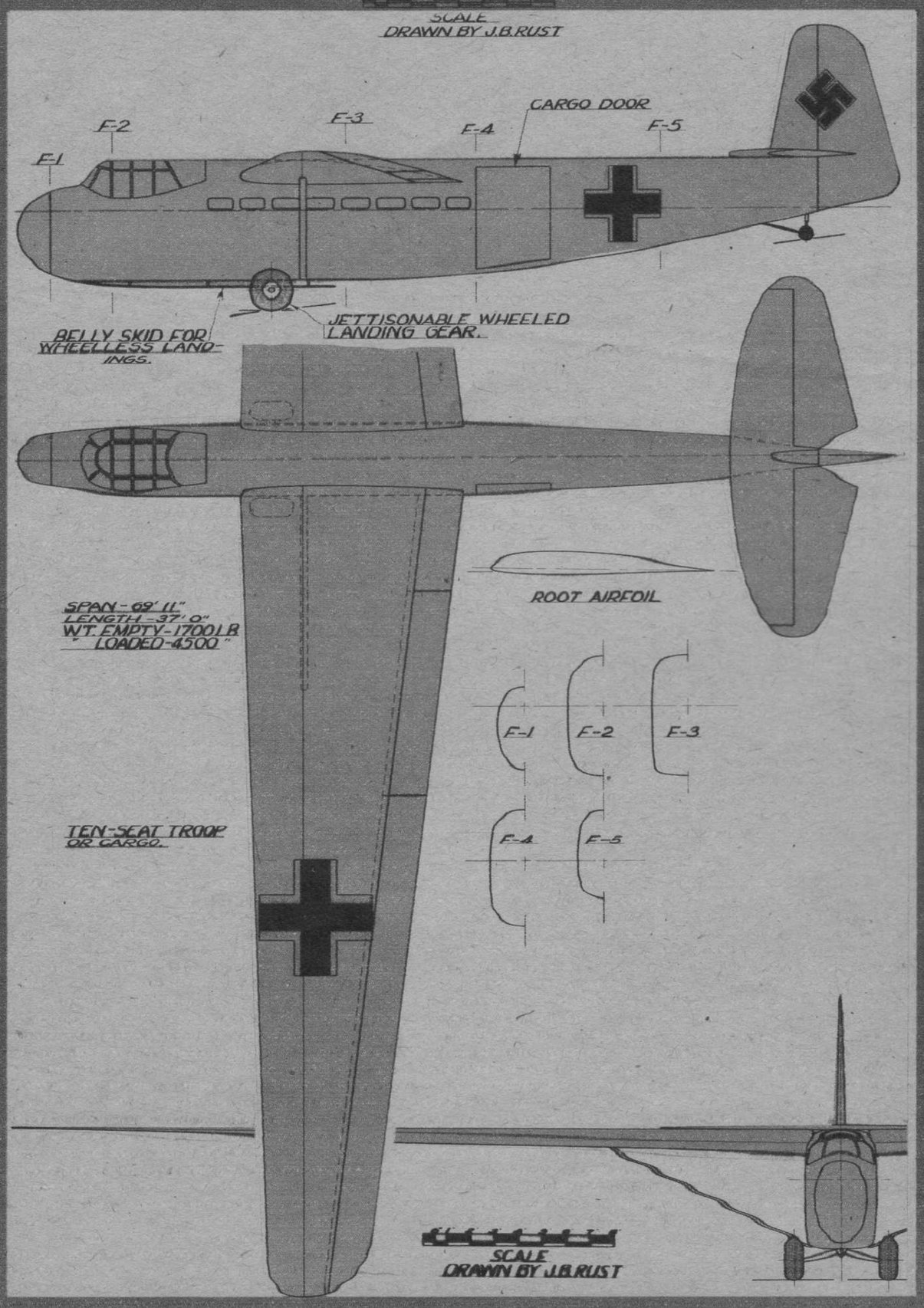
Wing Sections

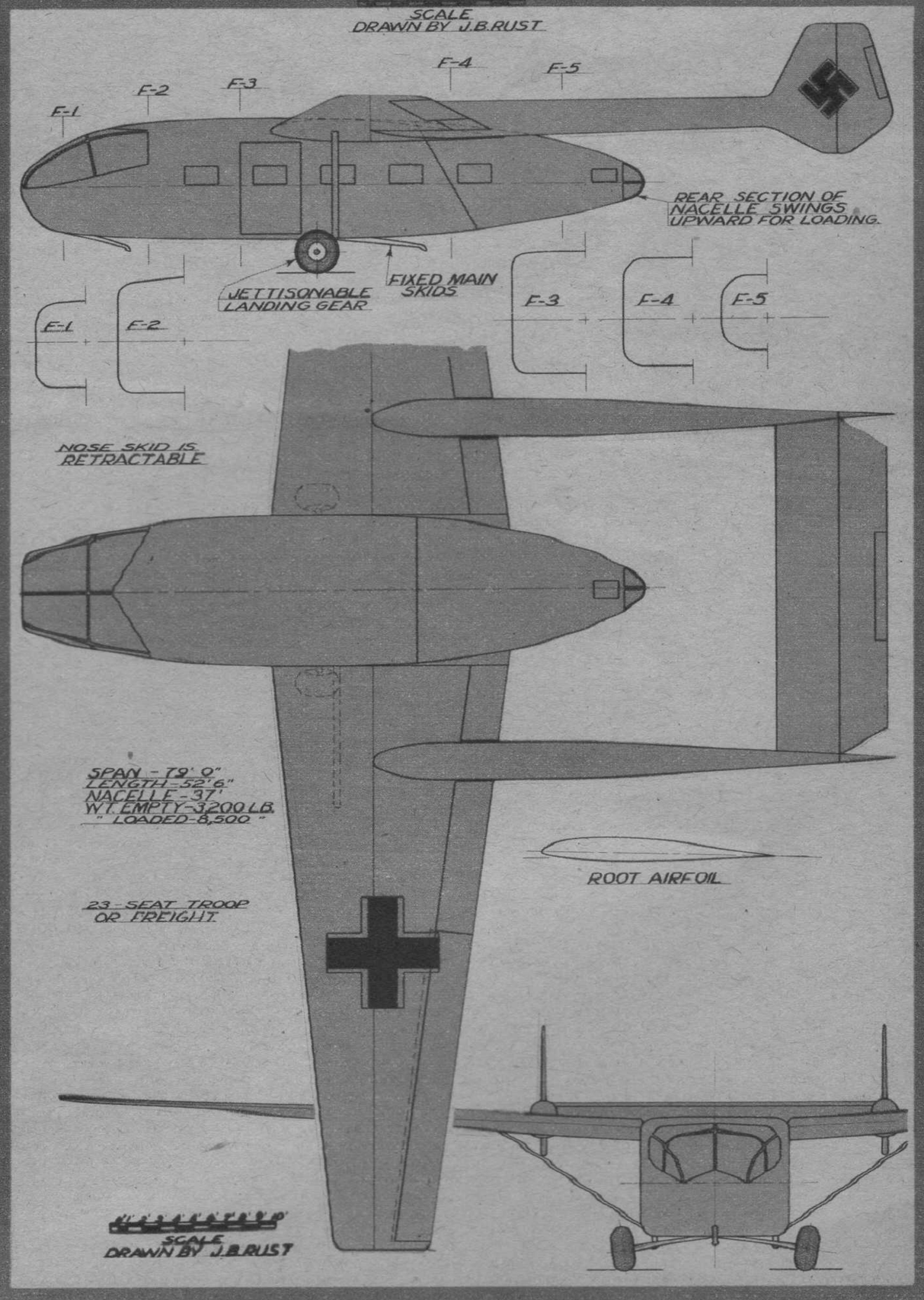


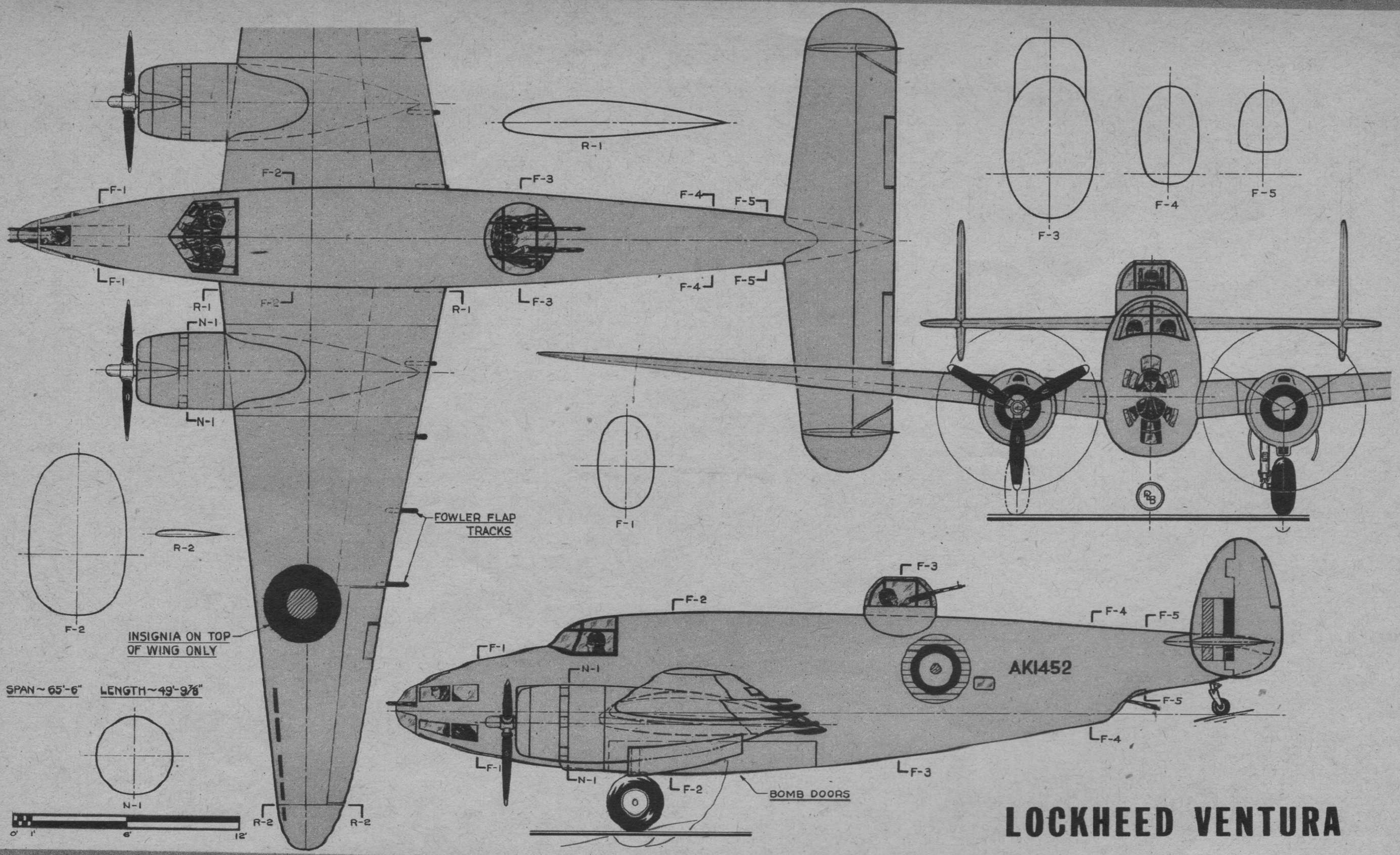


HENSCHEL 129

DFS-230A1 — GERMAN TROOP-CARRYING GLIDERS — GOTHA 242

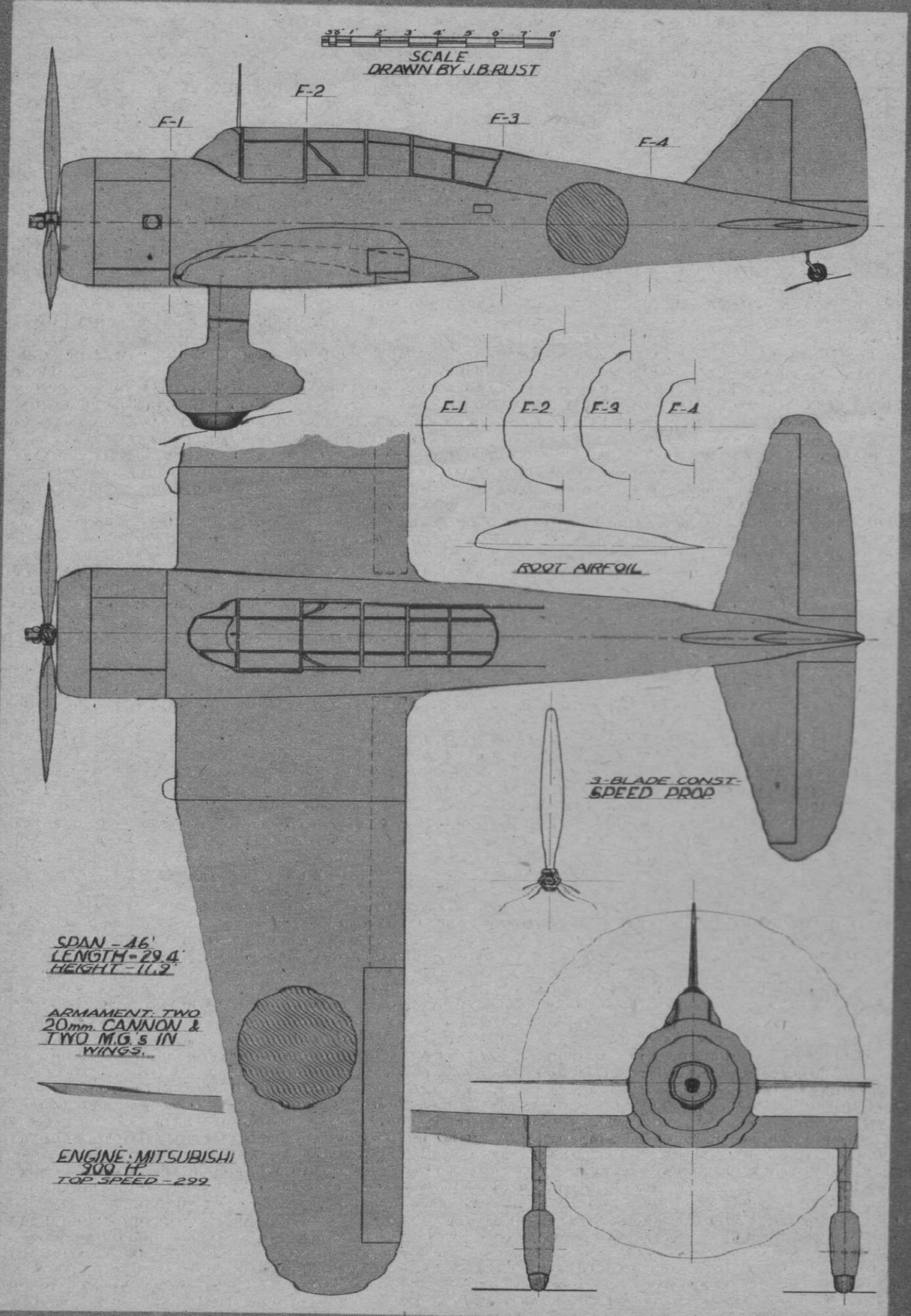




