UNIVERSAL MODEL AIRPLANE NEWS

OCT.

15¢

A COURSE IN AVIATION FOR FIFTEEN CENTS A MONTH!"

THE SOPWITH DOLPHIN AT THE FRONT. Plans Page No. 10

If Michael Angelo had been a model airplane builder-

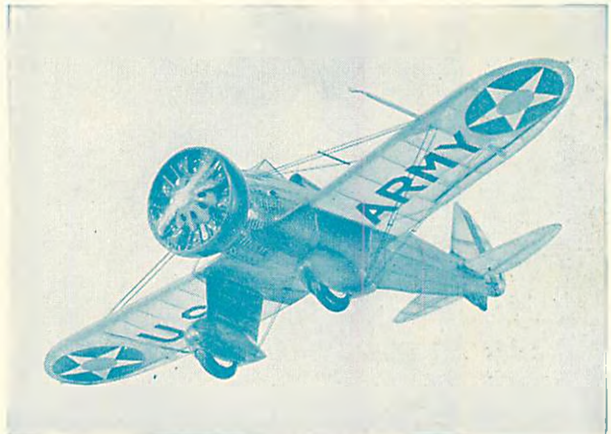
he would have enjoyed building Cleveland-Designed models. He loved details—he loved to do things right. One day when someone told him not to bother so much with details, he answered in kind: "It's the infinite care of the details that makes the finished job perfect". We of Cleveland second that motion. And so when model builders and even model concerns say about us that our models, and particularly the photos of them, look too real—look too good to be true—we simply answer that they don't look too real to us. In fact, we're always endeavoring to make them look and be more realistic. This whole business with us is very much of a scientific hobby and we believe there are thousands of other model enthusiasts who love to do things as perfectly as possible. So you know that all photographs on this page as well as all the photographs used in any of our advertising of scale models are of the actual Cleveland-Designed models themselves, not retouched photographs of the real airplanes as skeptics are inclined to believe. They should build a few of these models to see the truth of our statement of the actual models looking even better than the photographs (not only because of the coloring but also because of the many details which cannot all be seen on the photographs). Contrary to the practice of many advertisers, we do not retouch photographs to bring out artificial beauty (?) covering the entire photograph in the process so that it looks like a hand-drawn sketch. We are proud of our productions and give our artists strict instructions not to doll up photographs, only backgrounds, to place in clouds or landscapes and to brush over the small bead to give the appearance of the propeller whirr, except where details fade into backgrounds and where uneven splotches of coloring are magnified by the powerful lights which reflect through the surfaces.

Here's a Real Bargain Offer

for those who want drawings only. In order to give many of those who do not know what Cleveland-Designed models are like, but only wish drawings, we have had specially printed drawings of two of our largest models, the DeHaviland-4 Battleplane, and the Curtiss JN4D Training Plane. Drawings alone each 35c or two for 50c. Postfree. **No other drawings available.** This is just another introductory offer at a still cheaper price so that **everyone** has a chance to see what Cleveland-Designed models really are like. **While they last.**

SEE WHAT $1.95 WILL BUY

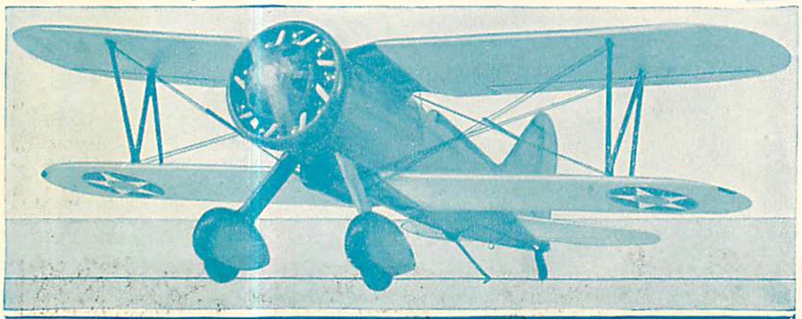
HERE'S a brand-new way of offering Cleveland-Designed flying kits with balsa wood all printed out for you, strips all cut to the proper thicknesses and accurately, only as Cleveland can. The drawings are accurate to the ¾" scale, all the details worked out and very explicit. Even the dummy motor which we now employ is easy to make with the necessary balsa parts all printed out (the ring being cut from flat stock for accuracy and detail). Plenty of cement and paper cement (or B.O.), two bottles of the newly perfected Cleveland Pigmented Model Dopes (beautiful opaque colors now), etc., etc., are supplied, to say nothing of all the little things like Japanese paper, music wire, iron hinge wire, simple to assemble Cleveland-Designed hubs, indestructible fibre propeller parts, right down to the last detail of thread for brace wires, for Cleveland Model & Supply Co. is the home of complete kits that ARE complete and of quality far beyond the average.



BOEING XP936

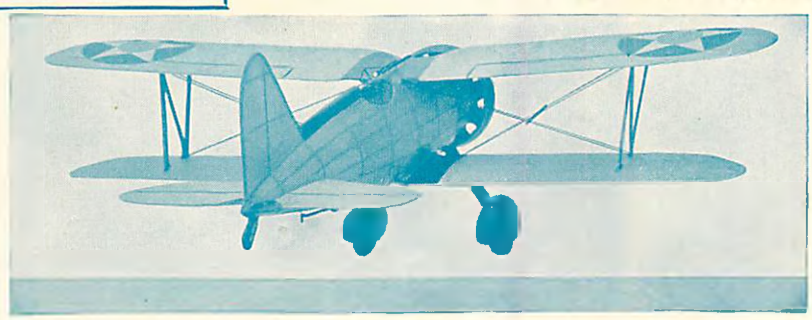
Illustration Shows It Climbing on the Turn (Note the Complete Motor and Ring)

This is Boeing's brand new fighter which is on the Army "Secret List". So new that it still has the "X" letter designating it is an experimental Pursuit job. It is a radical departure from the usual U. S. fighting aircraft, being a low wing design. It is capable of well over 238 MPH. The model is detailed as authentically as possible with its numerous little gadgets, the P-W Wasp motor and Boeing end ring which you easily make, etc., etc. One of the finest and most detailed of all Cleveland-Designed models. Due to its fairly large wing area, its flying qualities are excellent. Being a ¾" scale model, its span is 20¼", length 17⅞", weight 2.5 oz. Colored yellow wings and tail surfaces, everything else olive drab except the few details which may be colored black with ink. Price, for the entirely complete Kit SF-23, all balsa printed out, etc., postfree, $1.95. Insurance 5c extra.



AKRON FIGHTER F9C-2

Illustrations Show It Coming In For a Deck Landing With Hook of Cleveland's New Arresting Gear Dropped In Place and Also Taking Off. (Deck Level Photos.)



The U. S. Navy's newest and smallest Curtiss fighter. It is Cleveland's new beauty destined to be the successor of the Laird Super-Solution for beauty and flights and almost everyone knows of the Cee-Dee Laird SF-5 (which sells at $2.50). It is a very consistent flying model and a real beauty in appearance. Detailed only as Cleveland details its models, including authentic gull shaped upper wing at the proper dihedral angle, the two leg landing gear which is very strong when built as Cleveland designs 'em, windshield sights, etc. All balsa comes printed out on flat sheets including curved parts, dummy motor, motor end rings, wheels and all—easy to build Cee-Dee ships now! Neither this ship nor the new Boeing are at all hard to make if some model experience is had. The fact is that they are about as simple as the Howard to build, but having more parts the same as the simple Gee-Bee model, take longer. Being a ¾" scale model, its span is 19⅛", length 15⅛", weight 2.2 ozs. Colored silver wings and tail, everything else blue except details which may be colored black with ink. The kit comes complete with everything needed for only $1.95 postfree. Order Kit SF-22. Insurance 5c extra.

The Gee-Bee and Howard All White Racer Models Still Going Strong

The Gee-Bee is still an extremely popular model—record flight by a Canadian man 962 ft. For the price of $1.50 you get an accurate ¾" scale model, span 17½", length 12", weight 1.5 ozs. Colored yellow and black. Complete Kit SF17 with everything needed only $1.50 postfree.

The Howard Racer model is still being sold at the price of $1.00 complete **including all materials, dopes and drawing.** This, as all our SF models, is ¾" scale. Span 15", length 13¼", weight 1 3/10 ozs. Complete Kit SF-18, including everything needed, mailed postfree anywhere for only $1.00.

Seen It?

Have you seen the latest C.M.E. Technical Bulletin for Cleveland Model Engineers? If you're a regular Cleveland customer, you receive this without charge, but if you're not, 5c will start bringing copies to you until you do become a regular customer. It is fully and generously illustrated with Cleveland's great line of 43 wonderful models. Every one authentic—all fly marvelously. Send for it today if you have never received a copy. Especially needed by men and boys who are beginning their winter model work or those who have recently joined school clubs. Send 5c for your copy today.

CLEVELAND MODEL & SUPPLY CO.
1866-N10 West 57th Street Cleveland, Ohio, U. S. A.

If your dealer can't supply you-use this coupon

CLEVELAND MODEL & SUPPLY CO.,
"Where Complete Kits ARE Complete"
1866-N10 West 57th Street, Cleveland, Ohio, U. S. A.

Gentlemen:
Enclosed find.......... for the following items which I have checked:

Kit SF-23	$1.95............	DH4 drawing	.35............
Kit SF-22	1.95............	JN4 drawing	.35............
Kit SF-18	1.00............	Both drawings	.50............
Kit SF-17	1.50............	CME News	.05............
Kit SF-5	2.50	Insurance	.05............

Print Name ....

Address..

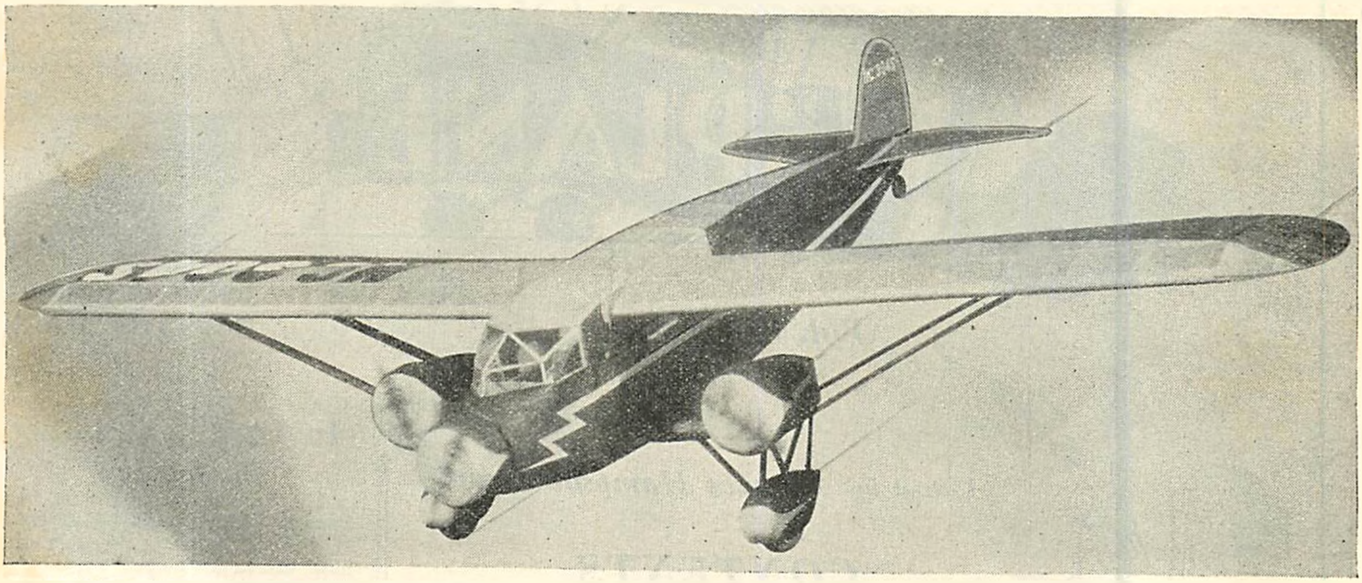
City...................... State..............................

Age............yrs. Model Experience...........yrs.

I am pinning to this coupon a list of the models I would like to see Cleveland-Designed, especially at the low prices for which Cleveland designs authentically.

NEW! First Time Offered! Another Scientific Sensation!

FLYING SCALE TRI-MOTORED STINSON AIRLINER



And Now Comes Another Scientific Triumph!

A tri-motored airliner that has been faithfully reproduced—a true-to-scale model that gives breath-taking performance on the air, and as you can readily conclude—the result of many months of planning, designing, experimenting and testing. And what a low price! Every boy can well afford to buy a Stinson Airliner now. Our buying power is so great that it enables you to get the highest quality merchandise at the lowest possible prices, with 3 hour service. And just look at these specifications:

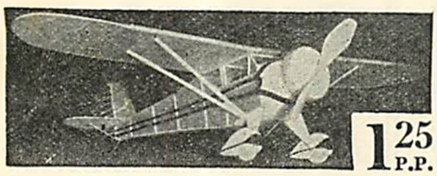
Wing Span, 26¼"; Length, 17½"; Weight, 1 oz.
Colors: Green and White.

Complete Kit
1 50
post paid

A Kit That Is An Astounding Value!

No manufacturer has ever put more into a kit,—or taken more out of the price than SCIENTIFIC this year.
Here's what your $1.50 brings you:

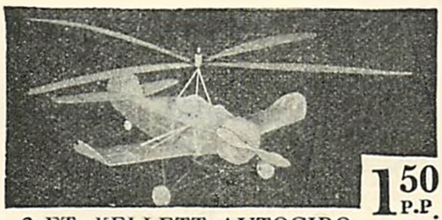
Ribs, bulkheads, fairings, and other parts clearly printed on balsa wood.—3 finished, turned balsa cowlings ready to be attached to plane.—Finished, turned, complete balsa wheels with bushings.—Ready-shaped propeller.—Semi-finished hollowed out pants.—Letters for top and bottom of wing and rudder, ready cut out and gummed.—All wire fittings ready formed.—1 oz. banana oil and colorless cement, and special colored dopes.—2 large sheets fine tissue (dark green and white)—Bamboo, rubber motor, and all other balsa strips cut to size.—Full size plans and constructing details.



1 25 P.P.

2 FT. MONOCOUPE

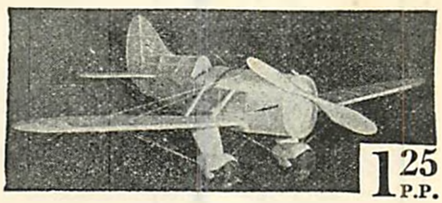
The model that boys want, a true-to-scale flying model of the famous plane. Kit contains everything for a complete Monocupe (essential parts printed on balsa), full size plans and instructions.



1 50 P.P.

2 FT. KELLETT AUTOGIRO

This Kellett Autogiro is one of America's most popular models. It works on the same principle as the original ship. Complete with everything (all ribs, wingtips, bulkheads, etc., stamped on sheet balsa). Full size plans and instructions..



1 25 P.P.

2 FT. GEE-BEE SPORTSTER

A winner for sturdiness and balance. Flies beautifully. Complete with full size plans (necessary parts clearly printed on balsa), and everything to build a perfect Gee-Bee.

• • • WORLD'S HIGHEST GRADE MATERIALS • • •

ALL KITS and SUPPLIES GUARANTEED AS REPRESENTED OR MONEY REFUNDED

36" Scientific Balsa

1/16x1/16	.01	8 for .05
1/16x1/8	.01	7 for .05
1/16x3/16	.01¼	6 for .07
1/16x1/4	.01½	6 for .07
1/16x1	.04	4 for .15
3/32x3/32	.01	6 for .05
1/8 x1/8	.01	6 for .05
1/8 x5/16	.01½	6 for .08
1/8 x1/4	.02	6 for .10
1/8 x3/8	.02½	5 for .10
3/32x1	.05	6 for .25
3/16x3/16	.02½	5 for .10
3/16x1/4	.02½	5 for .10
3/16x1	.06	3 for .15
1/4 x1/4	.03	6 for .15
1/4 x3/8	.03½	5 for .15
1/4 x1/2	.04½	4 for .15
1/4 x1	.06	3 for .15
1/2 x1/2	.08	3 for .20
1 x1	.17	2 for 30

Scientific Double Geared Winders New, large size. 50c

36" Sheet Balsa

1/32 x 2	.04
1/32 x 3	.08
1/16 x 2	.05
1/16 x 3	.09
1/8 x 2	.06
1/8 x 3	.11
1/4 x 2	.10
1/4 x 3	.17
1/64 x 2 x 18"	.02

Propeller Blocks

3/8 x 1/2 x 5	.01
1/2 x 3/4 x 5....3 for	.04
1/2 x 5/8 x 6....3 for	.05
5/8 x 3/4 x 7¼	.03
1/2 x 5/8 x 6....3 for	.05
3/4 x 1⅛ x 10....2 for	.09
7/8 x 1½ x 11	.07
1 x 1⅜ x 12	.08
1 x 1½ x 13	.09
1 x 1½ x 16	.11

Light Celluloid Wheels
Complete with bushings, red, green, yellow, white, blue, black.

¾" diam.	pair .06
1" diam.	pair .08
1⅜" diam.	pair .11
1⅞" diam.	pair .16
3" diam.	pair .35

Balsa Wood Wheels
Balloon type with bushings

1" diam.	pair .05
1¼" diam.	pair .06
1½" diam.	pair .07

Acetone
2 oz. can 10c; 4 oz. 16c pint, 70c

Clear or Colored Dope
Colors: Orange, red, green, silver, yellow, buff, black, grey, white, navy, mahogany, olive drab.
2 oz. 12c; 4 oz. 20c; pt. 85c

Banana Oil
2 oz. 10c; 4 oz. 16c; pt. 70c

Colorless Cement
2 oz. 16c; 4 oz. 25c; pt. 95c

N.A.C.A. Celluloid Cowlings

2¼" diam.	.20
2¾" diam.	.22

Aluminum Cowlings
N.A.C.A. and Open Face Type.

1½" diam.	.16
2" diam.	.18
2½" diam.	.23
3" diam.	.27
3½" diam.	.30
4" diam.	.35

Dummy Radial Engines
Black celluloid, 9 cylinders

1½" diam.	.19
2" diam.	.24
3" diam.	.29

SCIENTIFIC ENDURANCE BROWN RUBBER
Careful tests on special rubber testing machines show this endurance brown rubber to have 30% more energy per unit weight than any other rubber on the market. (All 1/32" thick.)

1/32" sq.	3 ft. for 1c,	225 ft. skein	$ .70
1/16" flat	2 ft. for 1c,	225 ft. skein	.90
3/32" flat	2 ft. for 1c,	225 ft. skein	.90
1/8" flat	2 ft. or 1c,	225 t. skein	.90
5/32" flat	2 ft. for 1c,	225 ft. skein	.90
3/16" flat	3 ft. for 2c,	225 ft. skein	1.15

HOW TO ORDER SUPPLIES
Orders under 25c not accepted.
Add 15c for packing and postage on all supply orders up to $1.50. Over $1.50 add 10% (orders west of Mississippi add 10c extra.).
On Canadian and foreign orders up to $1.50 add 25c. Over $1.50 add 15%.

Alum. Drag Ring Type

1½" diam.	.16
2" diam.	.18
2½" diam.	.23
3" diam.	.26
3½" diam.	.30
4" diam.	.35

Streamline Pants
For 1⅜" and 1⅞" wheels, pair .... .29
Small pants for ¾" and 1" wheels, pair. .15

Thrust Bearings
Large, each.. .02, doz. .19
Small, each.. .02, doz. .19

Reinforced Winders
Each .... .22

Rubber-Tired Air Wheels

1" diam.	pair .15
1¼" diam.	pair .18
1⅝" diam.	pair .23

Camel Hair Brushes
Each .... .10

Commercial Jap Tissue
Sheet 20½ x 25"...... .05

Colored Japanese Tissue
Red, blue, yellow, orange, brown, green, black.
Sheet 20½ x 24"...... .05
6 sheets .... .25

Scale Model Tissue
Sheet 21x25" ....2 for .05

Wood Veneer Paper
Sheet 20x30" .... .15
2 sheets for .... .25

Music Wire (not coiled)
Sizes .014, .020, .028, .034, 3 ft. for...... .01

Scientific Expert Rubber

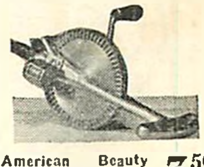
.045 sq.	3 ft. 1c,	225 ft.	.70
1/16 fl.	3 ft. 1c,	225 ft.	.70
3/32 fl.	3 ft. 1c,	225 ft.	.70
1/8 fl.	3 ft. 1c,	225 ft.	.70
3/16 fl.	3 ft. 1c,	225 ft.	1.00

Sheet Aluminum, 12" wide
.001, ft.. .15 .005, ft.. .12
.002, ft.. .15 .010, ft.. .12
.003, ft. ...15

Aluminum Tubing

1/16" O.D., per ft.	.08
3/32" O.D., per ft.	.08
1/8" O.D., per ft.	.07
3/16" O.D., per ft.	.11
1/4" O.D., per ft.	.13

Brass Washers
1/8" O.D., doz...... .01¼
gross .... .15
1/4" O.D., doz...... .01½
gross .... .15



American Beauty Winders with automatic counters attached complete.... 3 50
Winder without counter 55c

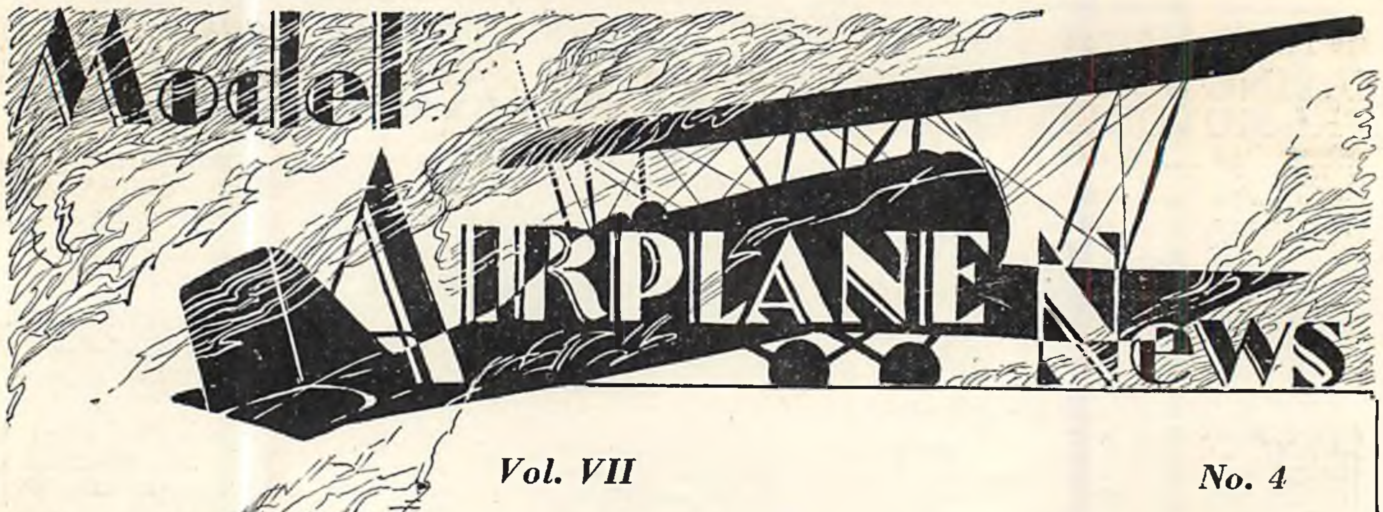
15" FLYING SCALE MODELS
SE 5 British Pursuit—Fokker Triplane—Spad—Lockheed Vega. Most complete kits, including full size plans and detailed instructions. Easy to build. Guaranteed to fly. 99c Each Kit Postpaid

FREE! Complete Price List. Send 3c. to cover postage.
SCIENTIFIC KITS AND SUPPLIES ON SALE AT LEADING DEPT. AND TOY STORES

SCIENTIFIC MODEL AIRPLANE CO.,

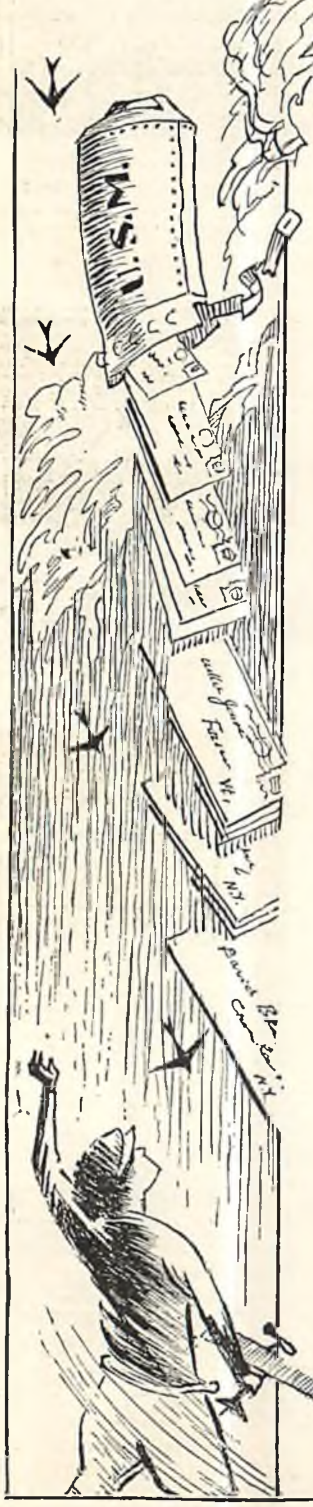
277 HALSEY STREET (Dept. N-10) NEWARK, N. J.
World's Largest Manufacturers of Model Airplane Kits and Supplies Exclusively

UNIVERSAL Model AIRPLANE News



Vol. VII *No. 4*

Edited by ***Charles Hampson Grant***



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OCTOBER — 1932

In Our Next Issue

The Autogiro

The second instalment of A Pioneer Makes Good by Orville H. Kneen, completes the story of how Cierva developed the autogiro into a successful flying machine.

Noted War Plane

Build the Friedrichshafen G II, War Time Bomber. Robert V. Smith gives you complete instructions and plans to create for yourself in model form, the greatest bombing plane of the World War.

Novel Glider Launching Device

How to Launch Your Glider From a Kite, by Lieut. H. A. Reynolds, provides you with much data that will enable you to enjoy a novel and interesting pastime.

The Three-View Drawings by Stockton Ferris, Jr.; a War Ace Story, by Lt. (j.g.) Miller; the Aerodynamic Design of the Model Plane, by Charles Hampson Grant, and other interesting features help to make the November issue of UNIVERSAL MODEL AIRPLANE NEWS a necessity for air-minded young men from ten to seventy years of age.

Order your copy of UNIVERSAL MODEL AIRPLANE NEWS from your newsdealer, or send $1.65 for your year's subscription to 125 West 45th Street, New York City.

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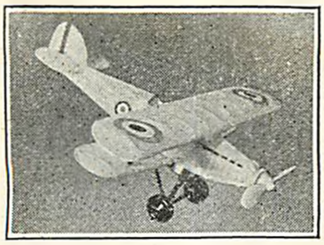
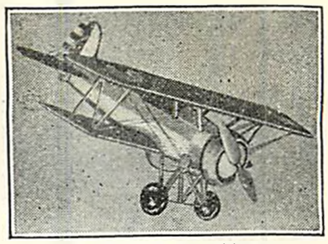
NATIONAL Construction Kits

are known from coast to coast for QUALITY—ACCURATE DETAIL and FLYING PEFORMANCE



BRITISH HAWKER FURY

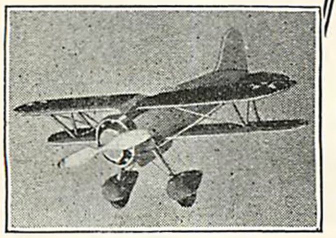
A modern English fighter of the British Royal Air Force. This ship is credited with a speed exceeding 200 m.p.h. National's 12" midget model is an excellent replica, and a very good flyer. Colors: White, black trim with British insignia. Kit complete.. 1.00
Blueprint only 25c



NEW 1932 BOEING
P-12E AND F-4B-3

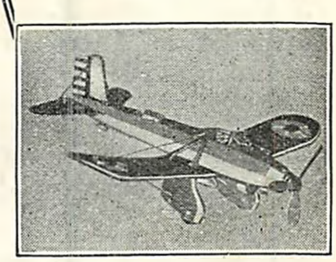
The army scrapper rated the fastest pursuit plane in the world, and its Navy twin, the fastest war bird. 18" combination kit with complete blueprints to build both models. Kit complete 2.50
Blueprints only 45c

All National kits are accurately designed for you to build perfect miniatures of the big ships. All balsa wood is cut to dimension, some shaped, stations, ribs, and prop blades printed, making it easy to cut out. All coverings and insignia are of correct colors—formed wire parts, wheels, cowling, pants, everything to build a perfect model—a genuine blueprint full size, completely detailed with instructions to guide you is packed with each kit. All National models are offered you at new low prices—consistent with quality. Each kit is guaranteed as represented or money refunded.