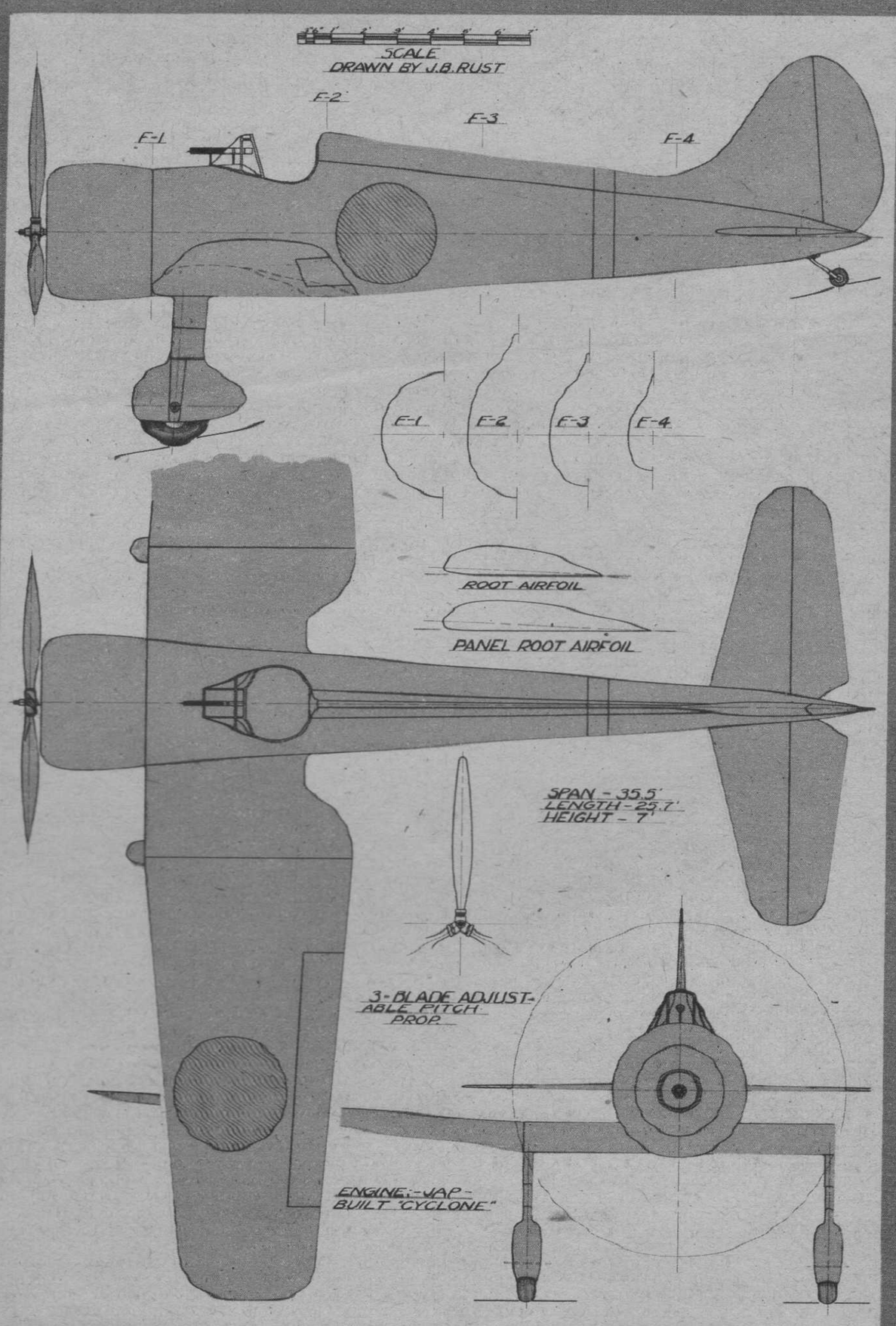


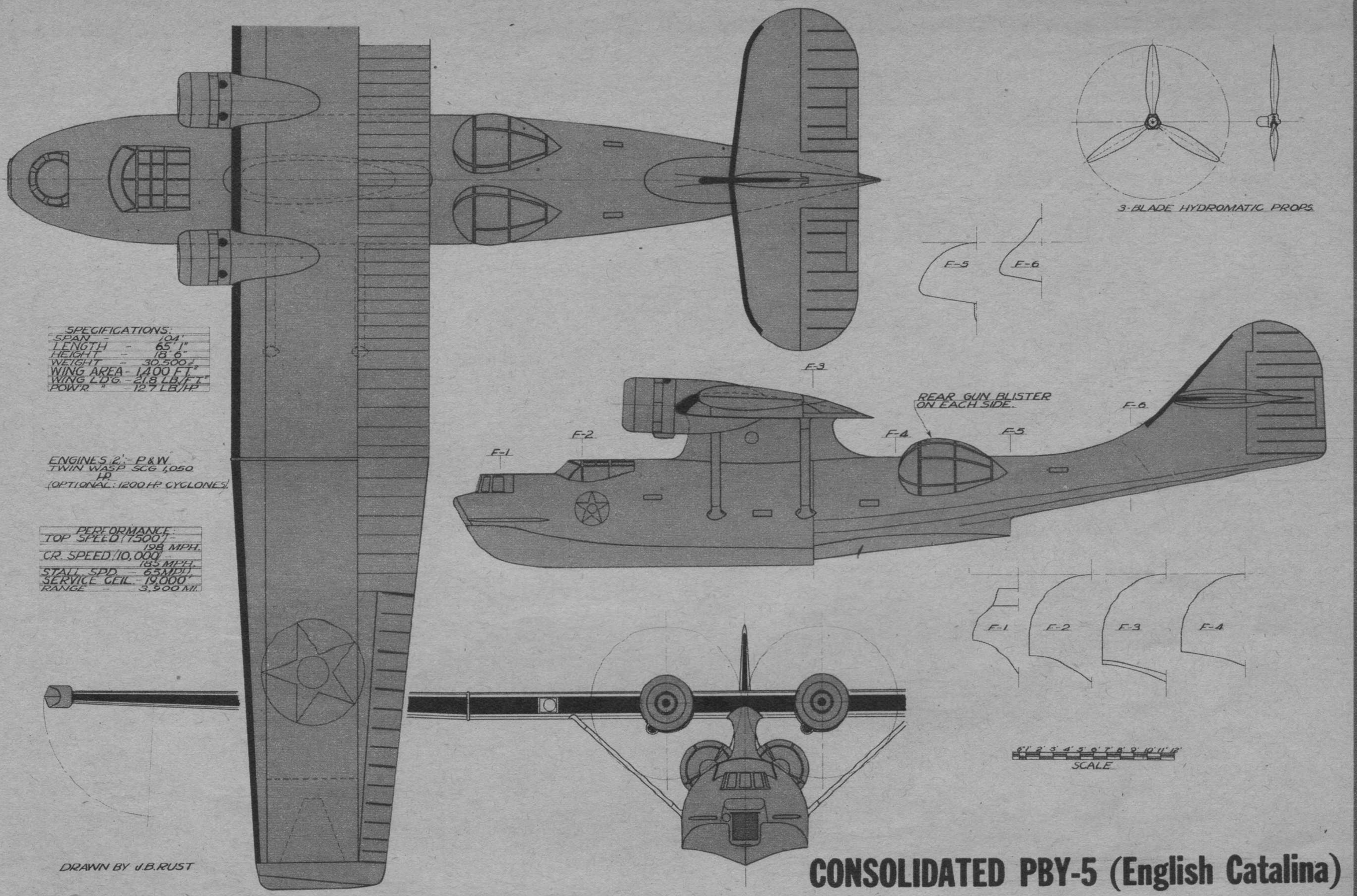
LOCKHEED VENTURA

MITSUBISHI 98



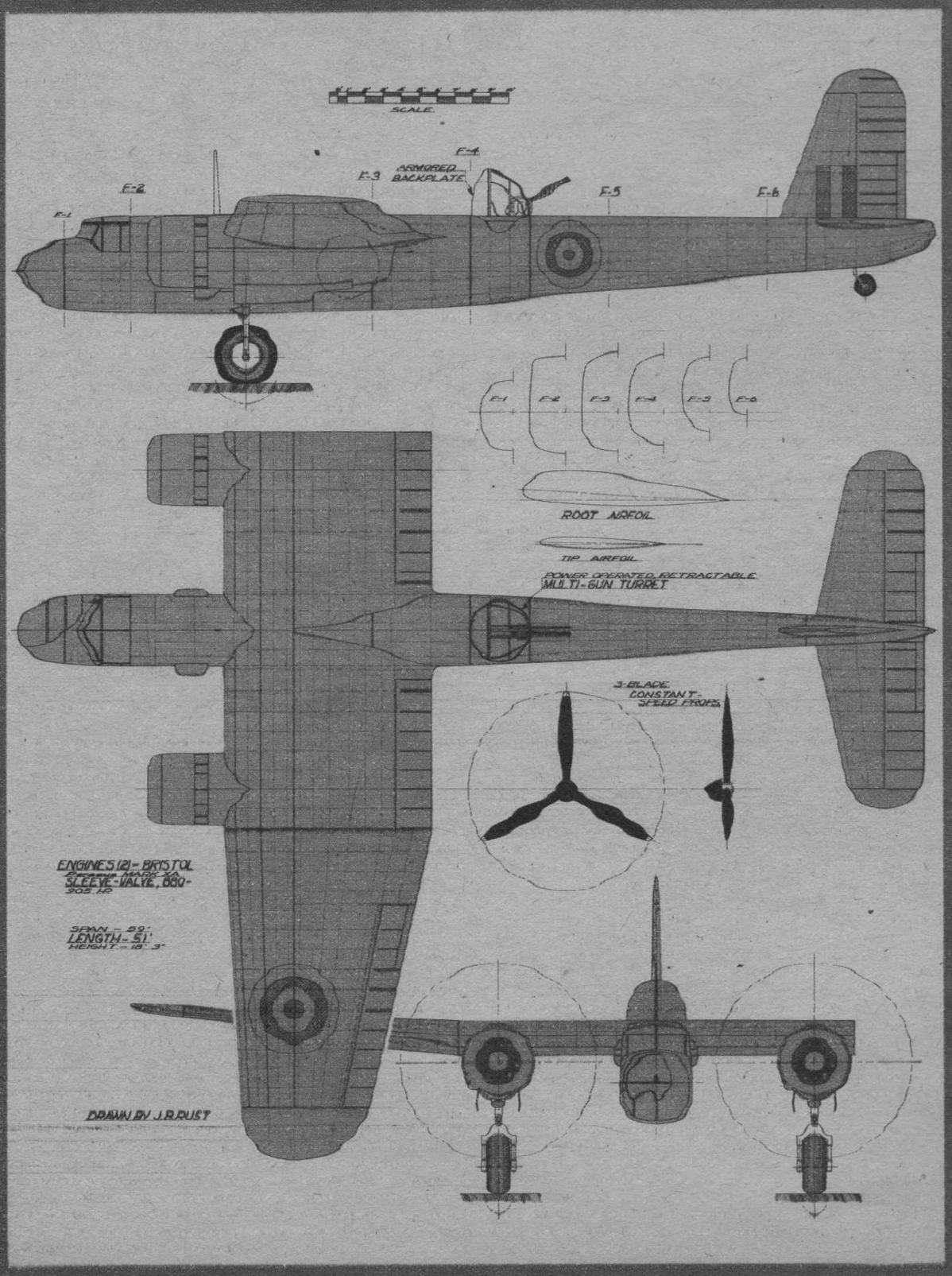
NAKAJIMA 97



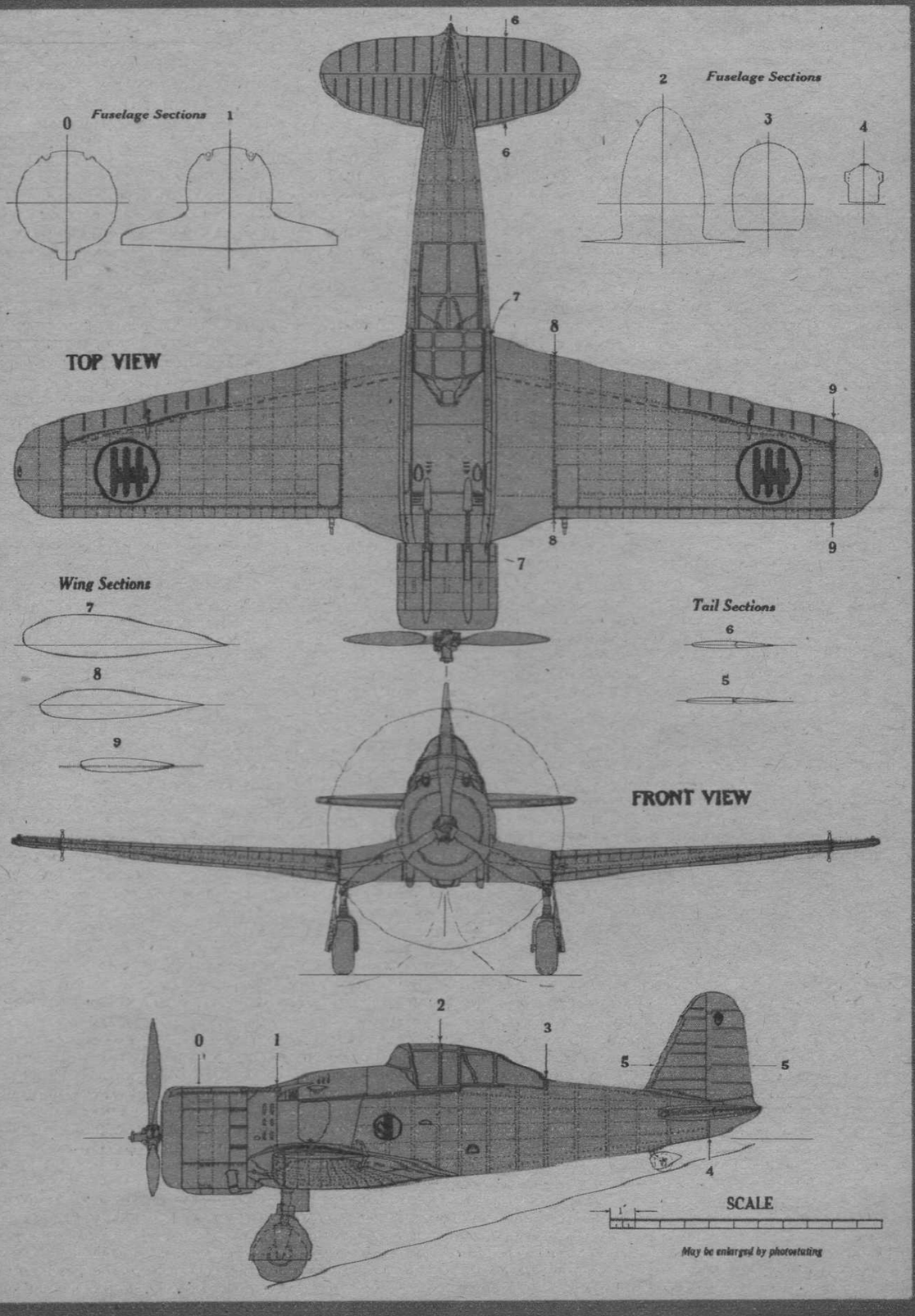


CONSOLIDATED PBY-5 (English Catalina)

BLACKBURN BOTHA



FIAT G-50

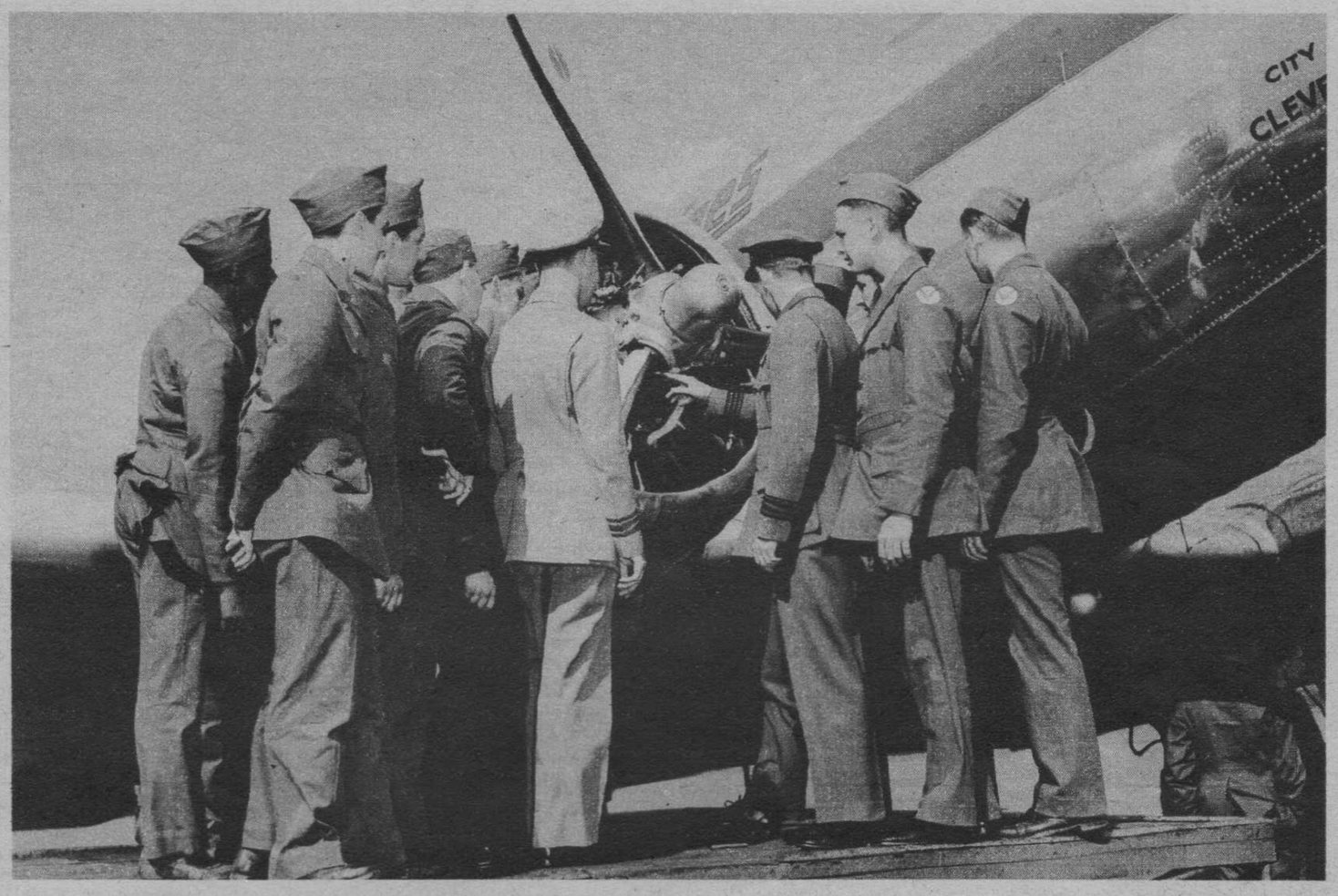


YOUTH IN AVIATION ★★

This section is devoted to the interests of the hundreds of thousands of young Americans below flying age who are learning about aviation, to fit themselves for the world ahead, as well as the interests of teachers and civic leaders who want to help them. You'll find the latest developments and information here.

High School Air Force

High school students who want to get into aviation have a real chance with various new preflight training courses that are starting this fall.



Fliers of tomorrow lend an ear to a flier of today. New Rochelle, N. Y., High students visit LaGuardia.

Typical class at Horace Mann High, New York City, learn mysteries of earth Inductor compass, stress and strain, meteorology and other preflight subjects.

WHEN, in September, the high schools of America open for classes, there will be an opportunity for every young man in the country to engage in preaviation cadet training. Two agencies, the United States Office of Education and the Air Training Corps of America, are now working to set up this program. The training will be an accredited part of the high and secondary schools' curricula, but it is understood that no boy who elects to take the courses is thereby obligated to pursue flight training in the armed forces. It is, in short, an excellent way for him to find out something about his abilities and inclinations.

The Army Air Force, of course, is well equipped to teach its air cadet all the necessary subjects he must master, but it is obvious that much valuable time will be found if the cadet enters the force already in possession of certain required fundamentals. With this in mind, the Office of Education is "air-minding" the now existing courses in mathematics, physics and physical education in the 28,000 schools under its supervision. In a good many of these schools a special course in aëronautics will be established, this to include: structure and design; aërodynamics (theory of flight); meteorology; communication, especially Morse International Code; air navigation; aircraft engines; and safety. All these courses are being made to fit the needs of the aviation cadet, to give him the knowledge he must have before he goes on to the more specialized flight training. Of course, in high schools there will be no actual flying instruction whatsoever.

The U. S. Office of Education has prepared a leaflet (Leaflet #62—"Preaviation-cadet Training in High Schools") which outlines in detail the necessary requirements and lists the army's technical manuals for physics and mathematics and where they may be obtained. This leaflet is for sale by the Superintendent of Documents, Washington, D. C. The price is five cents.

There will be no difficulty whatever in finding out about this program. Before the close of the last school year, educators in Idaho and Delaware, Missouri and Colorado had already met to discuss plans, and during the summer, courses at teachers' colleges were given to instruct the instructors. Dr. N. L. Englehart of Columbia University has prepared a teacher's guide, "Education for An Air Age," with others to come: "Biology," "Geography," "Physics—An Air Age."

The second agency, the Air Training Corps of America, is an organization which is in part patterned on the English ATC (England has already graduated 75,000 boys into the RAF, Canada 26,000). It is sponsored by such well-knowns as James A. Farley, Bernard Baruch, and C. R. Smith, the president of American Air Lines. The ATC was formed to foster the military aspects of preflight training among high school boys in their junior and senior years. While it will make use of textbooks on aëronautical subjects; it proposes to supplement classroom work with military drill and calisthenics. The drill manual used has been prepared under the supervision of the Army Air Training Command.

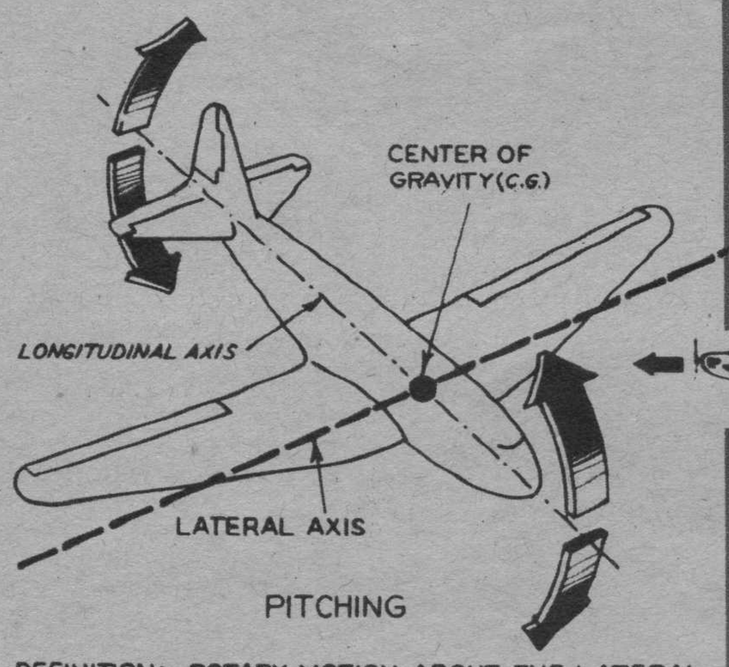
Here is the proposal for procedure:

"All ATCA units will be uniformed. Boys will wear these uniforms only on drill days. Membership will be entirely voluntary. In order to be enrolled in ATCA, boys must pass a physical examination by a local doctor and secure parents' permission to join. *(Turn to page 50)*

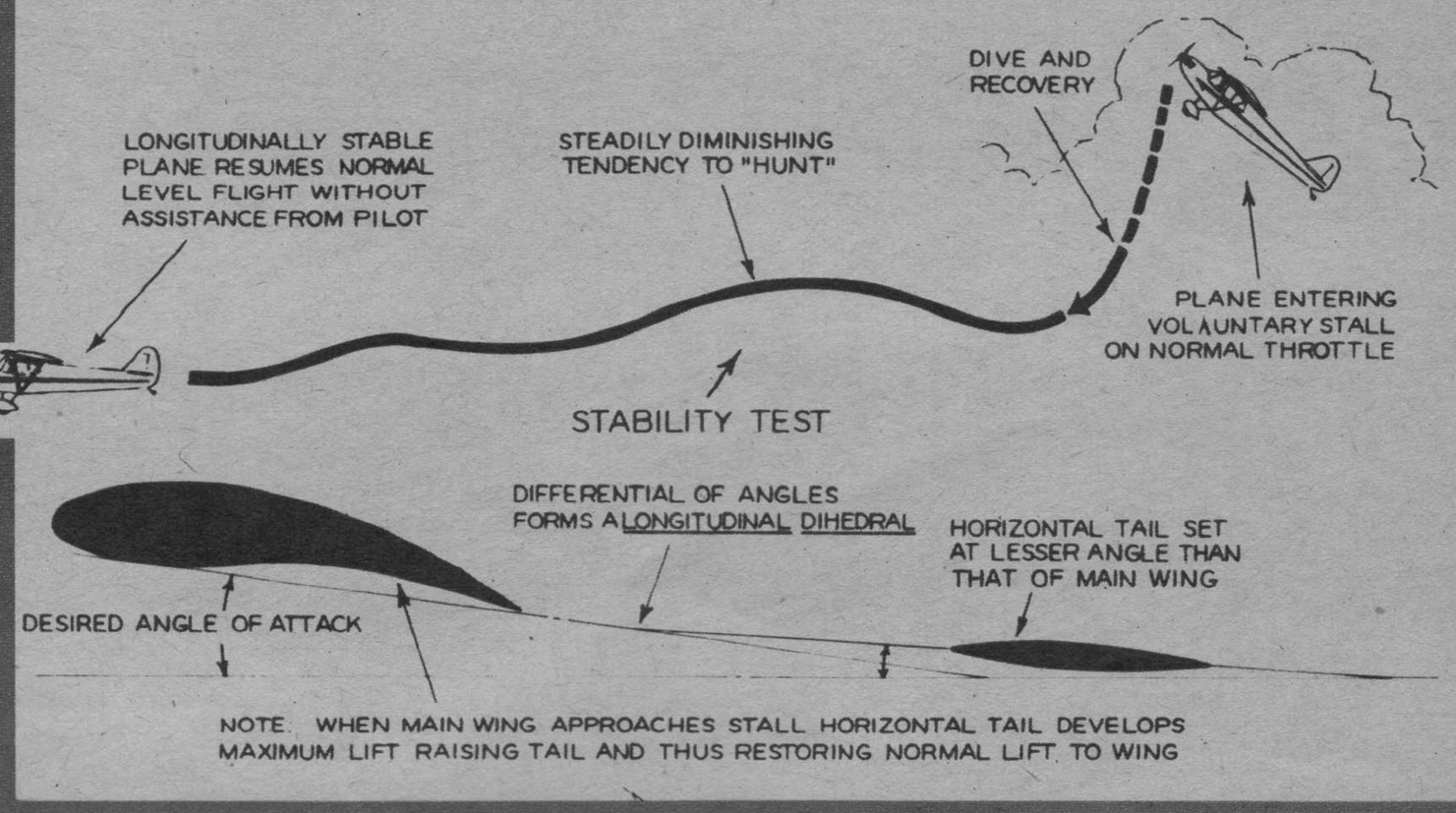
Air Manual, LESSON NO. 3

AIRCRAFT STABILITY

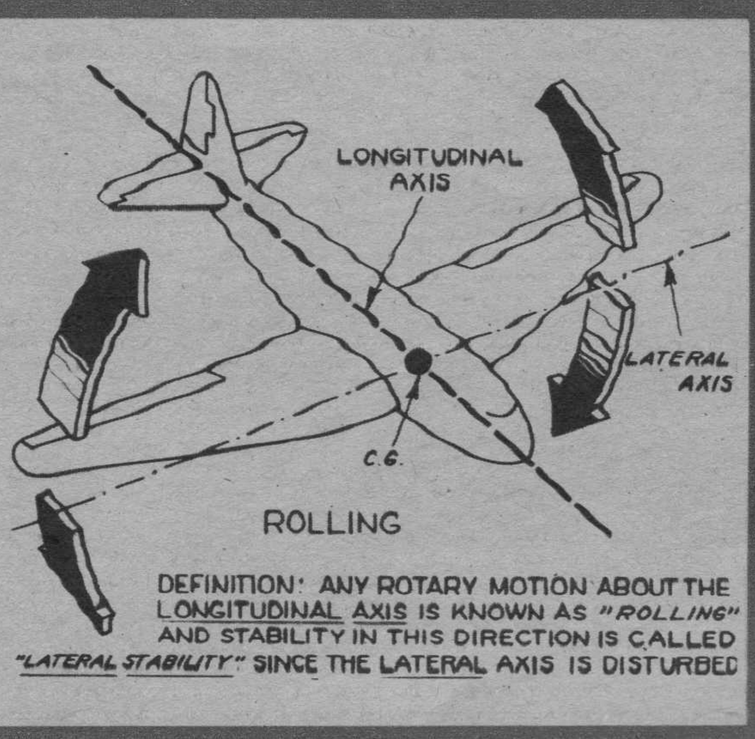
★ YOUTH IN AVIATION ★



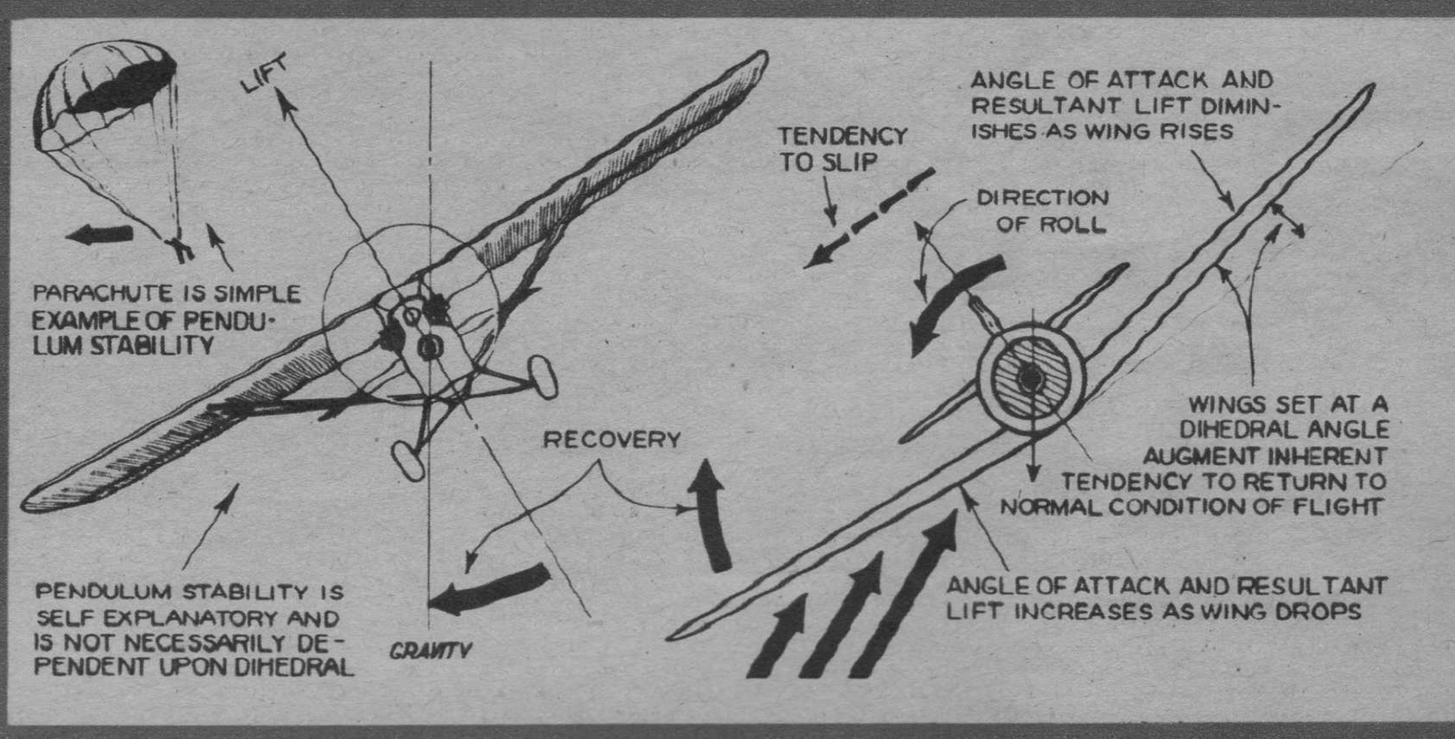
DEFINITION: ROTARY MOTION ABOUT THE LATERAL AXIS IS CALLED *"PITCHING"* WHILE STABILITY IN THIS DIRECTION IS CALLED *"LONGITUDINAL STABILITY"* BECAUSE THE LONGITUDINAL AXIS IS THE ONE DISTURBED