CURTISS F-9C-2
THE AKRON FIGHTER

Five of these small fighters are carried aboard and flown from the Akron. National was the first to offer this most interesting ship in perfect miniature. 12" Midget kit complete with detailed blueprint and instructions. Kit complete 1.00
Blueprint only 25c

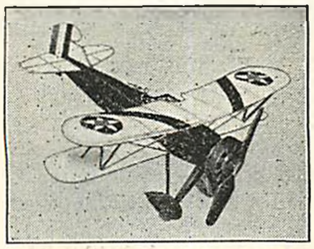


CURTISS A-8 ATTACK
THE TERROR OF THE SKIES

The 18" construction kit complete with full size, detailed blueprint, makes a splendid replica and excellent flying model. Kit complete........ 1.50
Blueprint only 35c

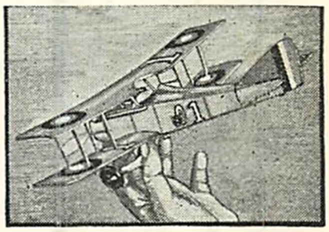
NATIONAL'S 1932 MODEL BUILDING FLEET CONTEST
$160.00 in CASH
AND OTHER VALUABLE PRIZES

Have you received your broadsides with full information and entry blank? Contest opened Sept. 1st. Closing date Dec. 1st—12 o'clock midnight. Awards to be made and announced on Dec. 15th, 1932.



CURTISS HELL-DIVER

One of the most famous ships to be sponsored by the Navy. 12" Midget kit complete with detailed blueprint and instructions. Kit complete 1.00
Blueprint only 25c



SPAD

No war-time model gained greater fame than this French built plane flown by Capt. Rickenbacker. National models of this famous plane are complete to the smallest detail and proven flyers.

12" Midget Kit (pictured) $1.00
24" Senior Kit 2.00

OTHER NATIONAL KITS

MIDGET 12" MODELS
$1.00 each plus 10c postage

Curtiss Hawk	Texaco 13
Heath Parasol	Bellanca
Fokker D-7	Sikorsky S-32
British S.E. 5	Lockheed Sirius
Curtiss Falcon	Pfalz Scout
Nieuport	Sopwith Camel
Spad	Gee-Bee Sportster
Albatross	Laird 400
Fokker Triplane	Polish P-6
Boeing P-12E	Lockheed Vega

Any midget blueprint .... .25
Any midget model ready to fly..... 4.40

JUNIOR 18" MODELS
$1.50 each plus 15c postage

Curtiss Condor Bomber Curtiss A-8
New Boeing F-4B-3. New Boeing P-12E
British Supermarine
Any Junior Blueprint .... .35
Any Junior ready to fly..............7.70

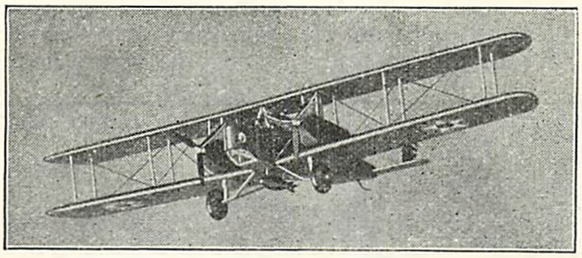
SENIOR 24" MODELS
$2.00 each plus 20c postage

Curtiss Hawk	Vought Corsair
Spad	Texaco 13
British S.E.5	Stinson Detroiter
Nieuport Scout	Lockheed Sirius
Fokker D-7	Heath Parasol
Fokker Triplane	Gee-Bee Sportster
Albatross	Laird 400
Boeing P-12	

Any Senior blueprint .... .50
Any 24" model ready to fly....... 12.00

FOKKER D-VIII

A German war-time model, developed and flown during the closing days of the war. National Midget is a perfect miniature of this famous war plane. Easy to build and an excellent flying model. 12" construction kit complete with detailed blueprint and instructions. Kit complete 1.00
Blueprint only 25c



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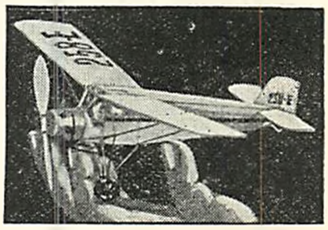

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A Pioneer Makes Good

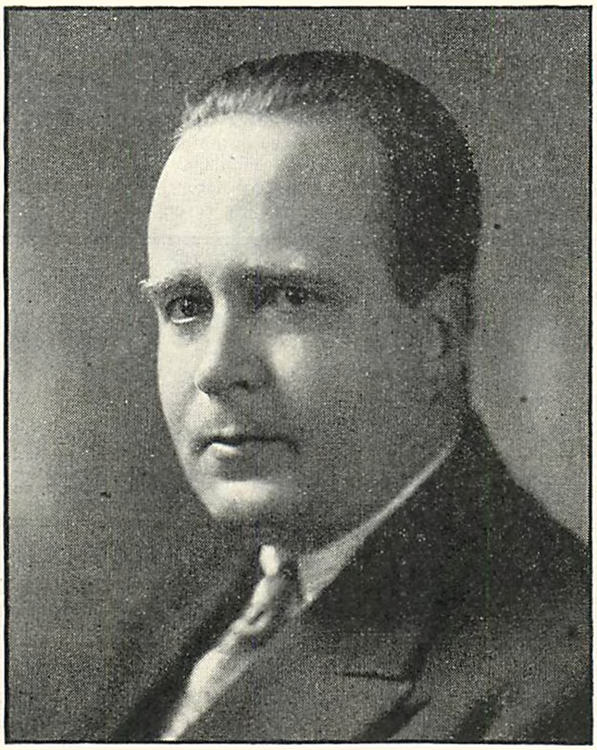
The Little Known Facts of Cierva's Struggle to Produce a Safe Flying Machine and How These Resulted in the Birth of the Autogiro

By Orville H. Kneen

IMAGINE ourselves in neutral Spain during the last hectic summer of the great war—A queer place to pick up new ideas on airplanes, if that's what we're here for. Why? Because the army has almost no planes. Finally, being unable to buy any from the fighting nations, its chiefs have decided on a grand competition.

Big prizes are offered for the best design of fighting, scouting and heavy bombing planes. Keen young aeronautical designers make their entries for the fighters and scouts, but the 50,000 *pesetas* offered for a heavy bomber has no takers. No one in Spain has even *seen* one, much less tried to design and build such a huge war-bird. It must carry deadly "eggs" weighing hundreds of pounds, and a crew as well.

Just in time a young student of the Civil Engineering School slides in his entry for the bomber. What would a civil engineer know about airplanes? More than you might think. During his six-year grind he had studied everything he could lay his eyes on that dealt with aircraft. And he knew how to design light structures to carry heavy loads and sudden stresses.



(*Photograph by Bachrach*)
Cierva, inventor of the Autogiro

More important still, this 22-year-old burner of midnight oil knew how to "sell" an idea. He induced some friends to "pungle up" (French for "shell out") enough good Spanish *pesetas* to supplement his own and build the big ship he rapidly drew up on paper. He must have been a good salesman, for he had no ready-made, build-your-own plans, not even a picture of a bomber. No such ship as he designed had been built. He had to figure out every part—then convince his friends it would do the business, and hardest of all,—wait for the test.

Months of secrecy and whispering. The big day arrives. The bomber is ready to fly—maybe. The crowd gasps — what's a crowd without a gasp or two?—as the hangar doors swing wide open and a huge biplane is trundled out, an excited young engineer giving a trundle or two himself.

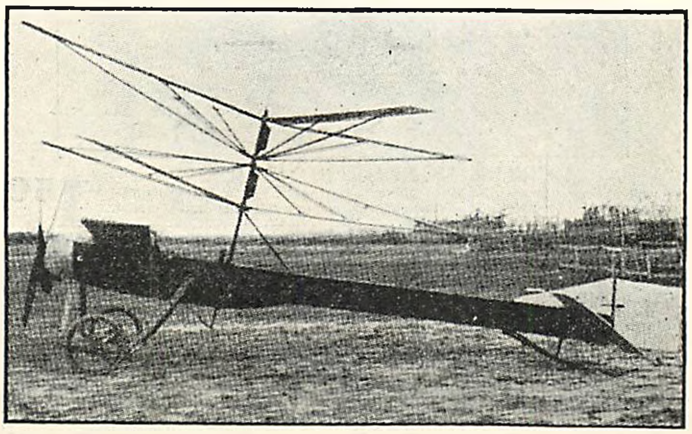
The three big motors warm up in their usual turnover. Set as tractors, they aim to get up in the world with a pull instead of a push (a novel idea then, and one that works better with planes than with jobs). The crowd gets an eyeful as well as a couple of earfuls.

The motors spin, the great wings vibrate gently to the tips of their eighty-foot span. The designer likewise vibrates from stem to stern. His "rep" is at stake. The bomber is built to carry fourteen passengers, but there is no grand rush for places. "After you, my dear Alphonse," and they all decide politely to let the pilot launch 'er. The inventor is requested to keep *both* feet on the ground, but finds it difficult.

TO MAKE the rest of this long story into a short-"short" with a sad ending, the pilot took 'er up and she responded nobly. She flew like a bird and a half. Soon the pilot was sure he had her eating out of his hand, though he'd never steered such a big one before. Finding her docile, he started getting familiar. With the usual result.

Flying low one day, he started to make a sharp turn in high, as many another low, reckless driver has tried. The ground came up and smacked him down. They fished the pilot out—the only thing left in one piece—but Cierva was pretty badly shaken.

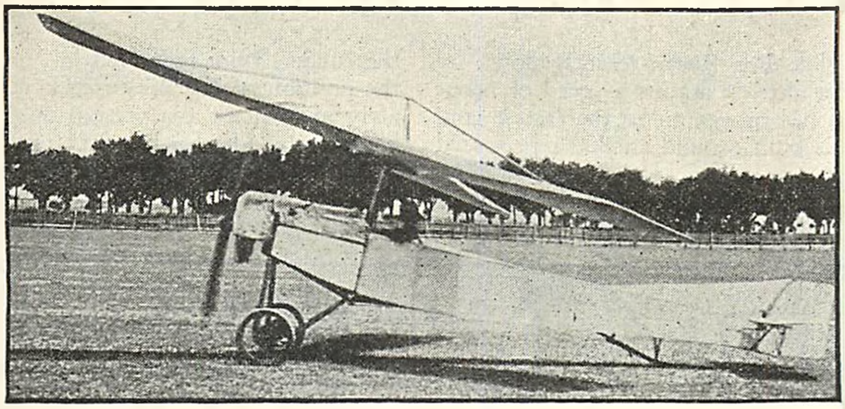
No, he wasn't in the plane; they wouldn't let him go up, yet. But who wouldn't feel shaken, with his career smashed into kindling?



Cierva's first experimental machine, in which rigid rotor vanes were mounted on an old Deperdussin fuselage. This proved to be failure number one. It "cracked up"

He did get the equivalent of $10,000 as the prize winner. But unluckily he and his friends had already dug up $32,000 to win *it!* It took no slide-rule to figure out how long the family pile would last at that rate. Evidently those stories about "riches taking wings" were no fairy tales. Designing airplanes which could smash up even before you could collect the first instalment looked like no royal road to riches. More like the rocky road to Dublin!

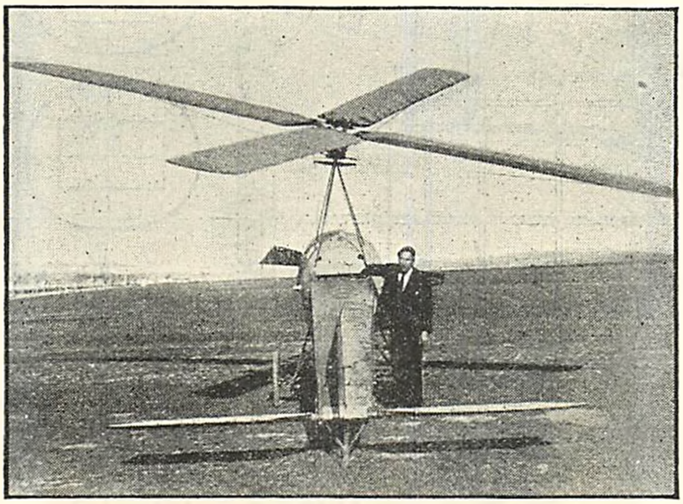
The young engineer took the pieces of that desiccated bomber and made them into an Autogiro, did he not? Yes, he did not. But the wreck yielded him dozens of plain and fancy assorted ideas. It started him on a year of mulling, with a large turnover of mulls per day, and destined to have mighty important results.



Here is the second machine which also was equipped with rigid vanes and proved unsuccessful

The point was that he had designed and built a good ship—efficient, balanced, powerful. A good pilot had flown it all over the sky. All was well as long as he flew high, wide and fast.

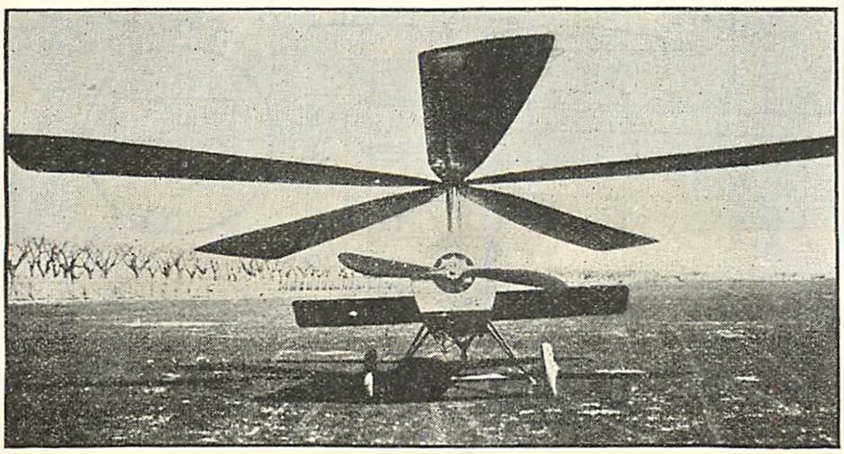
It looked all wrong to Cierva. Speed's all right when you're putting salt on birds' tails. But you've gotta come down sometime, if only for gas and chow. Now if you had a ship that could fly *low and slowly,* keep an even keel and live controls, let you pick a vacant lot with a gas pump alongside a hot-dog stand, and finally let you land and take off without injuring scenery or ship — *then* you'd have an aircraft that would be a regular flying motorcar!