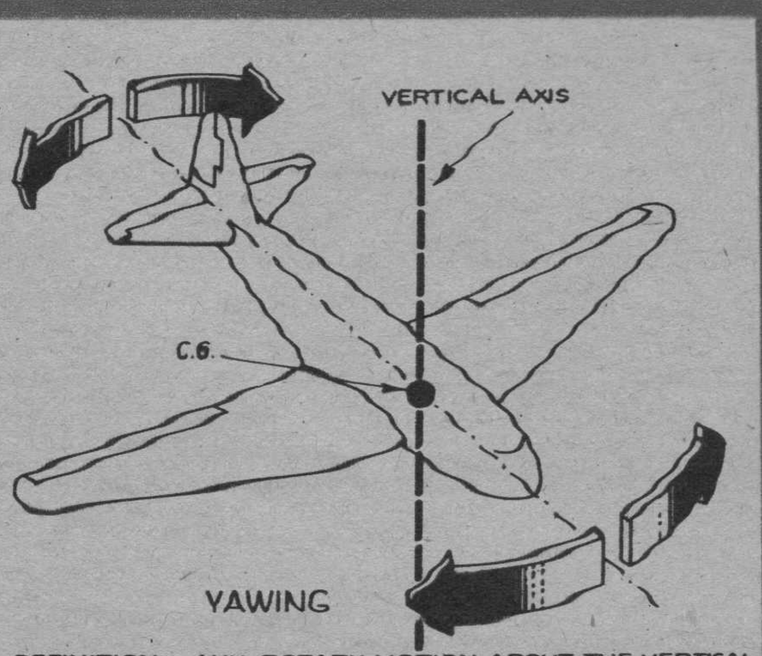
LONGITUDINAL STABILITY—The stability of an airplane means its ability to return to some particular condition of flight without effort on the part of the pilot after it has been slightly disturbed on any one of the axes. Stability which concerns pitching is called "longitudinal stability" and is attained by building in a longitudinal dihedral angle (see diagram) between the main wing and the horizontal tail. In effect the tail serves as a constant damper and resists any tendency of the airplane to pitch about the lateral axis and dampens oscillations to restore the ship to normal flight.



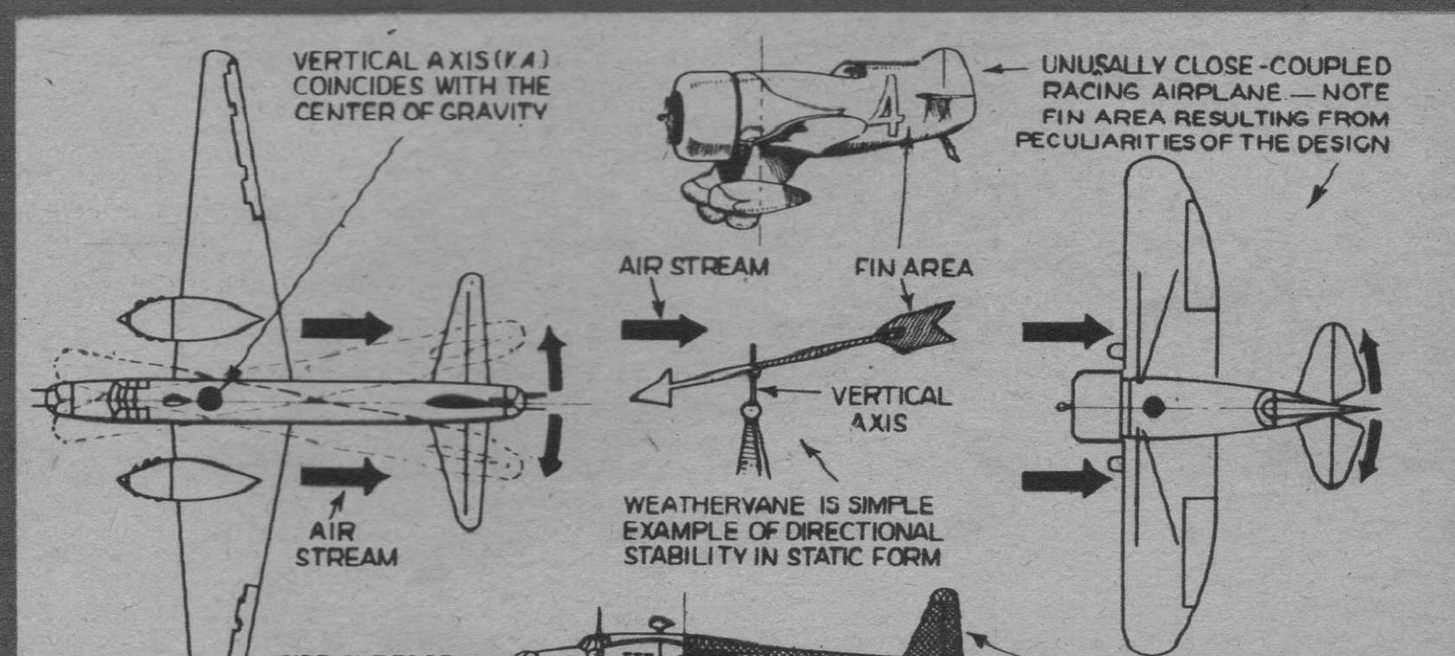
DEFINITION: ANY ROTARY MOTION ABOUT THE LONGITUDINAL AXIS IS KNOWN AS *"ROLLING"* AND STABILITY IN THIS DIRECTION IS CALLED *"LATERAL STABILITY"* SINCE THE LATERAL AXIS IS DISTURBED



LATERAL STABILITY—Stability which concerns rolling about the longitudinal axis is called lateral stability and is generally attained by building a dihedral angle into the wings so that when a slight roll takes place the forces acting on the airplane tend to restore it to an even keel. To a certain extent this is a property of all airplanes regardless of the dihedral angle. Lateral stability may also be insured by pendulum action which is an inherent property of most high-wing planes. In practice, lateral stability is tied up with directional stability, since yawing follows rolling and vice versa.



DEFINITION: ANY ROTARY MOTION ABOUT THE VERTICAL AXIS IS TERMED *"YAWING"* AND STABILITY IN THIS DIRECTION IS CALLED *"DIRECTIONAL STABILITY"*— AS SUCH IT IS CLOSELY INTER-RELATED WITH LATERAL STABILITY.



DIRECTIONAL STABILITY—In order to establish directional stability, which concerns yawing about the vertical axis, the side surface or fin area of the plane must be so distributed that pressure developed in a slight turn will tend to force the tail back to its original flight position. If the turning effect behind the center of gravity is greater than the turning effect in front of the center of gravity the airplane is said to be directionally stable.

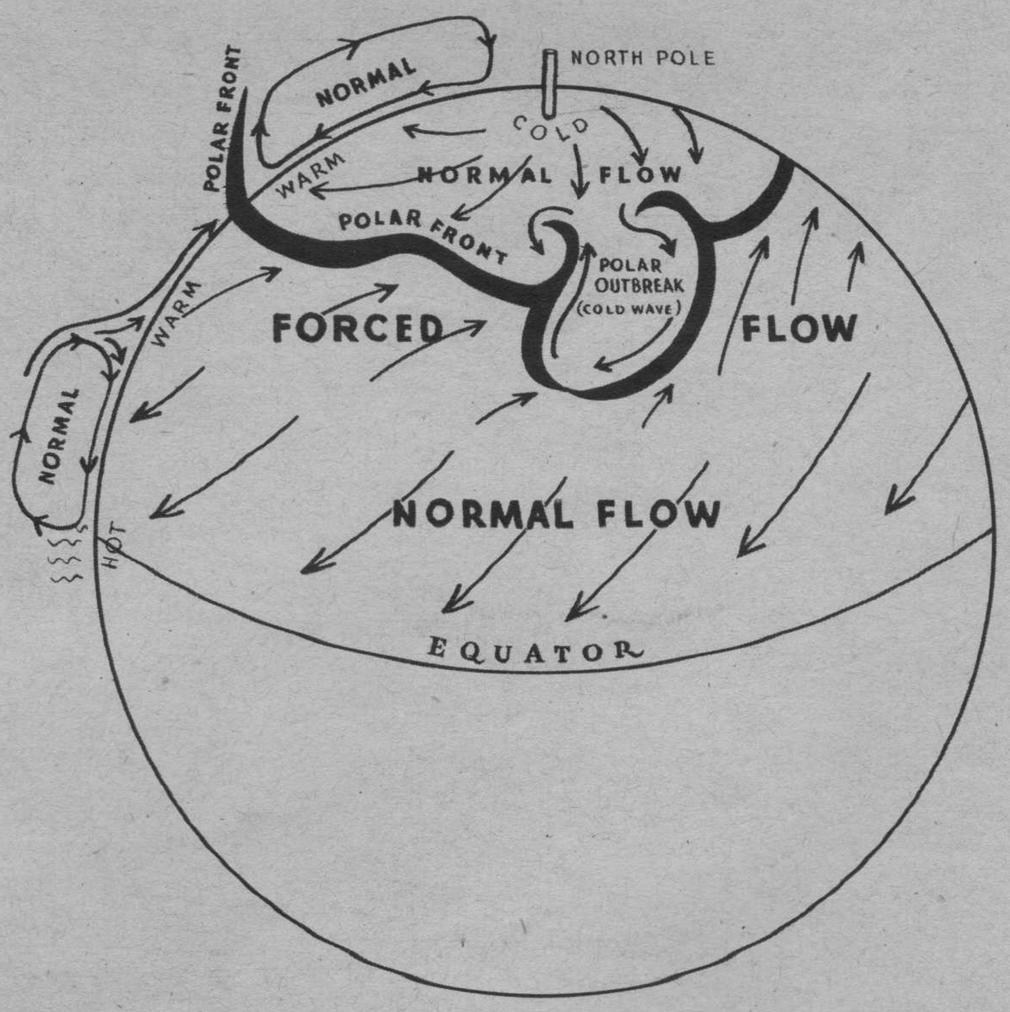
YOUTH IN AVIATION ★★

Weather, Front and Center!

BY KEN WILLARD

INSTRUCTOR, PARKS AIR COLLEGE

Just what are weather "fronts"? How do storms grow? An instructor in meteorology explains in simple terms.



Tendency of hot air to rise at equator and for cool air to flow in from poles is disturbed by earth's rotation, night and day—with this result (Northern Hemisphere).

OF all the subjects a fellow has to know these days to get into the air, either as a civilian or as an aviation cadet in the army or navy air forces, weather is probably the most difficult to grasp. There are two reasons for that; first, the subject itself, although we are surrounded by it, is intangible, and second, it is fully as hard to instruct weather satisfactorily as it is to master the subject.

Take a front, for instance. And you can have it; I certainly don't want one anywhere around when I'm flying. They play too rough. But just in case you meet one unexpectedly, it's a good idea to know what is likely to be encountered, so you can be prepared for it. Therefore, the army and the navy and the CAA require that everyone who flies has some basic idea of what constitutes a front, and meteorology is of prime importance in the ground-school training which every flier gets. But how are you going to show a student a front? I suppose you could hold classes only on those days when fronts were passing over the schoolroom, meanwhile trying to comment. Or you can draw pictures on the blackboard, which is the most usual method. Both have their good and bad points. It is interesting to watch a front pass, even for laymen, because of the display that it provides, but it is even more interesting to a student of the subject, because he recognizes the actual manifestation of theoretical motions which he has been taught to avoid. But the scope of the action is too vast to be accurately pointed out.

The blackboard method is useful in showing the step-by-step progress of a frontal development, but it lacks action, and it is a well-accepted rule of instruction that visual as well as verbal instruction is necessary to maintain interest.

One of the best ways to demonstrate any action is to make a working model—especially if the subject matter is too bulky to get into a classroom or laboratory. Then, with the step-by-step diagrams on the blackboard, the model can be operated and each step pointed out as it occurs.

Although no methed has yet been devised to make a working model of a front, a fairly close approximation to some of the basic structure can be had by making use of water in place of air. You see, air is a fluid that is compressible, and water is also a fluid, but practically incompressible. The compressibility is the big difference, and we can explain that difference before a demonstration, and then the student knows what to look for.

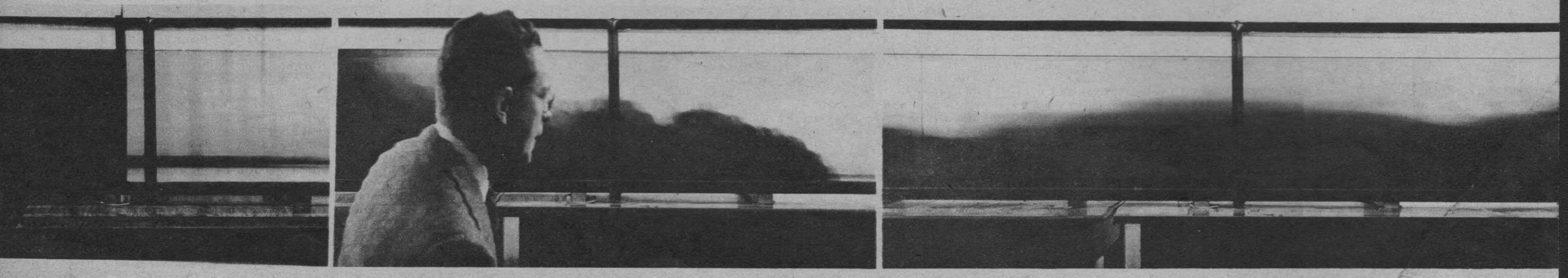
"Take a front," I said. And you say, "O. K., but what is a front?" And that is where the preliminary explanation comes in. And it goes something like this (with apologies to all strictly scientific meteorologists for omitting so many contributing but confusing factors).