Cierva's fourth unsuccessful attempt. Here he incorporated means to change the angle of attack of the rotor blades, as desired, while in flight

His friends — he had many—patted him on his broad back and laughed at his pipe dreams. But Cierva had several jumps on aviating dreamers in general. He'd lived with planes since he was twelve. He was paper-gliding when the Wrights were putting cricks in people's necks and in world records, by flying ninety miles in two and a third hours. He knew why little helicopters, with rubber-band motor, could bore their way straight up but big machines couldn't carry enough power to do the same.

He knew, too, why all planes stay up — speed of air under and above the wings. No forward speed and you don't fly. Forty miles an hour—fast ships up to ninety — just to keep aloft! And that's pretty fast when you're trying for a landing, maybe in fog, haze or darkness!



The third experiment. In this machine Cierva tested the effect of five rotor blades without success

Cierva had been gliding through all the books on flying. He'd hopped, in fancy, with keep-at-it Lilienthal, test-'em-out Maxim, figger-'em-out Chanute, the American professor who knew how to build light, strong, box-like gliders. He knew why the Wrights had been first to keep on flying, once in the air. And he knew that fixed-wing flying was (and is) a neat trick of balancing your wings as you slide swiftly along the air waves. When those waves cease going past your wings, you're sunk. He knew all that.

And he had had lots of bumps. To test their book-learning, he and two other young aviators had built gliders. Cierva had flown them. Then they had bought a fine airplane, that is, all that remained of one after the pilot had tried to land without killing the crowd that dashed onto the field. The kindly aeronaut had shown the boys how to build it anew, even to a prop whittled out of an old wine-soaked counter. Canvas, doped with glue, dyed red, made rattling good wings.

In fact, whenever she flew, the whole thing rattled and flapped like an ancient windmill. But fly she did, the aeronaut at the controls, and young Cierva perched in front, so thrilled he couldn't speak. Thus he got some early rides, until the rains came and the glue washed out!

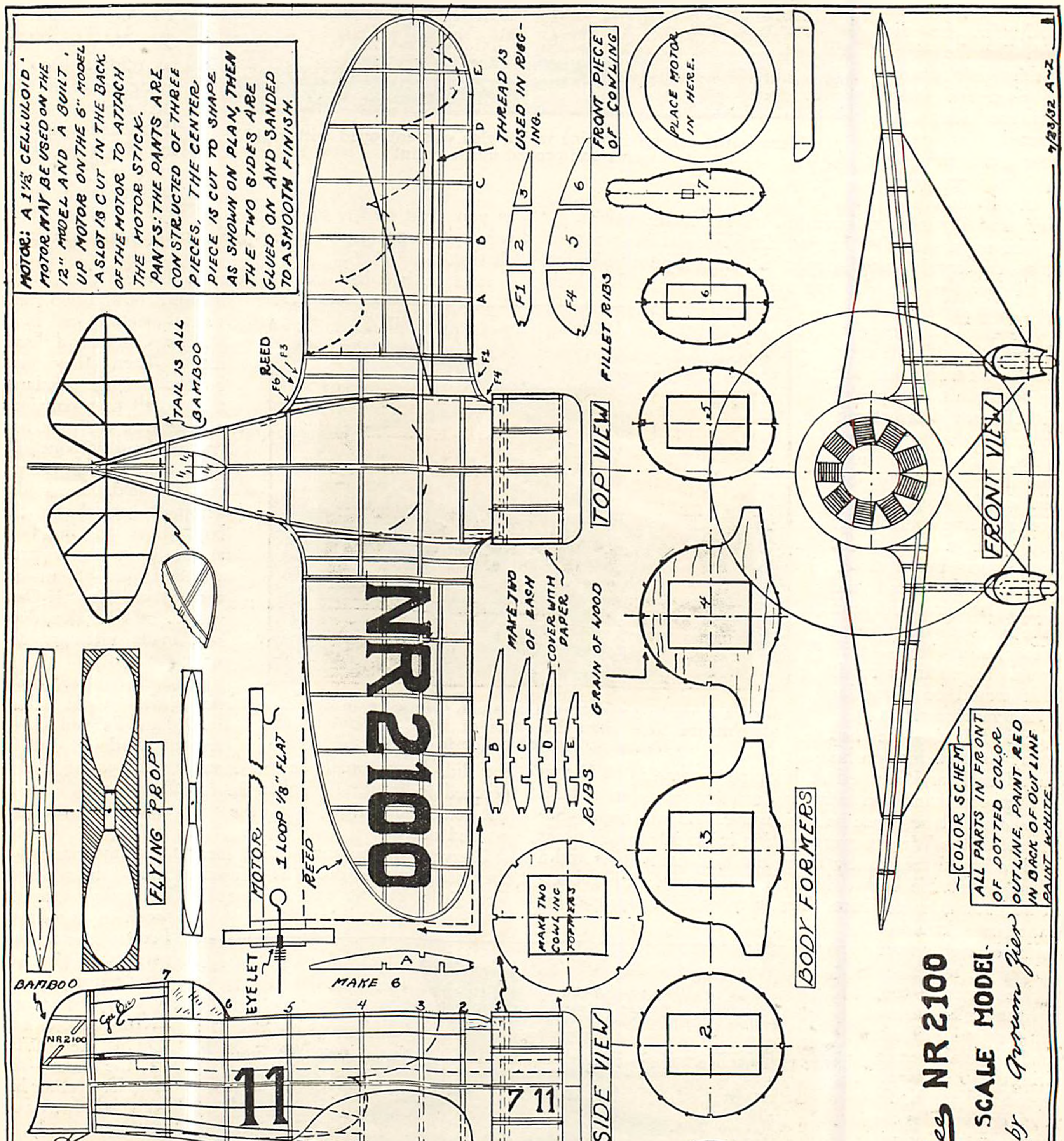
Cierva and company had less luck with a fast monoplane they designed and built. It refused to rise to the occasion Too little lift at take-off speed. The landing gear got weak in the knees. *Pesetas* ceased when parents padlocked their purses. Cierva went to the engineering school, kept up his aeronautics on the side — and after his brother had been laid away to rest, got ready to try out any new idea that popped into his large and well-oiled brain.

Luckily, there were no flying sharks around, to (*Continued on page* 46)

THE GEE BEE NR-2100 RACER

Here is the little Gee Bee Racer recently flown by Boardman at Bowles Airport. It attains a speed of about 293 miles per hour and has proven to be the fastest land plane in the world. It is built around an 800 h.p. special P. & W. Wasp engine.

Special attention is called to the change in the shape of the rudder, from that used in previous models. Also note the position of the pilot's cockpit, well back and immediately in front of the vertical fin. Since this drawing was made, the rudder has been enlarged by increasing the height of it about twelve inches. This change decreases the tendency to spin and increases the directional stability.



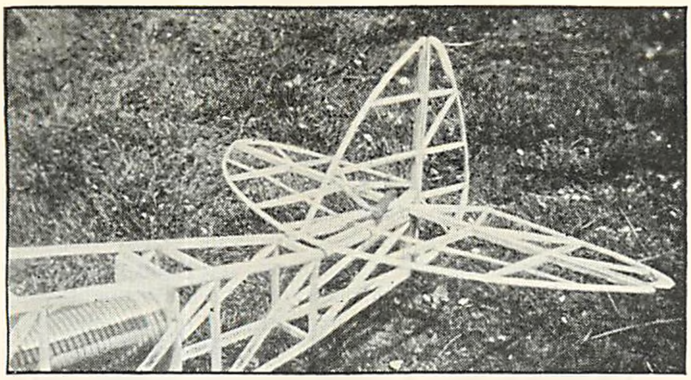


Fig. 4.—Tail surfaces of a sixty-inch compressed air model, with movable rudder and elevators

"WHATS" AND "WHAT NOTS" OF MODEL PLANE BUILDING

Practical Systems of Construction For Tail Surfaces and Wings

By Howard G. McEntee

THE tail surfaces of model airplanes may be made of many different materials. A few of these are balsa, bamboo and wire. Balsa is light and easy to use, but if the outline of the tail is not rectangular, many separate pieces are needed to get the proper shape. Also, the finished tail cannot be changed to alter the performance, as, for example, bending the rudder to cause a circle, for the wood is too brittle. Therefore, if this adjustable feature is desired, the rudder and elevators must be separate and hinged to the fin and stabilizers. This sort of construction adds realism, but it also adds considerable weight.

On very small models, thin sheet balsa may be used for the tail surfaces. For a one-foot model 1/32" thick sheet is about right. Of course, care must be used to select very light wood for such a purpose. Beginners can make correctly shaped tail surfaces this way, whereas other types would be very difficult. The grain of such tail surfaces must run outward from the fuselage, that is, at right angles to the center line. Very thin bamboo pieces glued on across the grain will give the necessary stiffness, if the wood seems too weak.

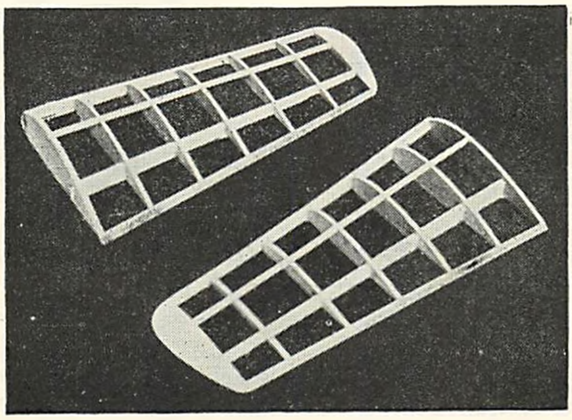


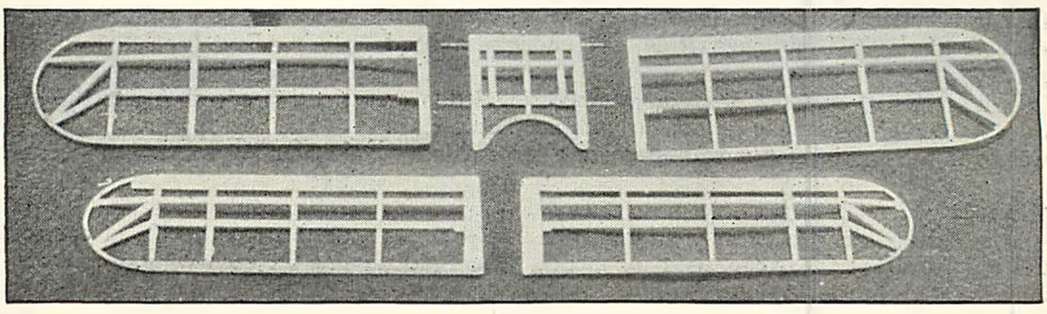
Fig. 10. This picture shows wings for a Boeing Bomber Model, with tips made from balsa blocks

The wire type of tail surface is not used much in this country although the English model builders use such construction almost exclusively. The outline of the tail plane is bent from one continuous piece, after which the necessary ribs are installed usually by soldering. Music wire is used throughout and such construction is practically unbreakable, which seems to be its great advantage, as the weight is much greater than we can use on our featherweight balsa ships. The writer, therefore, advises all but the experienced builder to leave wire construction alone.

Bamboo construction is about the best we have as it is a compromise of the strength of wire and the light weight of balsa. The bamboo tail, unlike built-up wood, can be bent somewhat to adjust for performance, so that it is unnecessary to add weight and complicate the model with separate control surfaces. The edge or outline is made in two pieces. Since both sides should be alike, one half of the outline is bent and then the piece is split so that after slight trimming you will have two halves exactly the same. If the design of the model is such that the horizontal tail is all in one piece, place the two halves on a flat board and glue them together at the center. At the same time install any spars and ribs needed, the latter also being made of split bamboo. In some cases the model is so designed that the rubber or the motor stick is in the way of the tail outline. In such cases the outline must terminate at the sides of the fuselage and cannot go through. The main spar of the tail is first glued in place and cut to length. Then the two outline pieces are glued on and last of all the necessary ribs are installed. This procedure is always followed on a hollowed-out balsa fuselage because we do not wish to cut long slots in the latter for the tail to slide in.

The all-bamboo type rudder is built onto the model, as described for the tail where the spar is glued in place first. When the fuselage is made, the rudder post is usually put on last. When ready to finish the rudder, cut the post to the proper height and glue the outline in place. When dry the necessary ribs may be put in place.

WE NOW come to some general considerations of tail planes. First, for models up to about two foot spread the tail is usually made thin and flat. In the case of bamboo, the thickness will be about 1/32", while the



Here the construction of a complete set of wings for a Nieuport No. 28 is clearly shown built-up balsa style will be between 1/16" and 1/8" thick for the size model mentioned. If you wish, you may give your tail surfaces a streamline section, similar in shape to the top of a wing rib, but, of course, the same curve on top and bottom. For a two-foot model the maximum thickness should be no more than about 3/16". When you build such tail surfaces, you will have to use more ribs than for the flat type of tail, in order to keep the covering held out in the proper shape. Such tail surfaces should, of course, be covered on both sides. The flat bamboo type, however, is often covered on one side only, the top for the elevators and one side of the rudder, especially if you wish to save weight.

Right here we shall consider weight on the tail of a model. Fig. 1 will serve to illustrate. Suppose, due to heavy construction, we build the tail surfaces ½ oz. heavier than necessary. The tail is distance B from the center of gravity and B is just three times as far as distance A. Therefore, we must add 1½ oz. at the nose to balance the model. Thus our ship is 2 oz. overweight due to a ½ oz. too heavy tail. Therefore, consider twice before adding such "luxuries" as movable controls, tail wheels, etc., to flying models.