First, there is the broad, general picture of the earth, the atmosphere and the sun. The sun is an incredibly large and hot globe of molten and gaseous material. It is approximately 93,000,000 miles from the earth, and has a diameter over a hundred times as great as the earth. The earth receives all of its heat from the sun, and the atmosphere around the earth has the peculiar property of allowing most of the sun's heat to pass right through it and right into the earth.

Now, the only way this heat from the sun can reach the earth is by the process known as radiation. Nearly everybody is familiar with radiation, since steam radiators are commonly used to heat apartments, and everyone has at one time or another built a fire to warm himself by the radiated heat. And you all know that if the radiated heat is too strong, you can either back away from it or turn away from it. Both moves will reduce the effect of the heating.

Similarly, the effect of the sun's heat when it strikes the earth will be greatest where it strikes head-on near the equator, and least where it strikes a glancing blow at the poles. So the earth will be hottest at the equator and coldest at the poles. Do you follow me? *(Turn to page 52)*

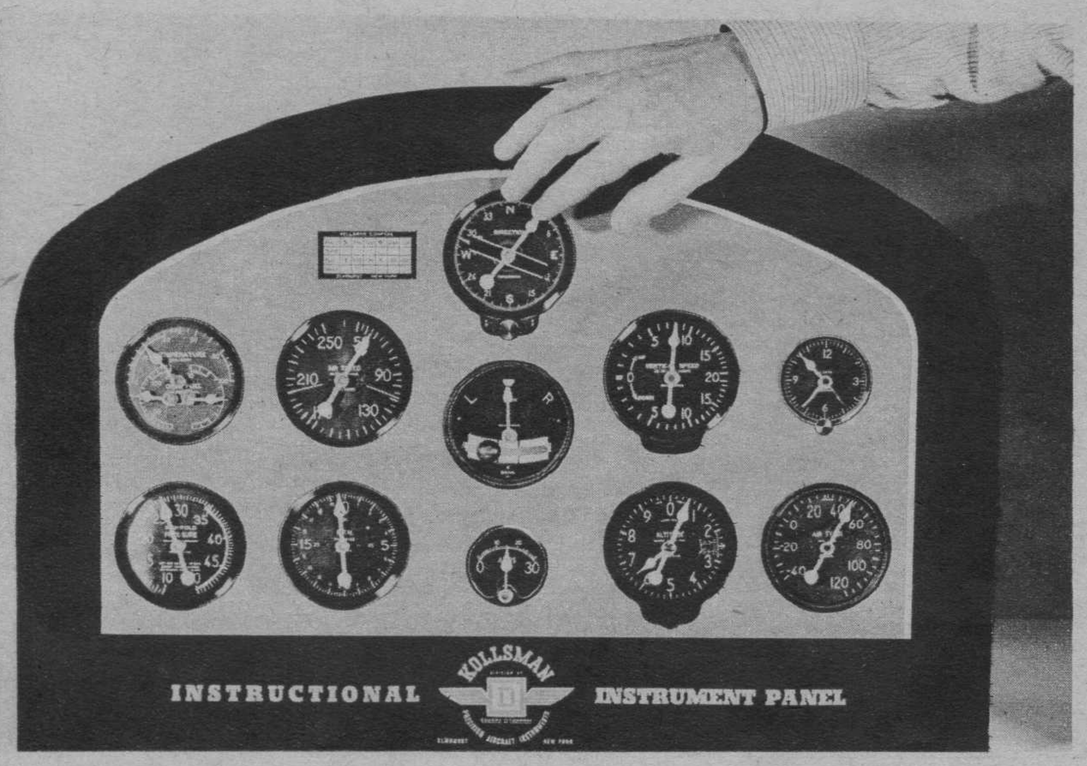
Good stunt for classroom use is this water tank for simulating weather "fronts." When barrier between blue-tinted water (salt added to increase density) and lighter red-tinted water (right) is removed, blue water underrides red water like "front." This interesting sequence is shown left to right. Tank is in use at Parks Air College.



Aids to Teachers

Teachers: United Air Lines Teacher's Kit and full-size Kollsman dummy instrument panel will prove a boon in many ways.

The United Air Lines Teacher's Kit, a collection of timely, authentic aviation material, is available to all for twenty-five cents. Send to: Professor Wheatley, United Air Lines, 5959 South Cicero Avenue, Chicago, Ill.



Kollsman dummy instrument panel includes all standard instruments shown actual size. Cost is one dollar. Send to: Mr. J. C. Carr, Advertising Manager, Kollsman Instrument Division of Square D Co., 80-08 Forty-five Avenue, Elmhurst, N. Y.

★ ★

Junior Air Reserve

Conducted By AL LEWIS
DIRECTOR, AIR YOUTH DIVISION, N. A. A.

Thousands of our American youth are getting their aviation training through JAR. If not a member, fill out coupon below.

GREETINGS, cadets! Let's sit down for our monthly meeting of the Junior Air Reserve. And to those guests you've brought along, we'd like to point out that the JAR is sponsored by the National Aeronautic Association, America's largest and oldest aëronautical organization. With those preliminaries out of the way, let's get down to the business at hand. And here's some real news!

The Junior Air Reserve has a national broadcast every Friday night over a coast-to-coast hook-up of the Blue Network. The time is 7 p. m. Eastern war time (6 p. m. Central war time, 5 p. m. mountain war time, and 4 p. m. Pacific war time, just to make it easy for you and not have any misunderstandings). Consult your local newspaper to find out your nearest station in the Blue Network.

The broadcasts got under way on July 10th and feature each week latest reports from the fighting fronts on the performance of America's warplanes, JAR news and notes, and an exciting adventure of army air forces pilots fighting in a war to keep democracy flying.

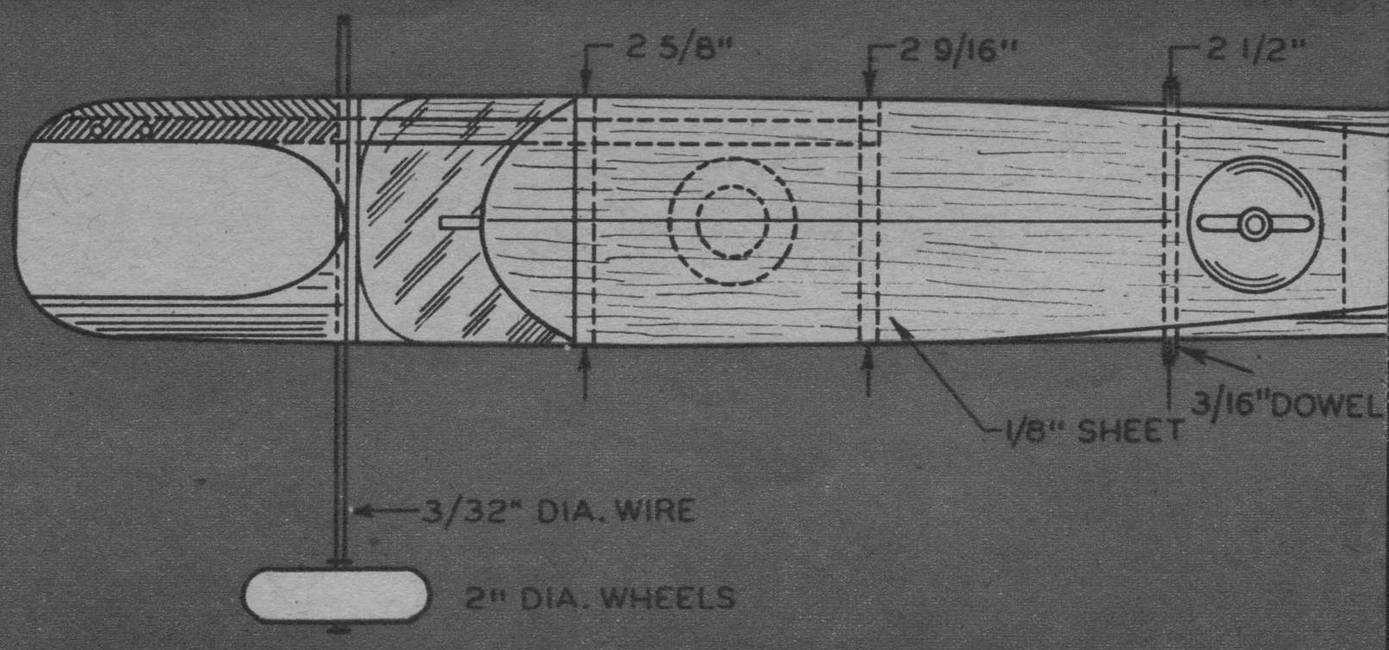
So make a note now—it's the Junior Air Reserve's own program, "Scramble." The title "Scramble" comes from the command, "Squadron, scramble," given when pilots in the interceptor commands take off on emergency missions.

Units in the Reserve continue to form fast. The first group command in the Southeast region was set up at Avon Park, Florida, under the direction of W. Calvin Pidgeon, director of academics at the Lodwick Aviation Military Academy. The Lodwick Academy, incidentally, is Southeast training center for the army air forces.

Group Commander Pidgeon reports that members of the academy's academic-department staff are donating their services to the Junior Air Reserve. The organization of four "flights" was quickly completed and more were to be formed as soon as additional applications reached the newly appointed JAR officials. One of the first jobs undertaken by JAR cadets in the Avon Park group command was the construction of solid identification models for use by the army. The *(Turn to page 46)*

Boomerang

BY FRANK EHLING



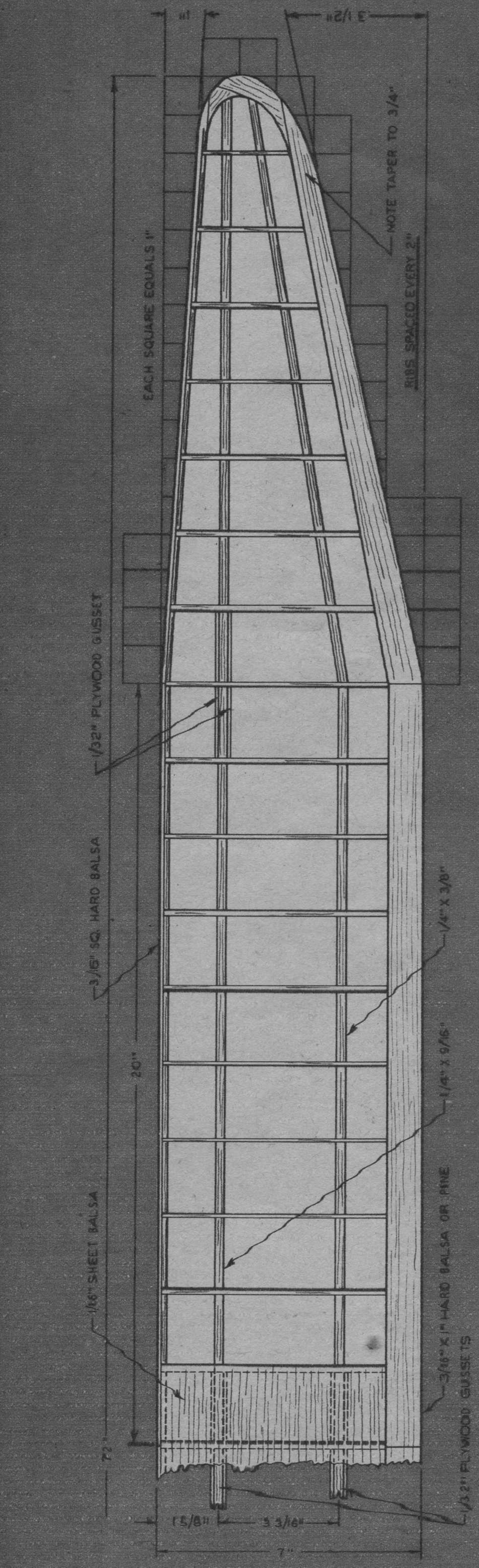
Soaring gas job features dethermalizer that heads model back toward take-off point.

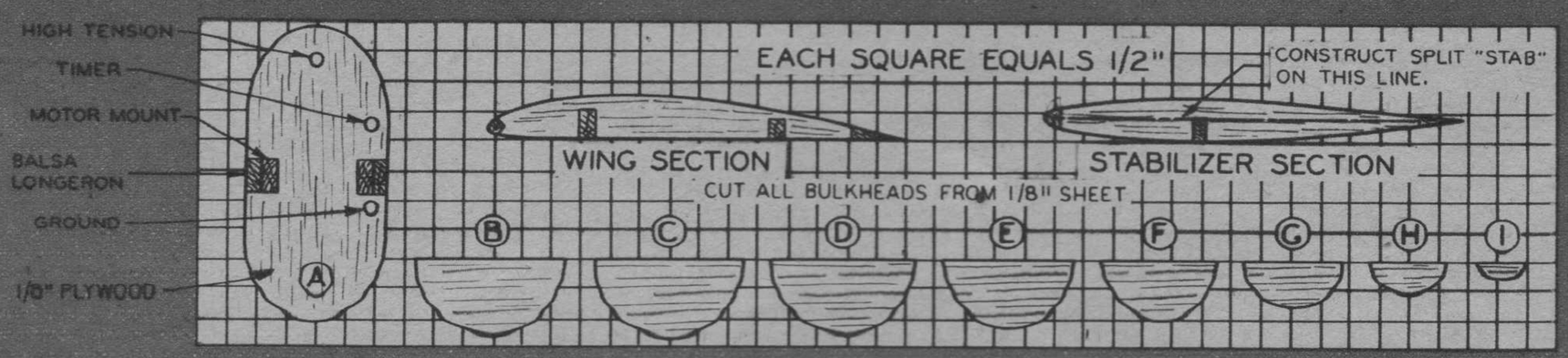
WITH balsa and motors getting scarce, the ship that is going to fly out of sight every other time is not one that will be popular today. The Boomerang was built to stay in sight, not as a gas job, but as a tow-line model, and its performance was excellent. After a while a motor was installed, and the flight performance was not altered in any way. Except that she started going out of sight. After a particularly long though successful chase, we decided something must be done, and installed a set of spoilers.