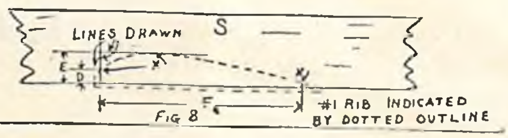


Fig 8

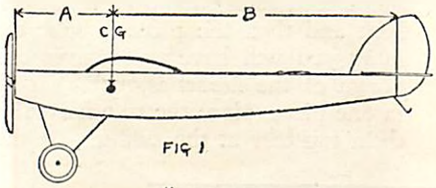


Fig 1

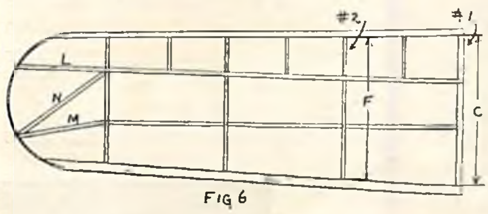


Fig 6

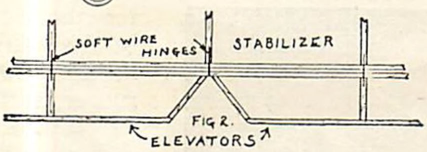


Fig 2.

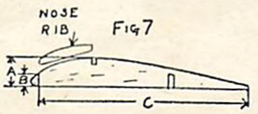


Fig 7

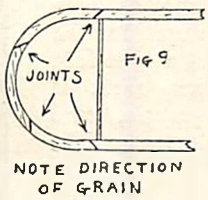


Fig 9

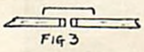


Fig 3

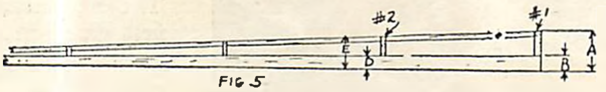


Fig 5

For hinges on models the simplest scheme is to use soft iron wire as shown in Fig. 2. For a two-foot model, three pieces of No. 20 B. and S. gauge wire will be sufficient. Place one in the middle and one at each tip. Fig. 3 shows a cross section or end view, the wire being bent as shown and the two ends forced into the wood and well glued. All hinges should be put on the top, and of course a space of 1/16" or so left between so the elevators may be bent downward.

The rudder may be hinged the same way, although it will look better if the center rudder hinge is pushed through the middle of the wood and glued instead of being glued on one side. The top and bottom hinges are also glued at the very top and bottom in the center. Thus the rudder may swing evenly to either side. With this wire system for hinging, no means for holding the movable surface in a certain position is needed as the wire is stiff enough to do this, although it is soft enough to bend readily.

Tail surfaces do not need any supporting struts or thread although these may be put on with very little extra weight if the constructor is scaling down a large ship.

On large models such as compressed air fliers, it is quite an advantage to have movable controls. Fig. 4 shows the tail surfaces of a compressed ail model. The rudder and elevators are movable. The hinges are made of ¼" lengths of 1/16" O. D. aluminum tubing glued at intervals to both stabilizer spar and elevator spar. A piece of music wire runs through all the tube pieces, from one tip to the other, thus forming the "pin" upon which all the hinges turn. This scheme is similar to that used on large ships, an example of which is the Curtiss Robin.

We shall now take up the subject of wings. Before going into this, however, the reader must be reminded that there are dozens of different types of wing and many more types of construction. Obviously, it is beyond the scope of this series to describe all these in detail. Therefore, only the most important will be taken up. To begin with, wings may be divided into two main classes: the straight wing and the tapered wing. The arrangement of the wings, biplane, high wing, low wing, etc., we shall take up later.

The straight wing is one in which *the majority of the* ribs are equal in curve and length. There may be one or two at the tips which are not so deep or a bit shorter; all but these are alike. They may, therefore, all be cut from the same form, the tip ribs being sanded down later if they are different.

The writer is strongly in favor of using the leading edge of the wing as one of the main wing spars. The reason for this is that the spar can take a much heavier blow from hitting some obstacle in flight than can the thin leading edge sometimes used. Also the construction is simplified as only one other main spar is needed besides a trailing edge and a top spar. The latter is extremely important to good looks in a model as it prevents the wing from warping lengthwise. This is because a sort of box spar is formed which greatly increases the strength of the wing. It is not necessary to make the top spar very heavy, 1/8 x 1/16" being ample for a two-foot span, with the spar being set vertically. The rear spar is placed on the bottom of the wing about two-thirds to three-quarters back from the leading edge. The size may vary but for a two-foot model the maximum should be about 1/4 x 1/8". The front spar and leading edge may be the same and put on with the widest edge vertical as was the rear spar. However the front spar should be cut and rounded so that it forms the front part of the wing curve, which curve is continued by the ribs. The piece may be roughly cut before assembly, then it can easily be shaped completely after the wing has been assembled. The trailing edge of a wing the size we have been discussing may be of 1/8 x 1/16" balsa and for a finished job it may be *sanded to a wedge shape*, the thin edge being to the rear.

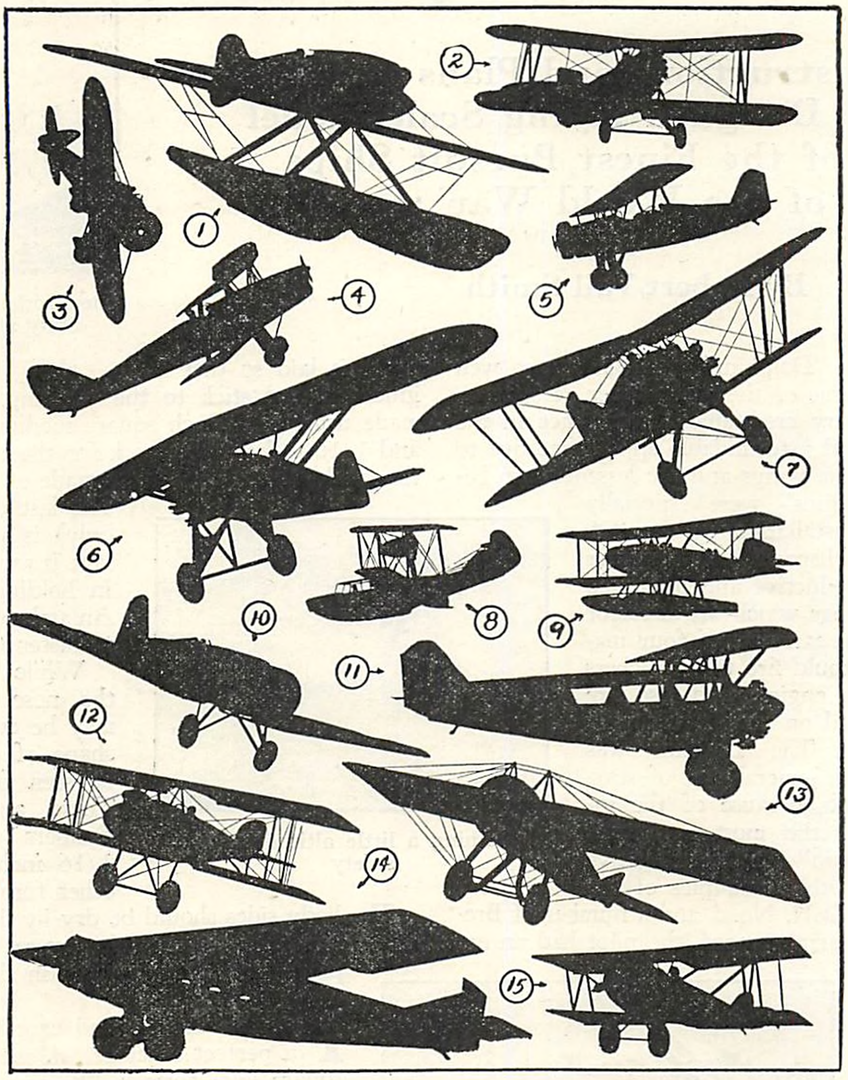
The top spar mentioned before must be placed at the highest point in the wing curve in order to be most effective.

Tapered wings are a little harder to make as the ribs all differ, although, of course, two of each shape are made, one for each wing.

Figs. 5, 6 and 7 show a simple way to figure your own set of tapered ribs. No. 1 rib is any which you have chosen and we assume it to be the largest one, that is, the rib next to the fuselage. As we know, the front and rear spars must be tapered, usually being (*Continued on page* 38)

How Well Do You Know Your Airplanes?

What Are the Names of the Airplanes Silhouetted on this Page?



The following awards will be paid by UNIVERSAL MODEL AIRPLANE NEWS to the persons whose letters, in the opinions of the judges, show the greatest evidence of accuracy, neatness and attention to detail. The winners will be judged by Mr. Charles H. Grant, Editor of UNIVERSAL MODEL AIRPLANE NEWS, and Mr. Stockton Ferris, Jr.

Award for First Place, $5.00; award for Second Place, $3.00; award for Third Place, $2.00.

In the event of two or more persons being tied for the first, second or third awards, both persons will be paid the award.

All entries to be eligible for these awards, must be received not later than October 20th, 1932. Address all answers to Silhouette Award, care UNIVERSAL MODEL AIRPLANE NEWS, 125 West 45th Street, New York City.

Get busy, sharpen your wits, and see how good you are. This contest will increase your aviation knowledge which will be a constant source of pleasure to you.

Here Are the Answers to the August Contest

WELL, well, well, believe it or not, here we have the answers and the winners of the August "How Well Do You Know Your Airplanes" contest.

As usual, boys from all over the country have sent in their answers to this great contest, which has proven to be very popular indeed. Unquestionably before this series of silhouettes of airplanes has been completed, our young readers will have had a complete education in the various types of aircraft in use at the present time. In fact, this is one of the purposes of the contest.

Now for the sad news.

The names of the planes that appear in the August issue are as follows:

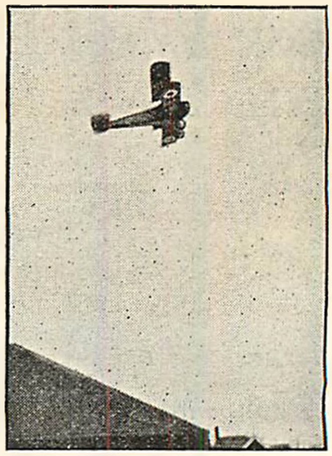
1. Boeing Monomail—Hornet engine (Pratt & Whitney).
2. DeHaviland 5 (war-time)—LeRhone 110 h. p. engine.
3. Curtiss 01G (Falcon)—Prestone Conqueror engine.
4. Handley-Page Hannibal—Four Bristol "Jupiter" 450-500 h. p. engines.
5. Curtiss 02C-1 (Hell-Diver)—Wasp engine (P. & W.) 500 h. p. engines.
6. Dewoitine D.33—Hispano-Suiza 650 h. p. engine.
7. Great Lakes Sport Trainer—Cirrus 90 h. p. engine.
8. Fokker XO-27 Observation—Two Prestone Conquerors.
9. Consolidated Fleet Trainer—Kinner 125 h.p. engine.
10. Curtiss AT-5—Wright J-5 220 h. p. engine.
11. Fokker D. VII—Mercedes 180-220 h. p. engine.
12. Bristol Bulldog—Jupiter engine.
13. General Mailplane—Wasp engine.
14. DeHaviland Moth—Gypsy 90 h. p. engine.
15. Barling Bomber—Six Libertys, 400-450 h. p. each.

A good many answers to the August contest were correct. However, some merely listed the planes and gave no details. The prizes were awarded to the three boys whose answers were correct and who gave the greatest amount of correct information about these ships, in neat form.

The winner of the first award of $5.00 is Mr. William A. Wooding of 53 Marion Street, Brookline, Mass. His answers were not only all correct but showed great knowledge concerning details of the ships themselves.

The winner of the second award of $3.00 is Mr. Wesley J. Cook of 711 East New Hampshire Avenue, Hawthorne, Calif. Mr. Cook made a very complete chart which showed the names, the perform- (*Continued on page* 38)

Build a War-Time Sopwith Dolphin

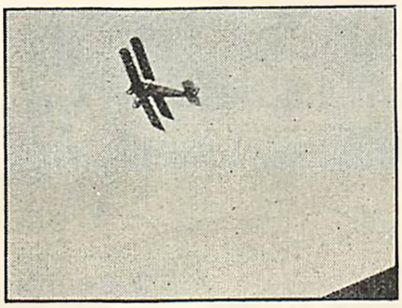


The Model Dolphin immediately after taking off

Complete Instructions and Plans to Build a Carefully Designed Flying Scale Model of One of the Finest Pursuit Ships of the World War

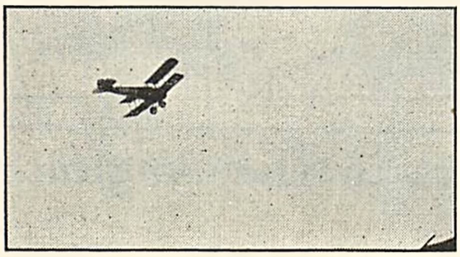
By Robert Vail Smith

THE Sopwith "Dolphin," although not so well known as some of the many other aeroplanes, put up a very creditable performance in the World War. It presented a formidable appearance due to the negative stagger of the wings and the lessened gap between them. The "Dolphins" were especially well adapted for the installation of the 200 and 300 horsepower Hispano-Suiza engines which had reached a productive and improved stage. Among many things which drove terror into the enemy, was the carrying of four machine guns. The pilot could fire twin Vickers guns, mounted over the engine, and also fire twin Lewis guns mounted on the leading tube spar of the upper wings. The "Dolphin" was somewhat larger than the general run of war-time single-seater pursuits because of the increased power. One of the most noticeable things about the "Dolphin" was the negative stagger of the wings. Other examples of the negative stagger are the DeH. No. 5 and a number of Breguet models. With this arrangement, the pilot had an excellent range of vision.



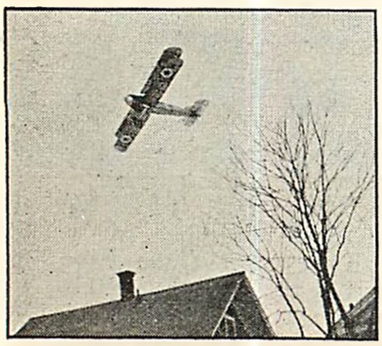
Gaining a little altitude for safety

The "Dolphin" model showed remarkable characteristics in its flying, attaining good altitude and also covering long distances. The model described herein, weighing less than one ounce, takes off and lands remarkably well considering that it is a flying scale model.



The Model going places in a hurry

A standard of ¾ inch to the foot is a convenient scale to make models by, being a scale set forth by "The Cleveland Model Co." This "Dolphin," although modeled to a slightly smaller scale is built to scale.