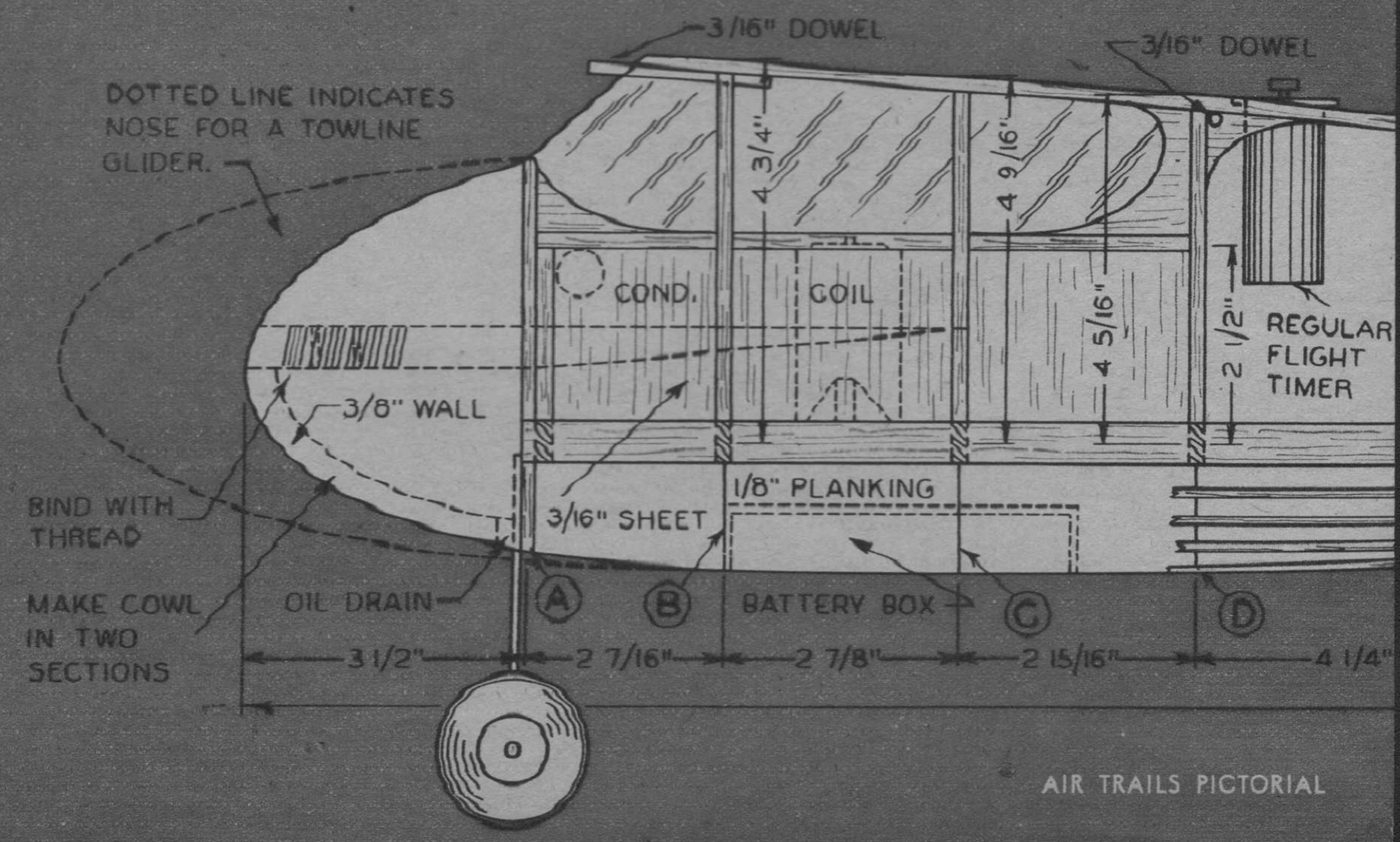
Two weeks later the ship was at the field again and off she went. The spoilers functioned and the glide was killed enough to bring her out of a thermal that was holding three other ships up there —and yet our job was far away when it landed. Here is where the idea of having the ship return to the field was born. But with nothing to guide us in our design, the experiment was at a standstill. Then it occurred to us that while messing around with gliders we had one which would glide straight into the wind, and in this way would glide back to you if there was a light wind blowing. Now all that we had to do was have the ship sprout a set of oversize rudders at the moment a return to the field was desired.

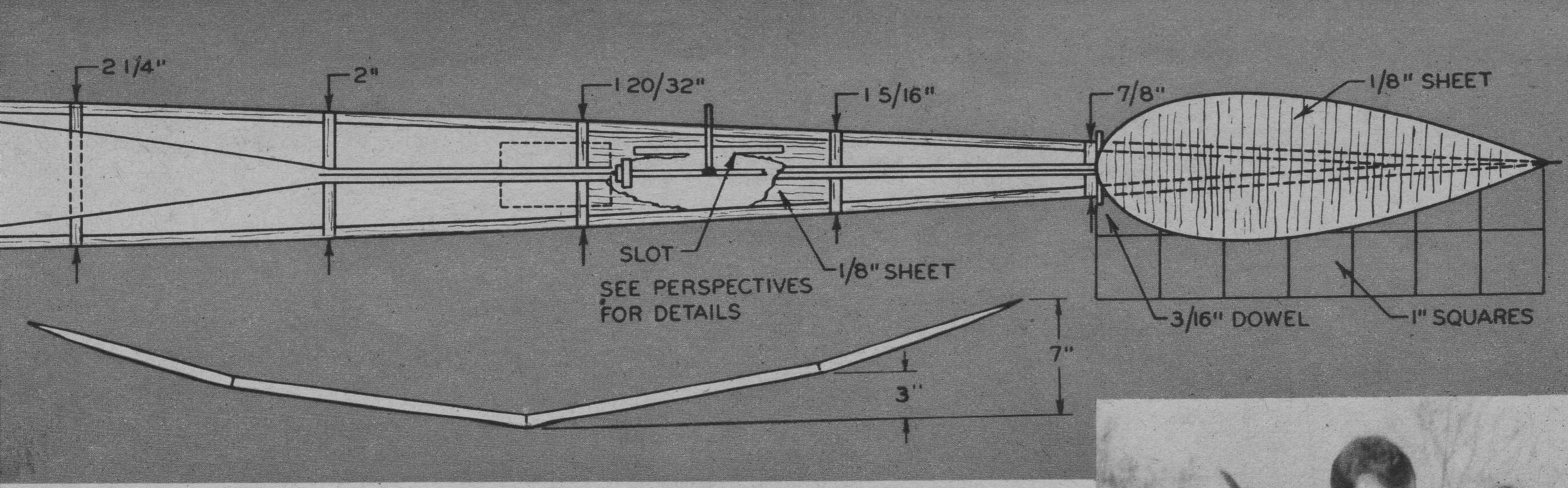
This was easily done with the aid of a split stabilizer and an air timer. The timer was set to release the split stabilizer and the rubber bands would bring up the stabilizer to form a set of rudders. Here's what happens: The center of lateral area moves so far back that the ship cannot turn, but glides into the wind, and in that way returns to the field, as long as there is a slight wind blowing.

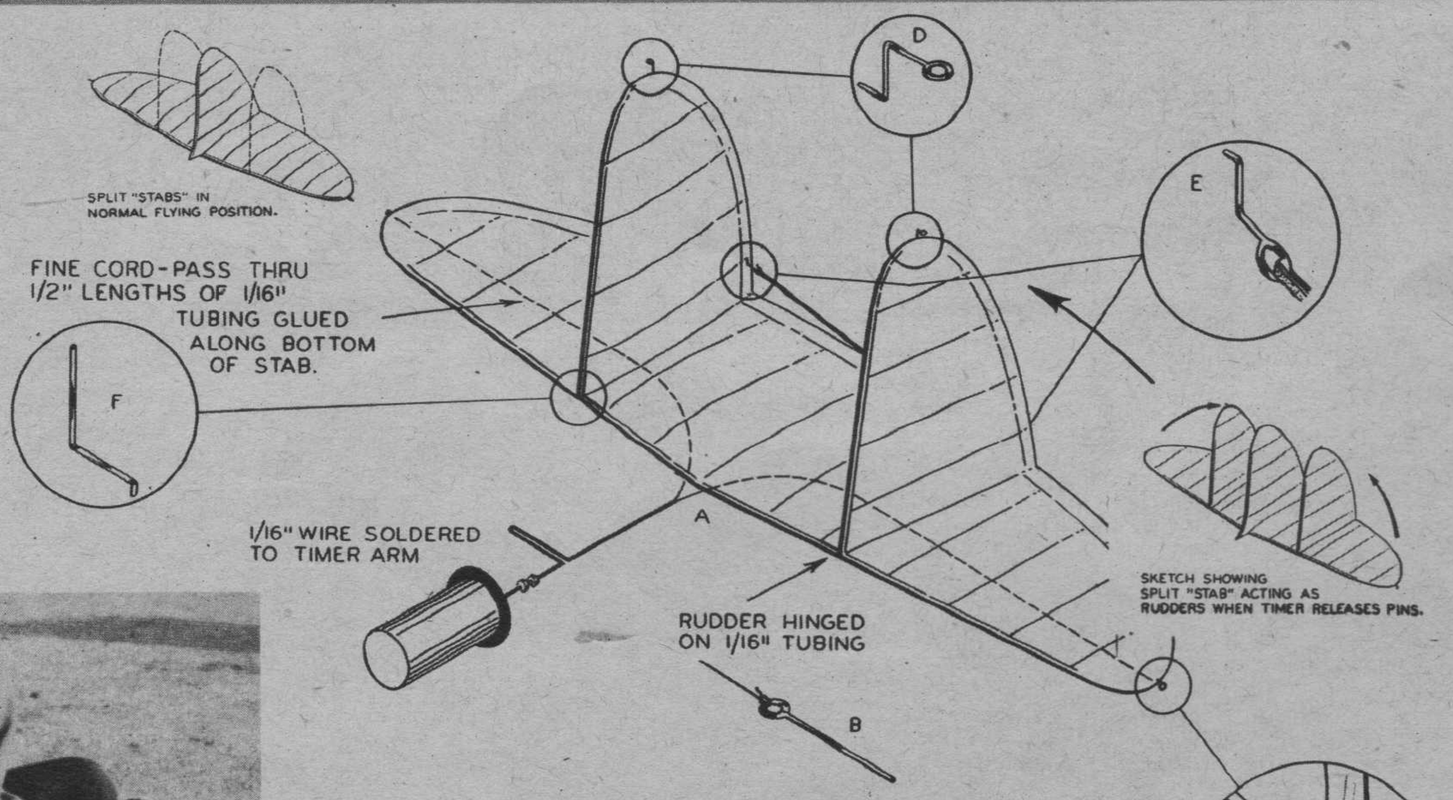
The fuselage is made in the usual manner. Don't mistake the lower longeron for a crutch, though it gives the same effect. The two sides are made at once, for this is a *(Turn to page 50)*





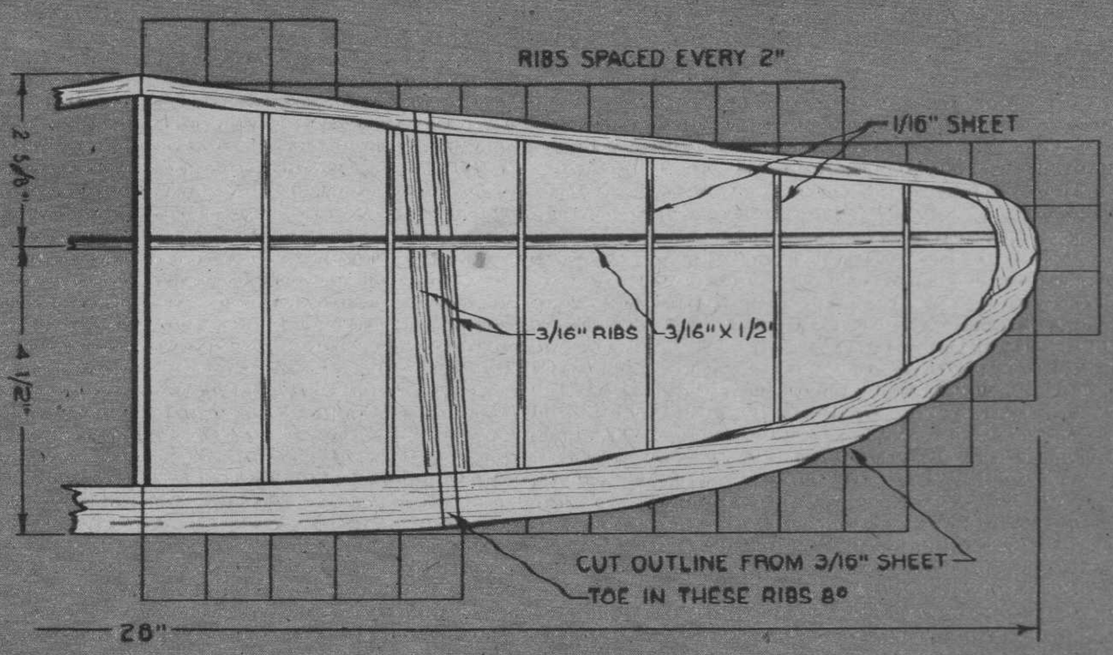


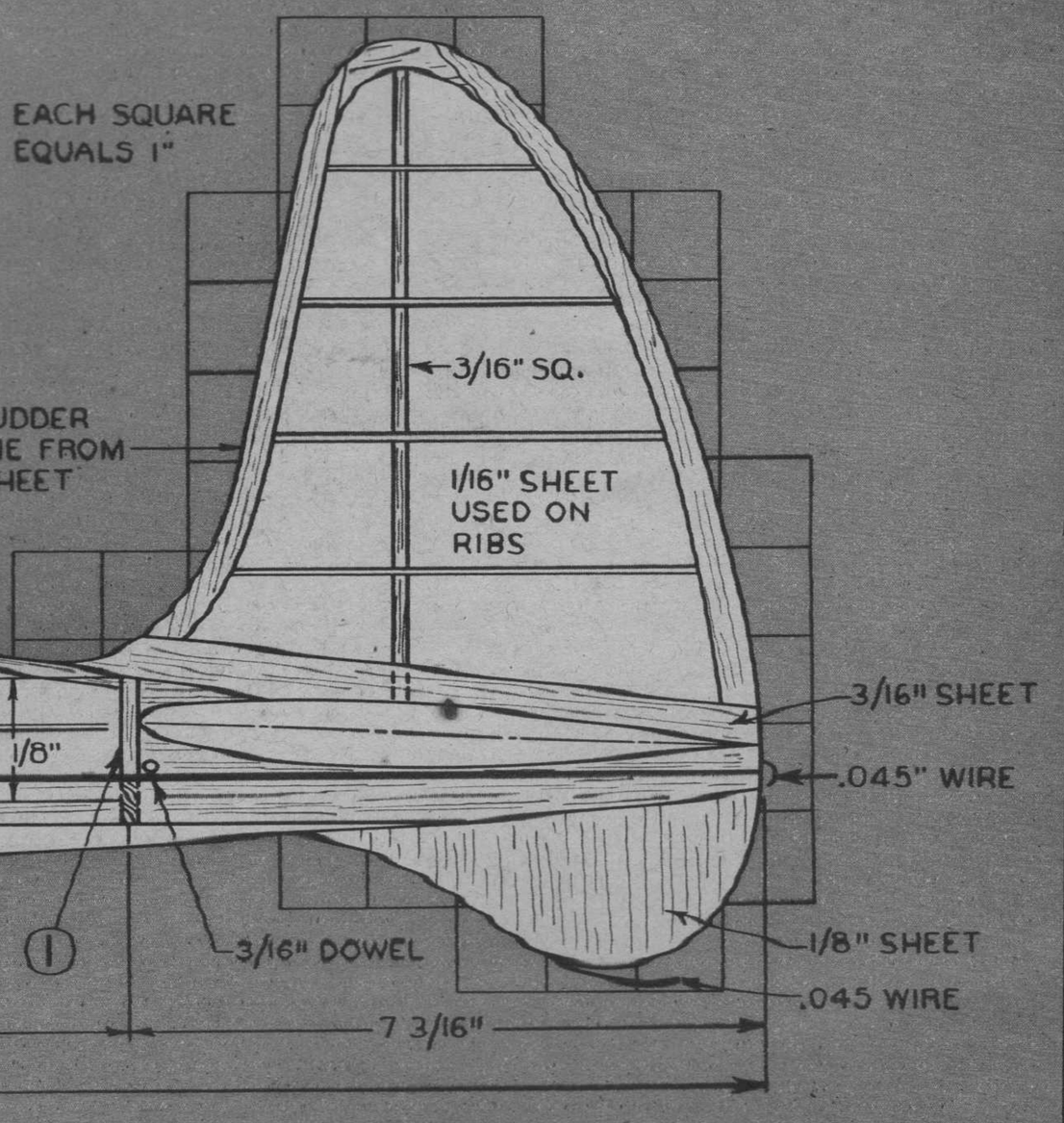




The Ehling dethermalizer: center rudder is fixed. Two outer rudders are hinged about halfway out on the top surface of the stabilizer. During ordinary flight, these outer rudders lie flat. When the timer pulls the release pins, a rubber band pulls each rudder erect, increasing rudder area, and thus causes the ship to "weathercock" into wind toward field.