Coming in after about fifty seconds

Fuselage

A tracing of the side view of the fuselage from plates 3 and 4 will be found helpful. This tracing is laid on a board, preferably white pine, over which some wax paper is laid so that the glue will not stick to the drawing. The sides are now made using 3/32 inch square medium balsa for longerons and 1/16 inch square stock for the uprights. The sides of the fuselage at the front are made of 1/16 inch sheet balsa. The last diagonal (on one side only) is left out until the fuselage is assembled. Pins are used in holding the wood in place. An ambroid type cement is used to fasten the pieces together.

While the sides are drying, the nose blocks and formers may be cut out. The size and shape of the nose blocks may be seen from plates 3 and 8. These are from soft balsa. Formers "C" and "D" are from 1/16 inch balsa. All of the other formers are 1/32" balsa.

The body sides should be dry by this time, and they are lifted from the jig. The sides are set upright and the cross pieces and formers glued in their positions.

PROCEED slowly and carefully, thereby insuring a perfect fuselage. A piece of wood 1/6 inch square joins formers "E" and "I," and also a piece 3/32 inch square from "C" to "D." After the fuselage skeleton is completed, the nose-block "B" is put on next to "C" and the motor and cockpit cowlings are put in place. A small sheet of balsa is placed between the landing gear struts and also nose block "K" is put on for final assembly of the body. The framework photographs will be found helpful in constructing the model.

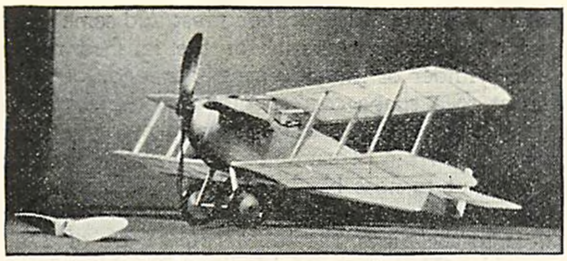
Because no motor stick is used, a rear hook of No. 14 (.033) music wire is made and placed in "J" as shown in Plate 9. A small dress snap on "A" and "B" will help the nose plug ("A") to hold the nose blocks together.

Landing Gear

The landing gear is very simple to construct. A right and left set of "V" struts are necessary and are made of ⅛ inch hard balsa, see Plate 9 for details.

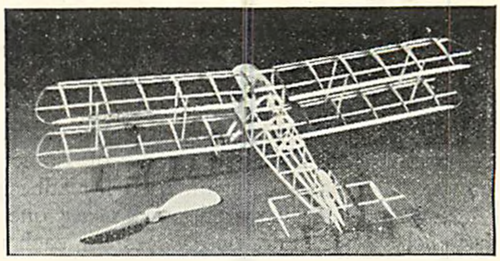
The spreader bar (axle) is a streamline piece of ⅛ x ⅜ inch soft balsa. After these parts are done, the gear may be assembled and attached to the body.

The wheels are of rather heavy stock so as to lower the centre of gravity. The wheels are 1¾ inch diameter. No shock absorbers are used, only the wire axles. The hubs are small pieces of balsa cemented over the end of the axles. This completes the landing gear except for the optional thread bracings.



The finished framework ready for the covering
Picture No. 1

The completed model with surfaces covered but not doped
Picture No. 3



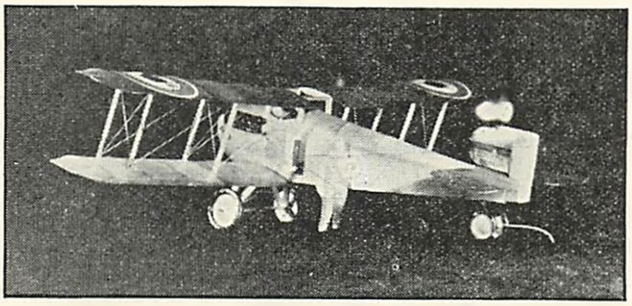
Tail and Rudder

The ribs may first be cut out of 1/64 sheet balsa for both the tail and rudder. The tail ribs may now be slipped on the 1/16 inch square main spar. After these are in their respective positions and cemented there, the 1/16 inch square leading edge which is rounded is put in place. The tips of the tail spar are tapered as in Plate 7. The outline of the tail is made of a splint of 1/32 inch square bamboo bent to the correct shape by heating over a candle flame or a soldering iron.

The Model partially covered. Pict. No. 2

The rudder is built in much the same way as the tail. The rudder employs two spars, one of 1/32 x 1/8 inch balsa and the other of 1/16 inch square stock. The 1/32 inch square bamboo is carefully placed about the framework so as to conform with the shape on Plate 4.

This double surfaced empennage is both light and strong.



Out on the tarmac ready for a night flight
Picture No. 5

Propellers

The flying propeller is the most important to make if one desires a flying model. A block which measures $\frac{5}{8}$ x $1\frac{3}{8}$ x $7\frac{3}{4}$ inches is first procured and marked as in Plate 2. This block should be of a soft variety. The propeller is carved in the usual manner by cutting out the block as shown by the heavy lines. The blades are then carved. The hub or boss is left on only for looks, and maybe weight if the model needs it.

The scale propeller, if desired, is carved in much the same manner as the other propeller only, of course, it is painted and polished so as to resemble the real one. A shaft of No. 14 music wire is bent to the correct shape and then pushed through nose block "A" and plug, as in Plate 8. Three duralumin washers are slipped over the shaft. This metal is used as it is self oiling. The propeller is next placed on the shaft and the shaft is bent into the propeller as in Plate 9. The blades of either propeller should be from 1/16 near the hub to 1/32 inches in thickness at the tips.

Wings

A total of twenty-four ribs are needed, twenty of which are cut from 1/32 inch balsa and four from 1/16 inch balsa. Soft material is best suited for this purpose. A template made of brass or tin will be found helpful in cutting the ribs. The main spars are 1/32 x 1/8 inch in size but the rear spars are longer than the front ones due to the rake of the tips. The leading edges are of 3/32 inch square balsa with front edges rounded. The trailing edges are of 1/16 x 1/4 inch medium balsa with their cross section being triangular as in Plate 9. The tips are of 1/32 inch square bamboo bent to the correct shape. Remember that there are two left and two right wings and do not make the mistake of building them otherwise. The wings are built in much the same manner as the tail assemblies. One has to be extremely careful in constructing the wings so that they are perfectly level and not warped. The tips of the spars are tapered as seen in Plate 8. The bamboo tips (on plate) were left off for clearness.

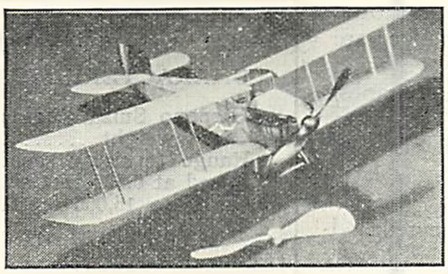
THERE is really no center section as common to most models, but a rather novel arrangement consisting of two tubes. These tubes are rolled from 1/64 inch soft sheet balsa around a 3/32 inch steel (aluminum, duralumin, brass) rod. The photographs and Plates 1, 3, and 7 will make this more clear. These are put on when the model is assembled.

The wing struts are now made, the large inter-plane struts are of 1/16 x 3/16 inch medium balsa while the short cabane struts are of 1/16 x 1/4 inch stock. All of the struts are carefully streamlined so as to lessen the resistance.

Covering and Final Assembly

Two sheets of superfine tissue will be necessary for covering the "Dolphin."

The fuselage may first be covered. Start by covering the top or turtle deck, as it is sometimes called. The adhesive used is "banana oil." More than one piece of paper will be necessary for this as there are quite a few curves in the turtle deck. The paper can be trimmed by using a razor blade which is better than scissors. The sides may then be covered and the last section in the side, opposite the one diagonal, is left uncovered so that one has access to the rubber. Lastly the bot-



The undoped Model viewed from the front. Picture No. 4

Front view of the finished model. Pict. No. 6

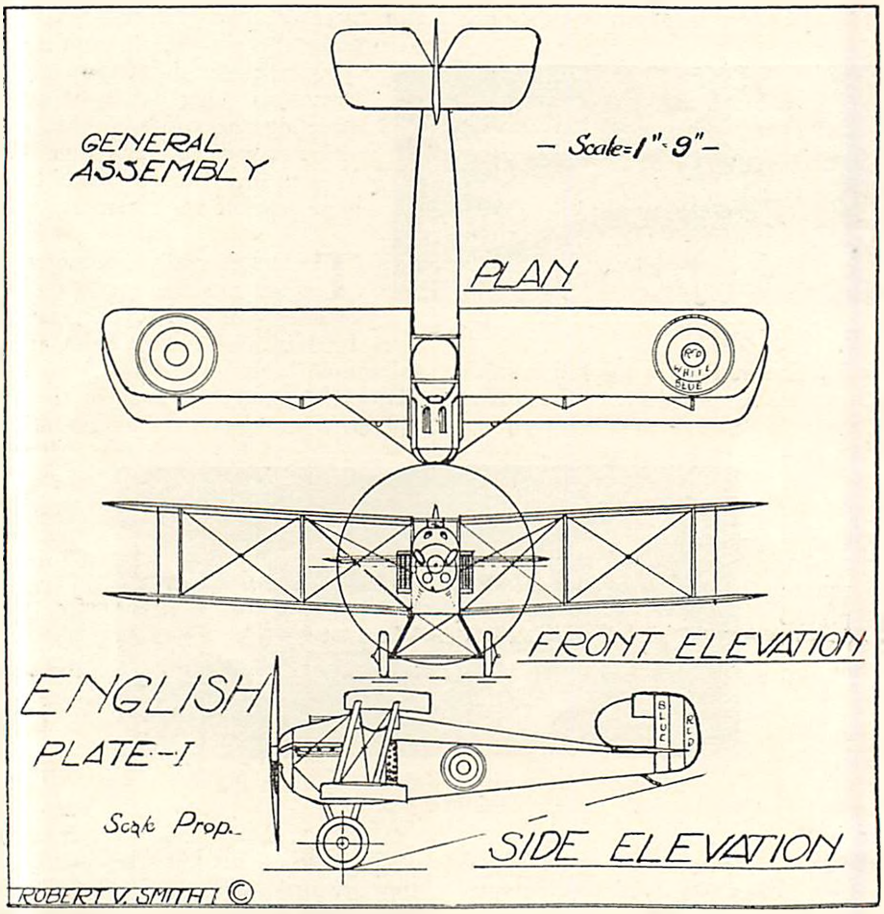
tom is covered and a place is left open for the tail skid arrangement which is seen on Plate 4. There are a number of ways in which to build the tail skid; the most desirable way is described on Plate 4.

The tail and rudder are next covered. The tips have to be covered with separate pieces of tissue because of the curves. Banana oil is again used for adhesion.

The wings are covered now, using one piece of tissue for each bottom and two pieces for each top (a separate piece for the tip).

One must decide upon a color scheme if any is to be used. The author's model had a blue fuselage, yellow wings and black and silver trimmings. These colors should be of a light dope and not lacquer (except for insignias). The colors can be sprayed on by the simple use of an ordinary atomizer, being careful to put on an even coat of the spraying mixture. This colored dope may also be brushed on, employing a small camel's hair brush. The model without any dope is shown in photographs 3 and 4.

After the parts are doped, the model may be assembled by placing the tail, rudder, and wings in their respective positions. The tail and rudder are glued on the fuselage as in Plate 4 and the photographs. The tail is set at zero angle incidence as is also the rudder.



THE wings are now placed in position; the lower wings are glued on first. Plates 3 and 4 give the position of the wings. The proper amount of dihedral is given them and the struts are glued in place. Slits are cut in the paper over the spars at these places as in Plates 5, 7, and 8. Photograph 5 shows some detail in the mounting of the wings. The small or cabane struts are glued in place as in Plates 1, 3, and 7. The upper wings can now be cemented in place in the same manner as the lower wings only the root ribs are glued to the ends of the tubes instead of the body. The 1/16 inch ribs are used for all root ribs because strength is required at these points.

Miscellaneous Details

Of course the model as it now stands could be called finished, but to really complete it, one must add some more detail as seen by the photographs of the finished reproduction. The cylinder or motor fairings are made of 1/64 inch balsa bent to a shape corresponding to the shape on Plate 1 and the photographs; the front and rear plugs are of soft balsa. The front streamlines are not glued to the nose block "B" but to nose block "A." The exhaust pipes are of tubular construction except for the pieces coming from the nose to the pipes, the tubes (pipes) are of 1/64 inch sheet balsa. The motor fairings and exhausts are painted black. A set of "Vickers" guns will add "looks" to the model, these are made on the same order as the motor fairings. A small celluloid windshield may be placed over former "D" directly in front of the cockpit to give realism to the model. Small pictures or drawings of instruments may be put on former "D" to improve the interior of the cockpit. The radiators are both novel in appearance and light in weight. They are constructed by making balsa boxes, 3/8 inch square by 1 3/8 inch long. The tops and bottoms are of 1/8 inch stock while the sides are of 1/32 inch balsa. Instead of covering the fronts and rears with wood, cloth is used, giving the appearance of mesh as in a real radiator. These boxes are glued to the fuselage at station "E" and may be painted black or silver as the builder desires.

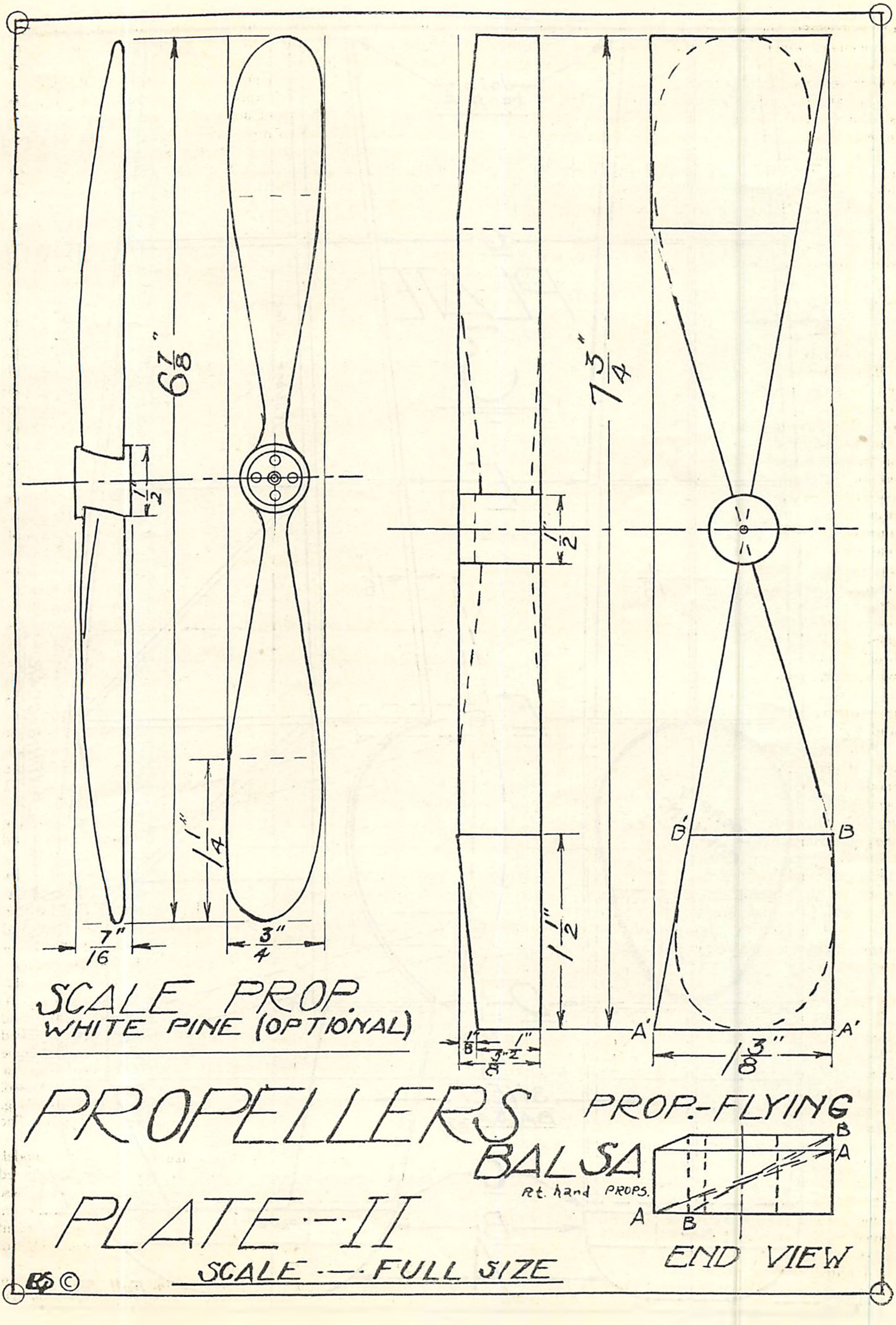
SOPWITH DOLPHIN
CHARACTERISTICS OF LARGE MACHINE

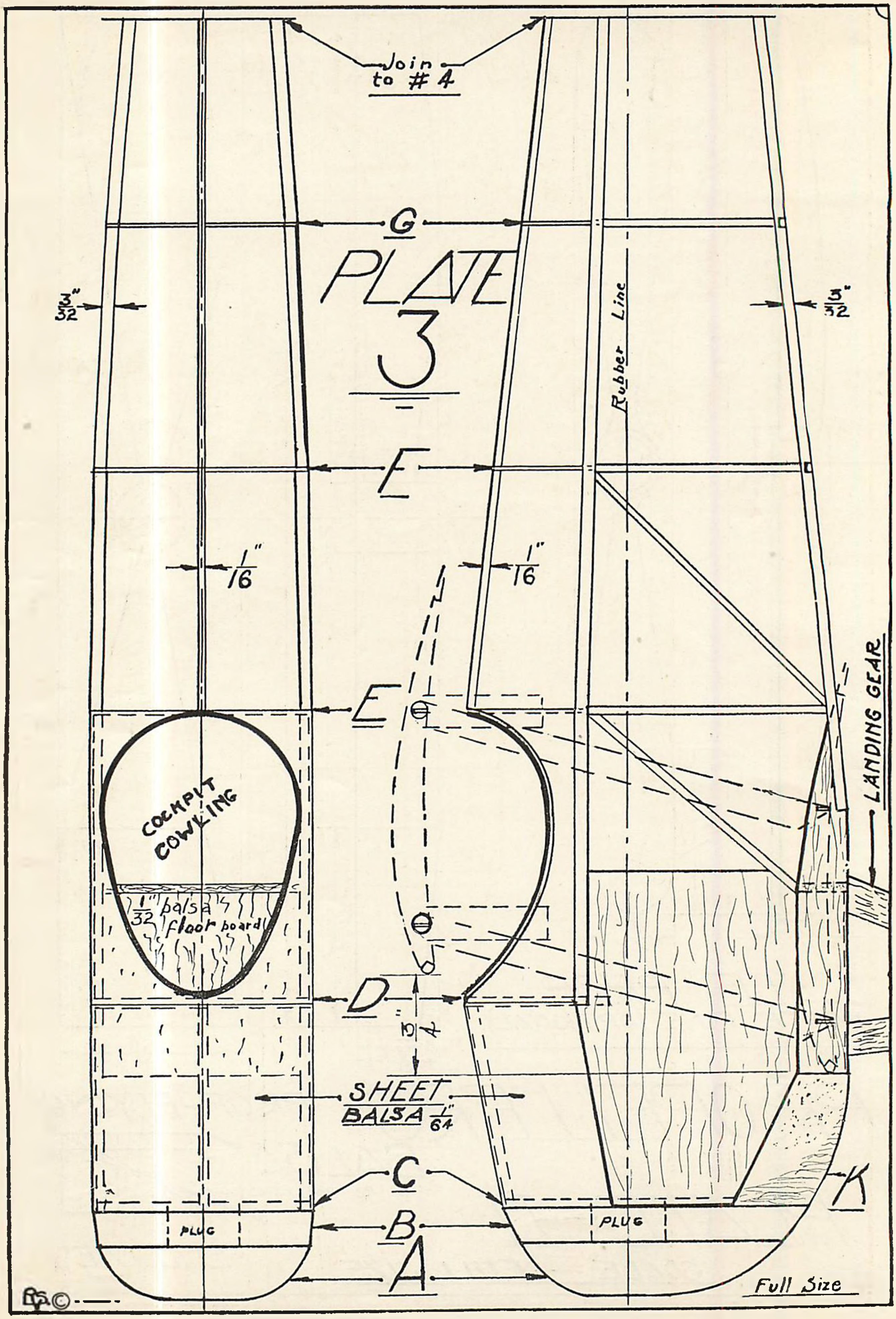
Hispano Suiza Engine	200-300 H. P.
Gross weight	1,881 pounds
Range (cruising speed)	230 miles
Speed at 6,500 feet altitude	131.5 M. P. H.
Climb to 15,000 feet	14.7 minutes
Ceiling	23,000 feet
Landing speed	40 M. P. H.
Color schemes (optional)	Colored, dope
Yellow and Green	White and Green
Orange and Blue	Yellow and Blue

Thread, representing flying and landing wires, always adds strength and beauty to a model if applied properly. A needle will come in handy for putting on the threads. Silk thread is used, being both light and strong. The thread can be doped silver to represent real wire. The threads should be kept tight.

Insignia adds a touch of warlike realism to the model. English insignia is used in this case, the circles having red centers and the tail having a red trailing stripe. These insignias can be painted on, using lacquer, or stuck on, using company-made insignia. It is necessary to paint circles on the upper wings because paper ones will not shape properly over the ribs.

Thread bracings in the landing gear will help to strengthen it and also will be (Continued on page 43)


6 7/8"
1/2"
1 1/4"
7/16"
3/4"
SCALE PROP.
WHITE PINE (OPTIONAL)
7 3/4"
1/2"
1 1/2"
B'
B
A'
A'
1 3/8"
PROPELLERS
PROP.-FLYING
BALSA
Rt. hand PROPS.
A
B
A
B
END VIEW
PLATE - II
SCALE — FULL SIZE
BS ©



Join to # 4
G
PLATE 3
3/32"
3/32"
Rubber Line
F
1/16"
1/16"
E
LANDING GEAR
COCKPIT COWLING
1/32" balsa floor board
D
5/4"
SHEET BALSA 1/64"
C
B
PLUG
PLUG
A
K
Full Size