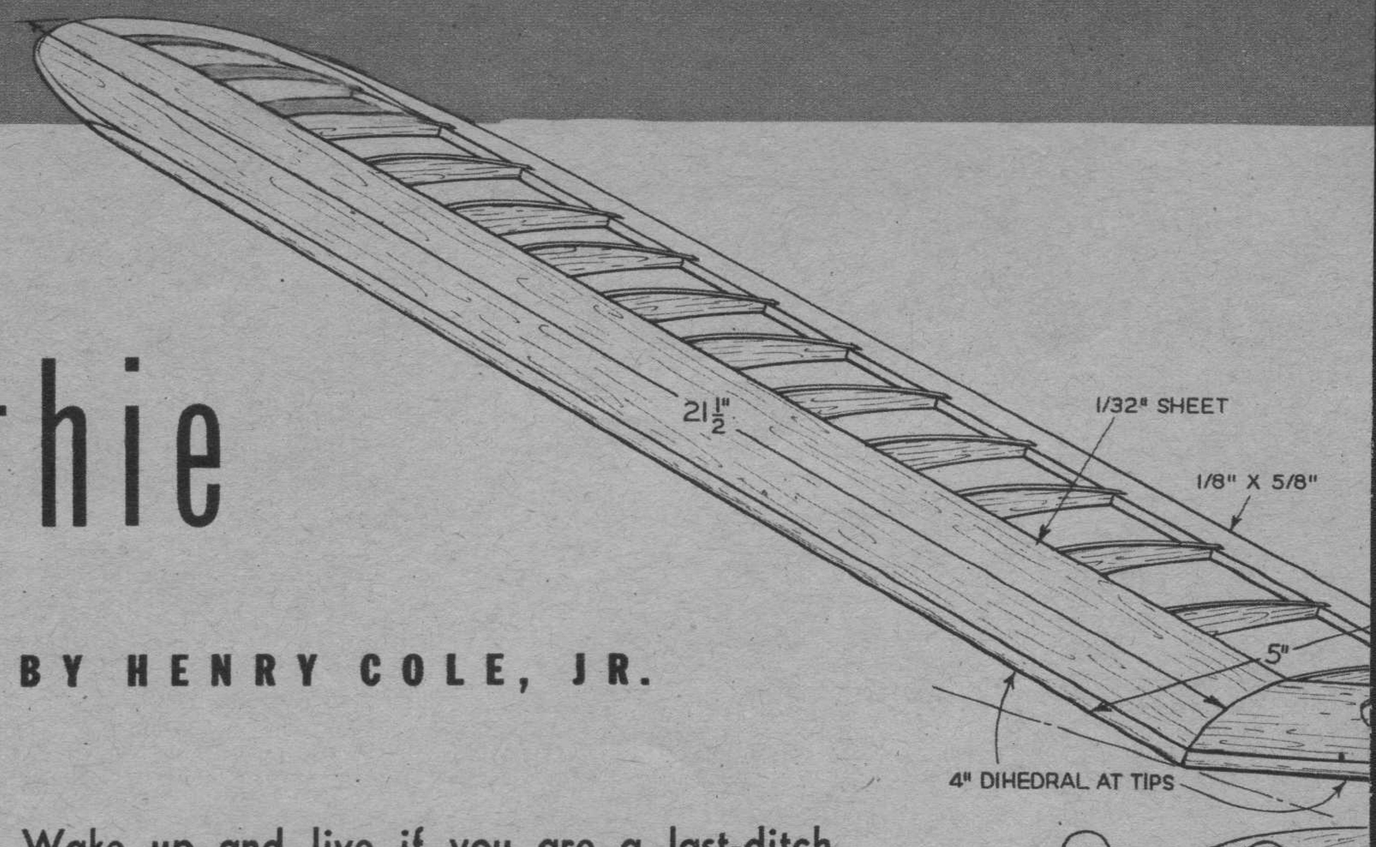
Frank Ehling and the original Boomerang. Gliding qualities—ship doubles as a sailplane with a longer nose.



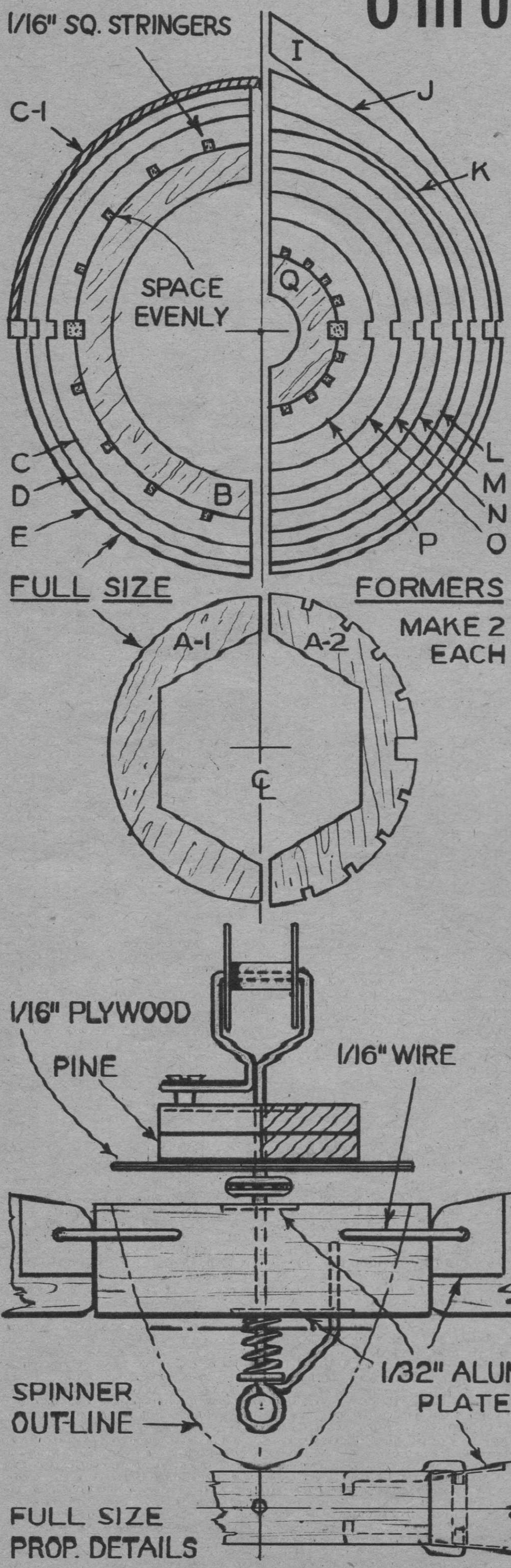


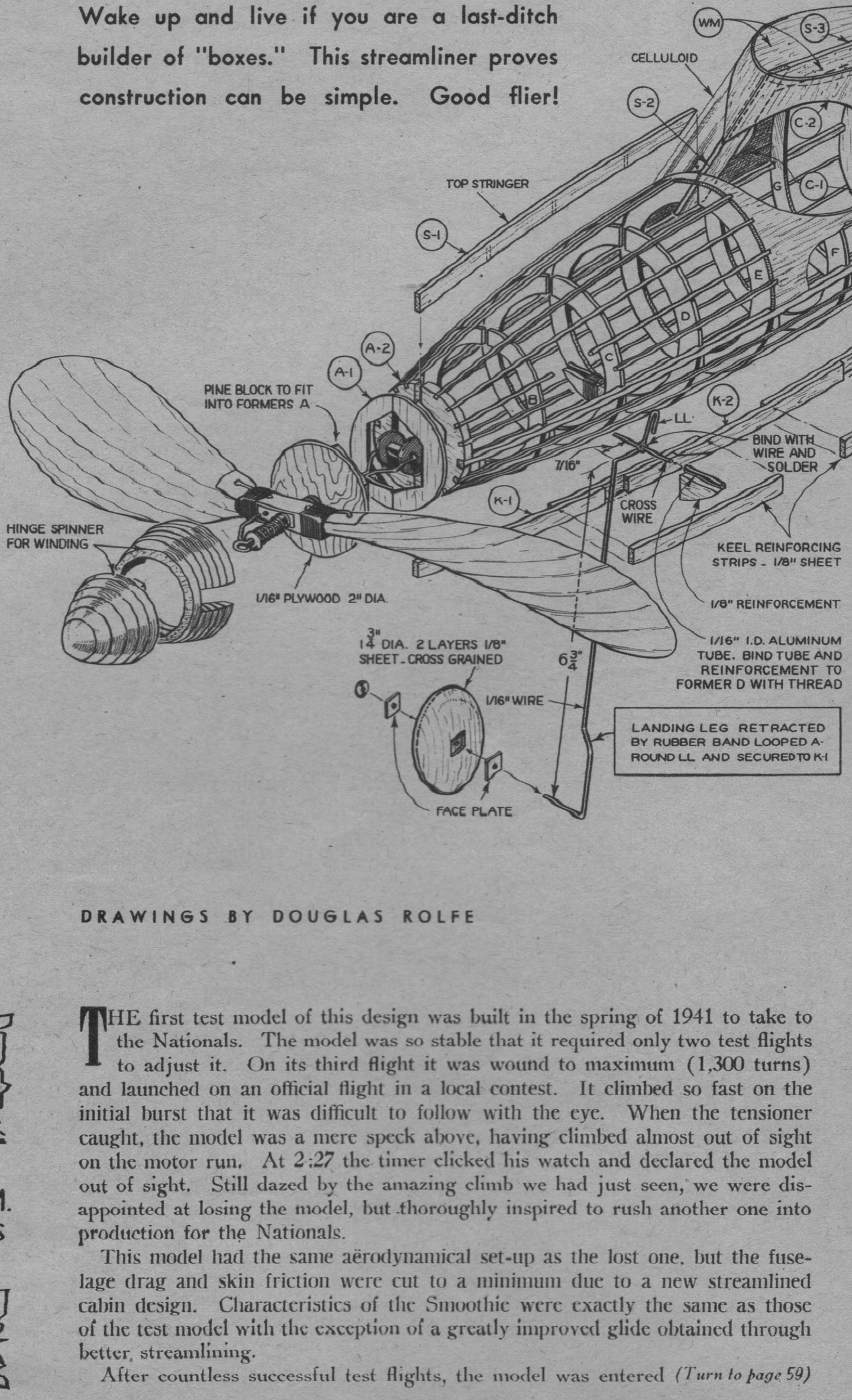
Smoothie

BY HENRY COLE, JR.



Wake up and live if you are a last-ditch builder of "boxes." This streamliner proves construction can be simple. Good flier!



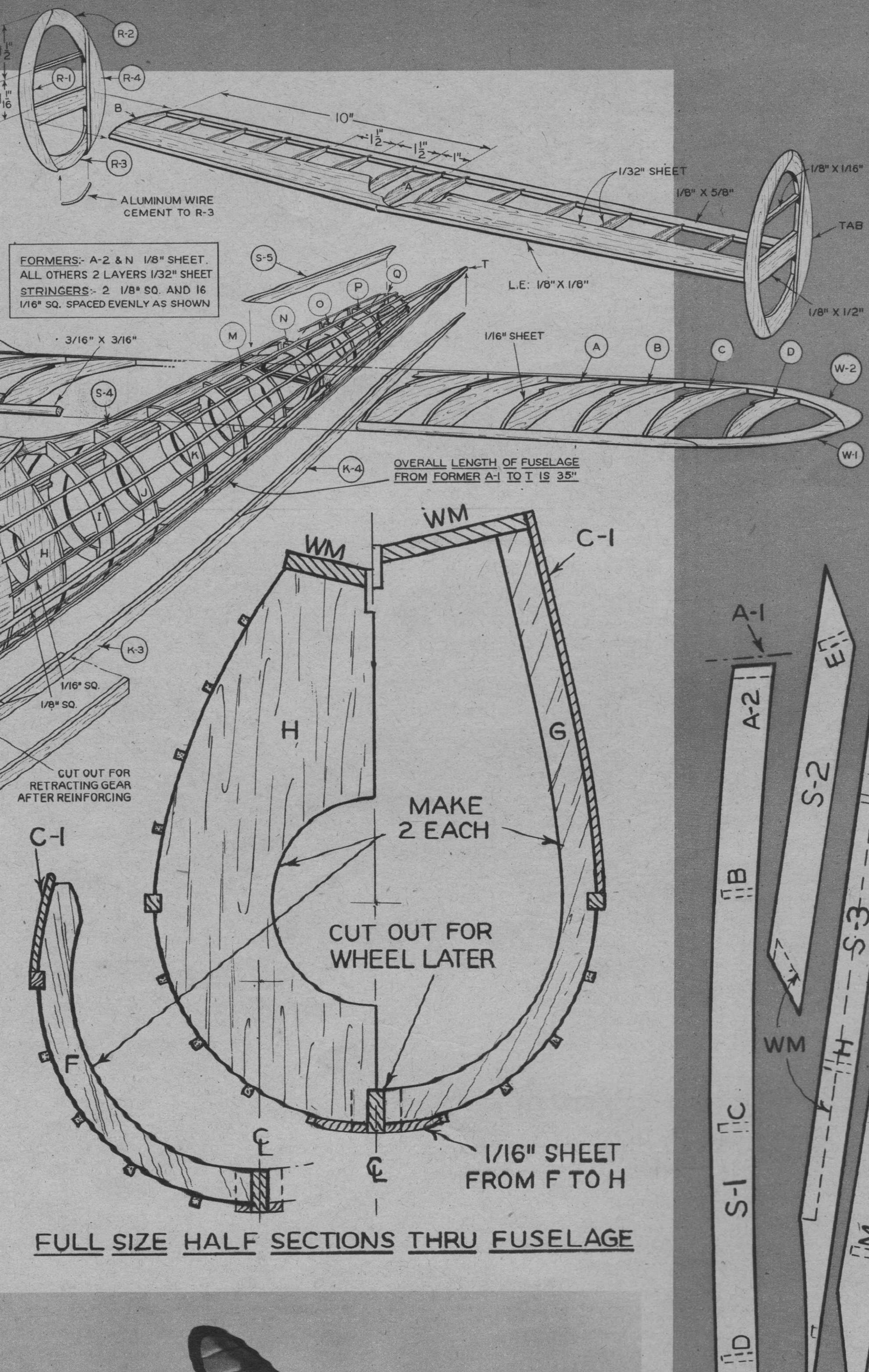


DRAWINGS BY DOUGLAS ROLFE

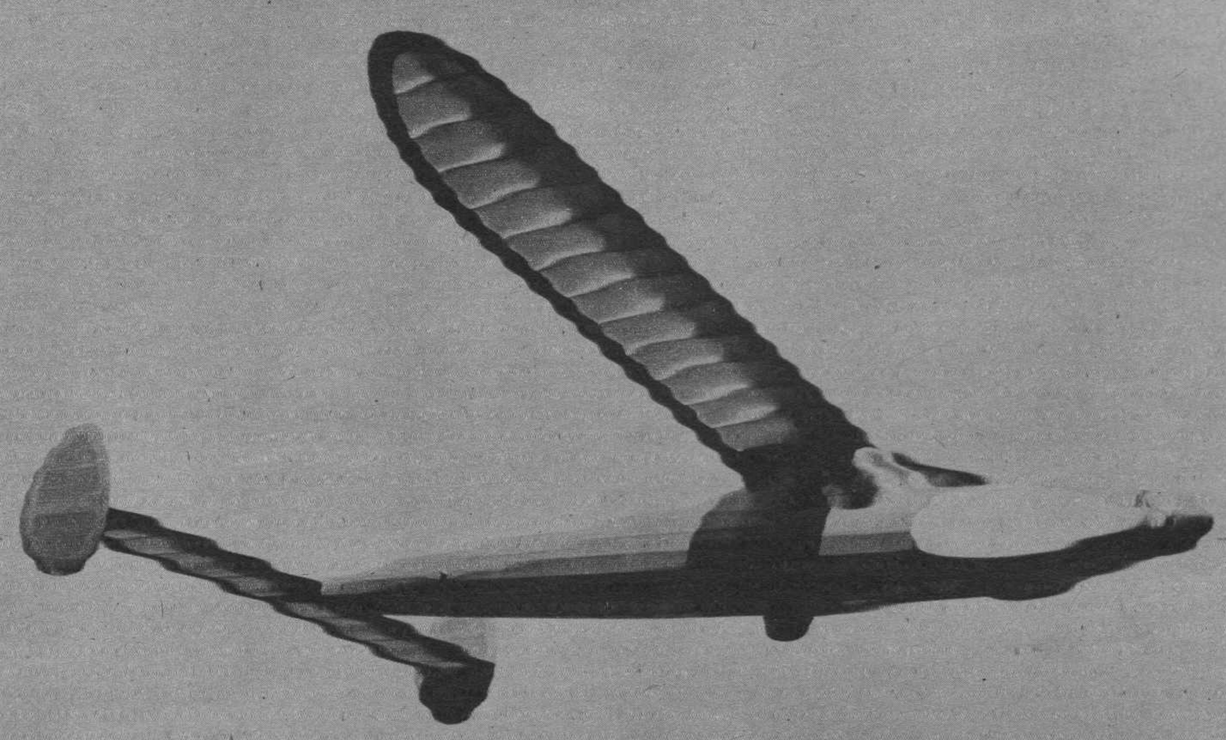
THE first test model of this design was built in the spring of 1941 to take to the Nationals. The model was so stable that it required only two test flights to adjust it. On its third flight it was wound to maximum (1,300 turns) and launched on an official flight in a local contest. It climbed so fast on the initial burst that it was difficult to follow with the eye. When the tensioner caught, the model was a mere speck above, having climbed almost out of sight on the motor run. At 2:27 the timer clicked his watch and declared the model out of sight. Still dazed by the amazing climb we had just seen, we were disappointed at losing the model, but thoroughly inspired to rush another one into production for the Nationals.

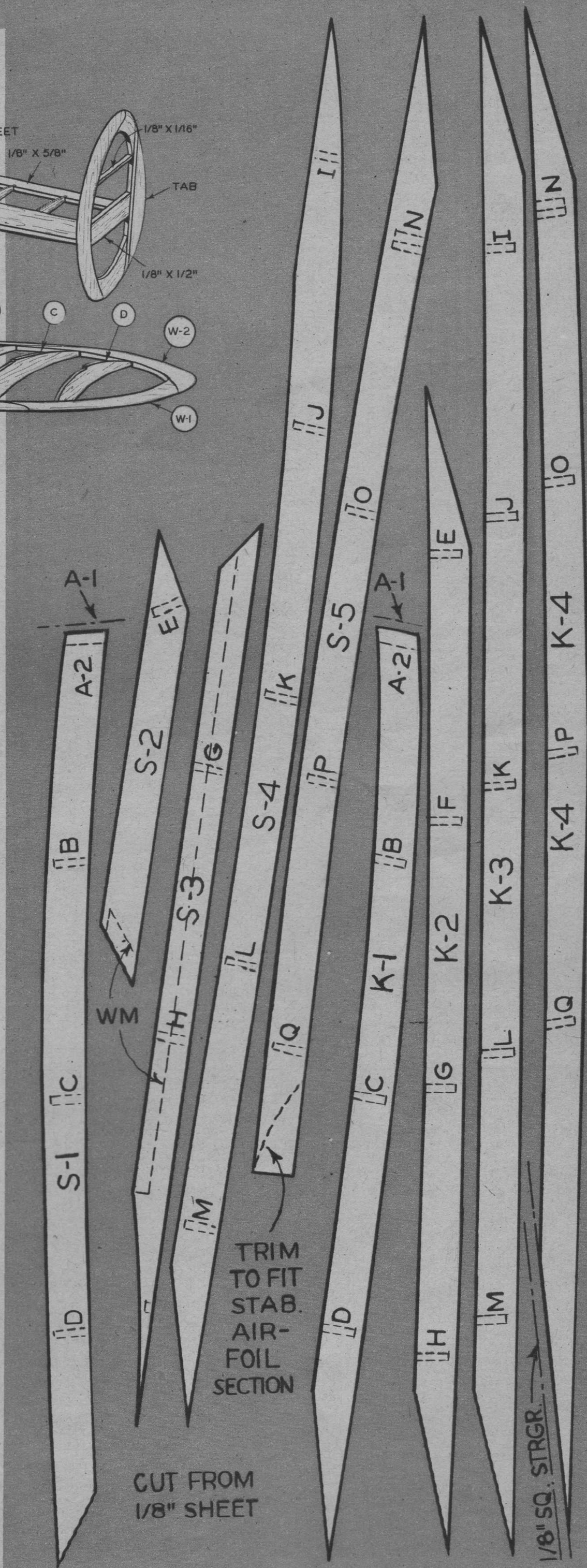
This model had the same aërodynamical set-up as the lost one, but the fuselage drag and skin friction were cut to a minimum due to a new streamlined cabin design. Characteristics of the Smoothie were exactly the same as those of the test model with the exception of a greatly improved glide obtained through better streamlining.

After countless successful test flights, the model was entered *(Turn to page 59)*



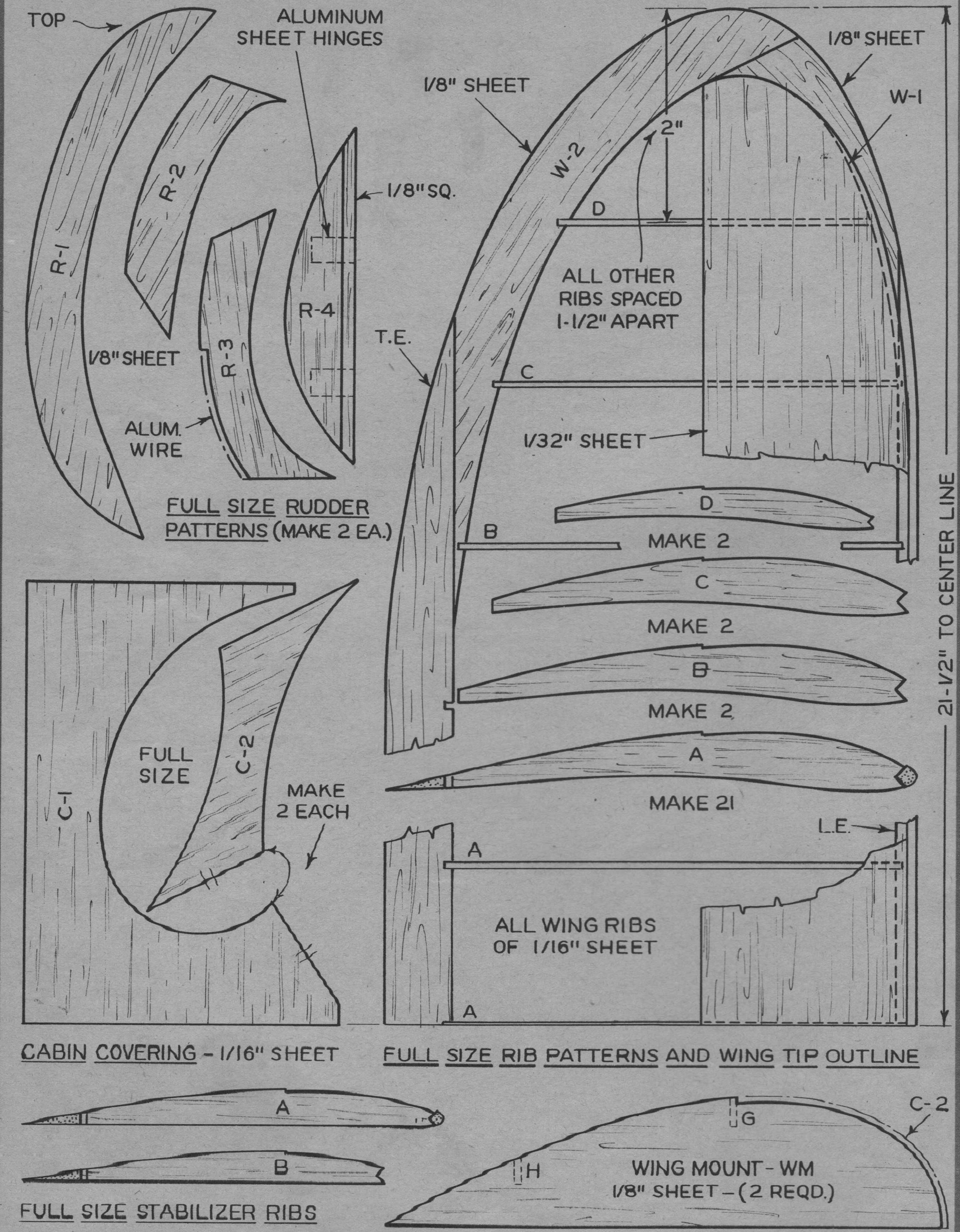
FULL SIZE HALF SECTIONS THRU FUSELAGE





FULL SIZE KEEL & TOP STRINGER PATTERNS

Smoothie

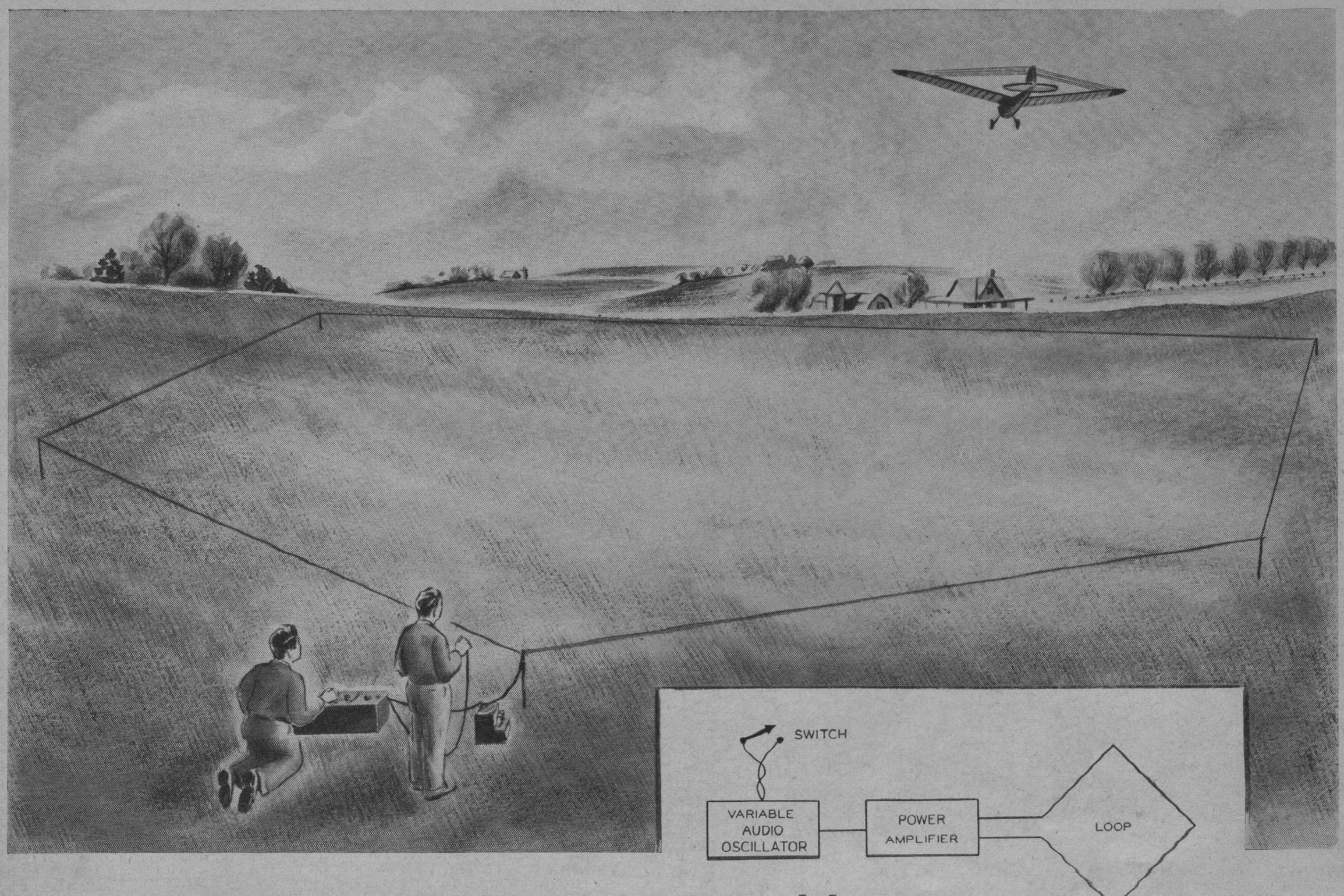


FULL SIZE RUDDER PATTERNS (MAKE 2 EA.)

CABIN COVERING - 1/16" SHEET

FULL SIZE RIB PATTERNS AND WING TIP OUTLINE

FULL SIZE STABILIZER RIBS



One of the most interesting but still theoretical substitute methods is pictured above. Model flies within area outlined by the transmitting loop.

Substitutes for Radio Control

BY CLINTON B. DESOTO

Can't replace radio control? Cheer up, these substitute methods look promising.

EVEN in time of war some room remains for hobby activities. Simply because they bring relaxation and renewed enthusiasm, such activities do their own bit in helping the war work along. All work and no play makes Uncle Sam's nephews and nieces dull boys and girls at their defense jobs. And so, even though the nation is grimly at war, model building continues —even radio-control model building.

Of course, radio control as we have known it is now banned for the duration. Both to make badly needed radio channels available to the military and also to guard against the possibility of sabotage carried on under the guise of civilian conversations, all private use of radio has been suspended. That leaves us faced with the necessity of devising makeshift remote-control systems—substitute "invisible control wires," as the Custin brothers called them in their article in a recent issue of Air Trails. They were talking about radio control, of course—ultra-high-frequency radio, five-meter stuff.

But there are other ways of linking a model and its groundling pilot with invisible control wires than by using radio—or the *radiation field*, which is really what it is. We can use low-frequency induction fields, too. We can make a superspecial a. c. transformer with the primary and secondary coils spaced hundreds of feet apart, or even a mile or more, and by properly proportioning the circuit values send energy from one coil to the other.

All that is needed is enough current in the primary—the transmitting coil—and a sufficiently sensitive amplifier after the secondary—the receiving coil.

The general idea is illustrated in Fig. 2. When current flows through the *(Turn to page 42)*

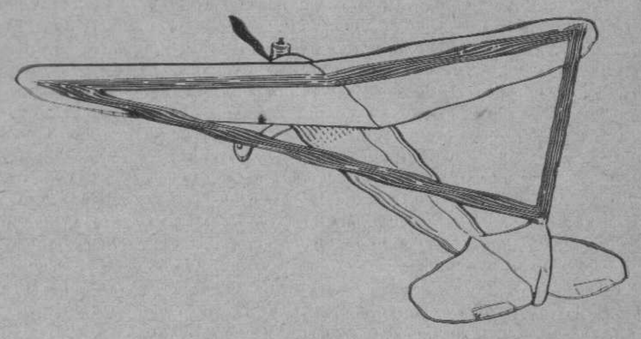


FIG. 1

Jig for constructing loop may be made from ½" dowels. Wire, after being wound, is shellacked few times to make self-supporting. Loop varies.