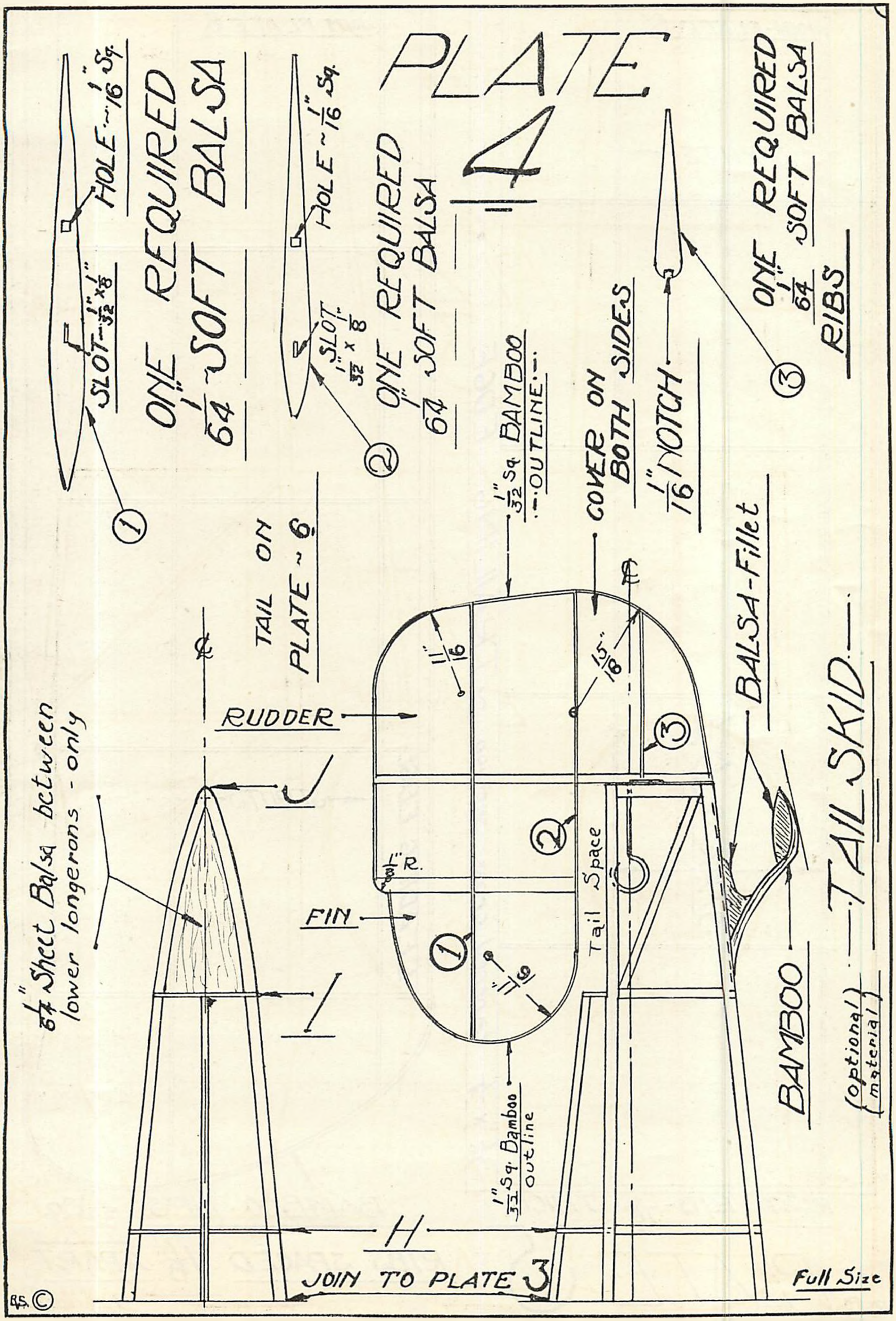
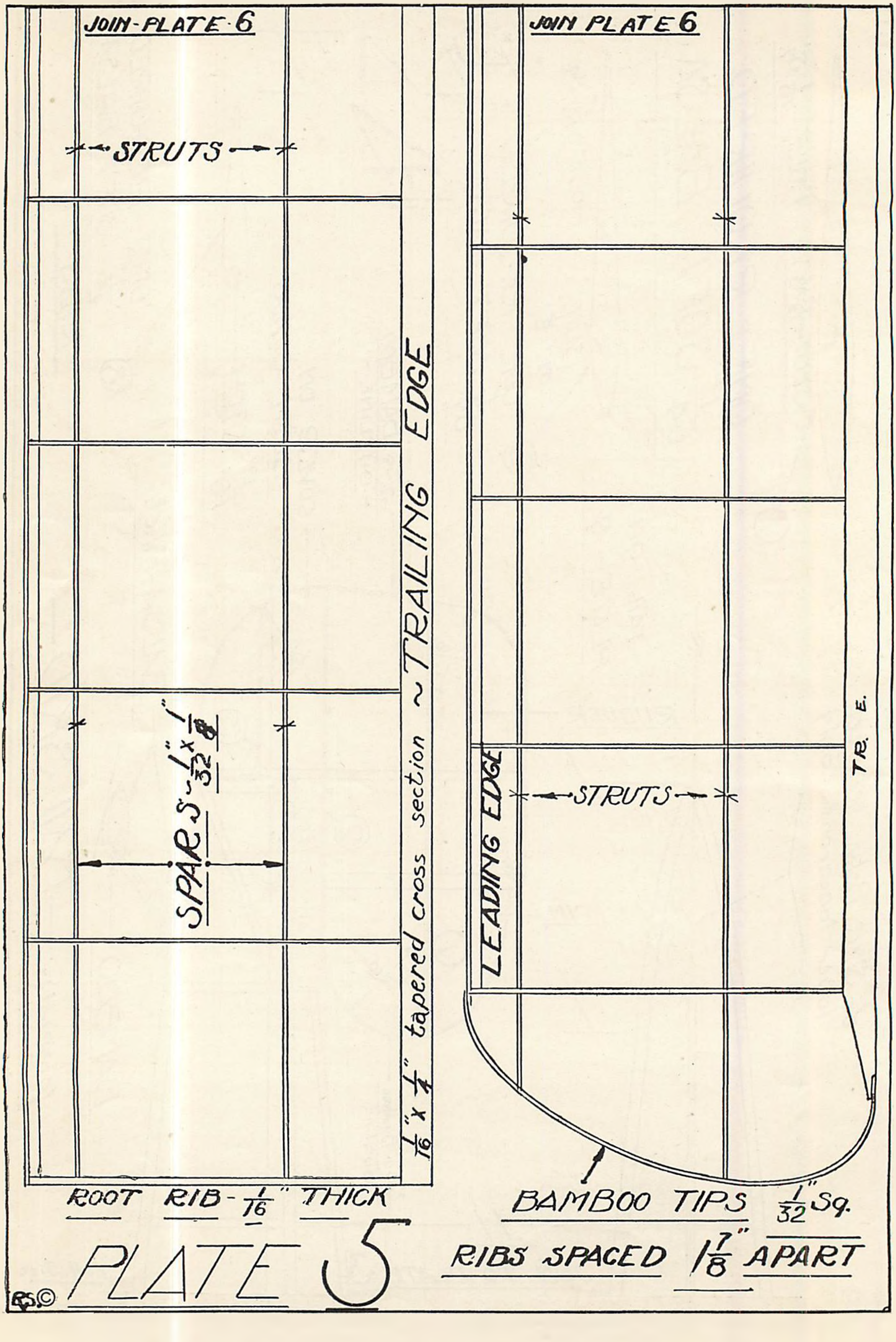
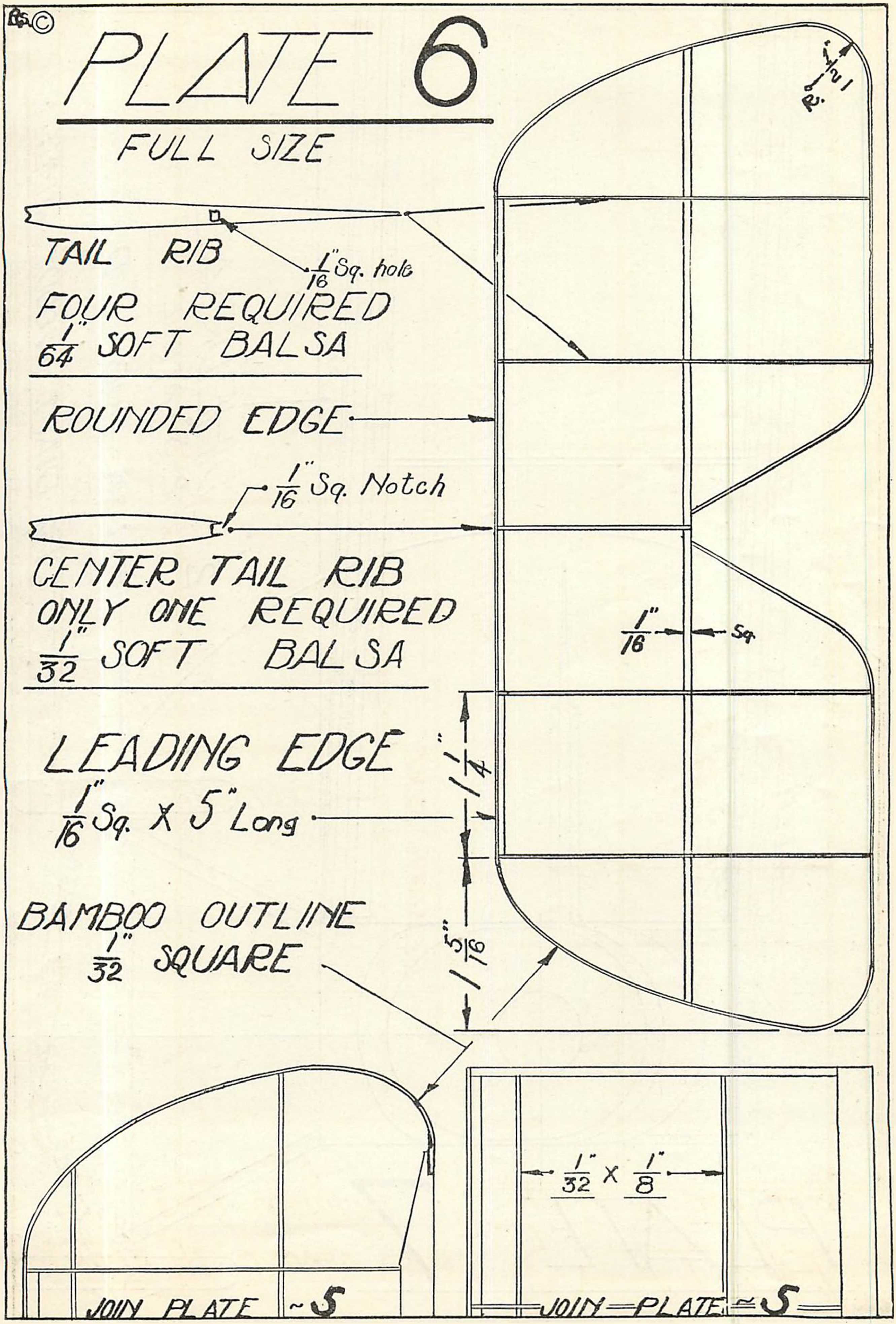
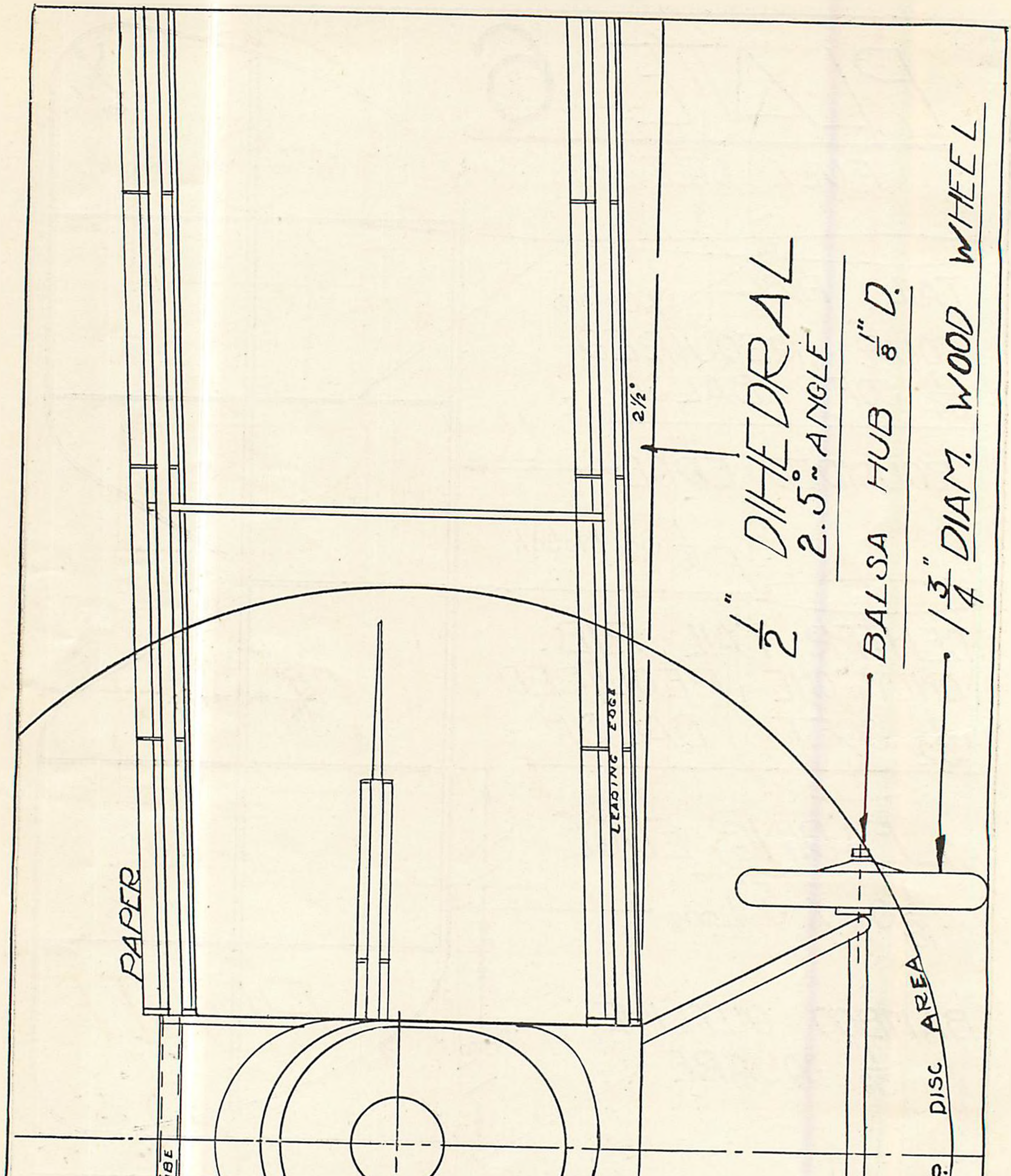


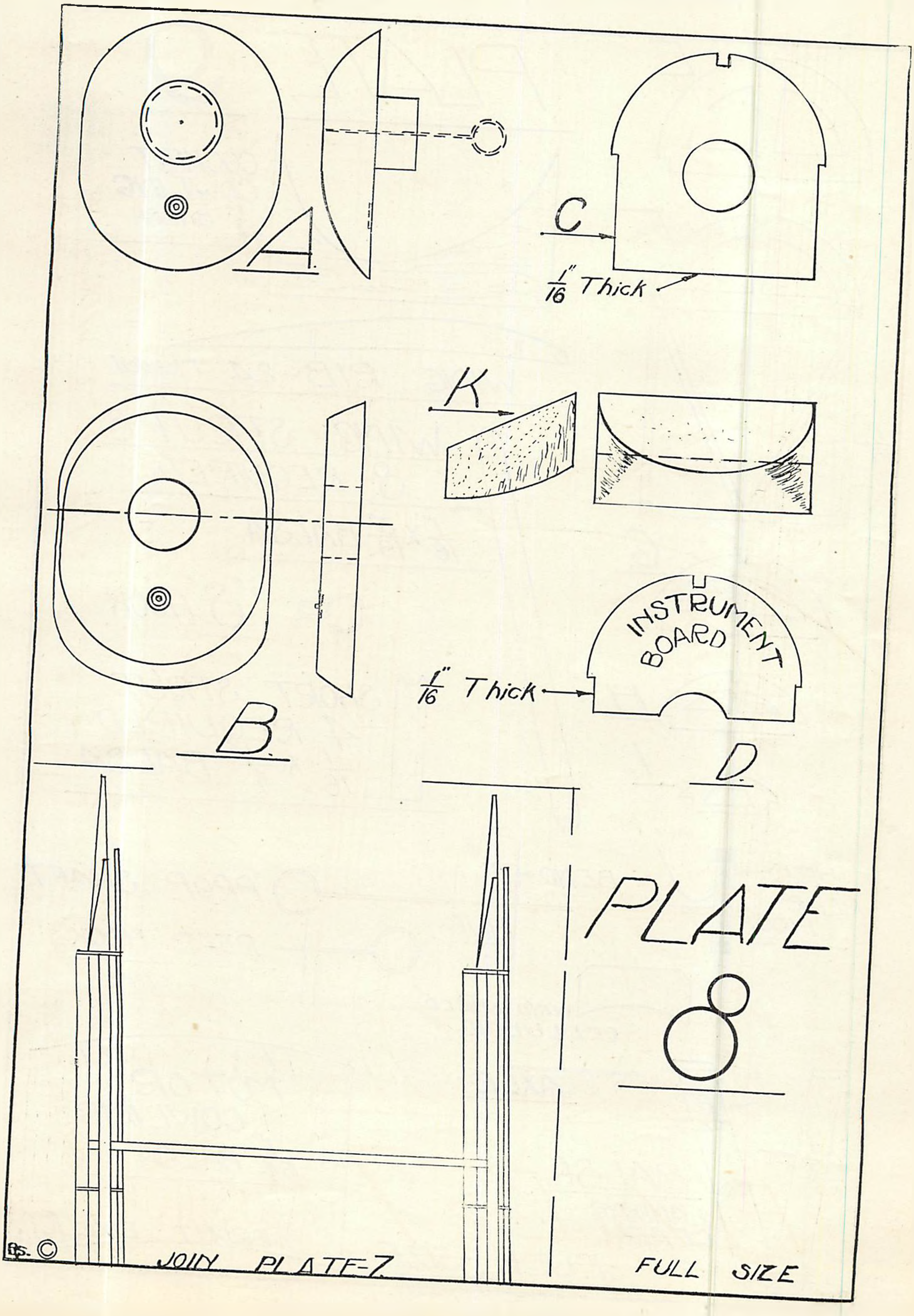
PLATE 4
SLOT ~ 1/32" x 1/8"
HOLE ~ 1/16" Sq.
ONE REQUIRED
1/64" SOFT BALSA
①
SLOT 1/32" x 1/8"
HOLE ~ 1/16" Sq.
ONE REQUIRED
1/64" SOFT BALSA
②
ONE REQUIRED
1/64" SOFT BALSA
RIBS
③
TAIL ON PLATE ~ 6
1/32" Sq. BAMBOO OUTLINE
COVER ON BOTH SIDES
1/16" NOTCH
BALSA-Fillet
RUDDER
FIN
Tail Space
1/64" Sheet Balsa between lower longerons - only
1/32" Sq. Bamboo outline
BAMBOO
TAILSKID
(optional material)
H
JOIN TO PLATE 3
Full Size
R.S. ©


JOIN-PLATE 6
STRUTS
SPARS - 1/32" x 1/8
1/16" x 1/4" tapered cross section ~ TRAILING EDGE
ROOT RIB - 1/16" THICK
PLATE 5
JOIN PLATE 6
LEADING EDGE
STRUTS
TR. E.
BAMBOO TIPS 1/32" Sq.
RIBS SPACED 1 7/8" APART
E.S.©



B.S.©
PLATE 6
FULL SIZE
TAIL RIB
1/16" Sq. hole
FOUR REQUIRED
1/64" SOFT BALSA
ROUNDED EDGE
1/16" Sq. Notch
CENTER TAIL RIB
ONLY ONE REQUIRED
1/32" SOFT BALSA
LEADING EDGE
1/16" Sq. X 5" Long
BAMBOO OUTLINE
1/32" SQUARE
R. 1/2"
1/16" Sq.
1 1/4"
1 5/16"
1/32" X 1/8"
JOIN PLATE ~5
JOIN PLATE ~5


PAPER
LEADING EDGE
2½°
1/2" DIHEDRAL
2.5° ~ ANGLE
BALSA HUB 1/8" D.
1 3/4" DIAM. WOOD WHEEL
TUBE
FLYING PROP. DISC AREA
PLATE ~ 7


A.
C
1/16" Thick
K
INSTRUMENT BOARD
1/16" Thick
B.
D.
PLATE 8
JOIN PLATE-7.
FULL SIZE

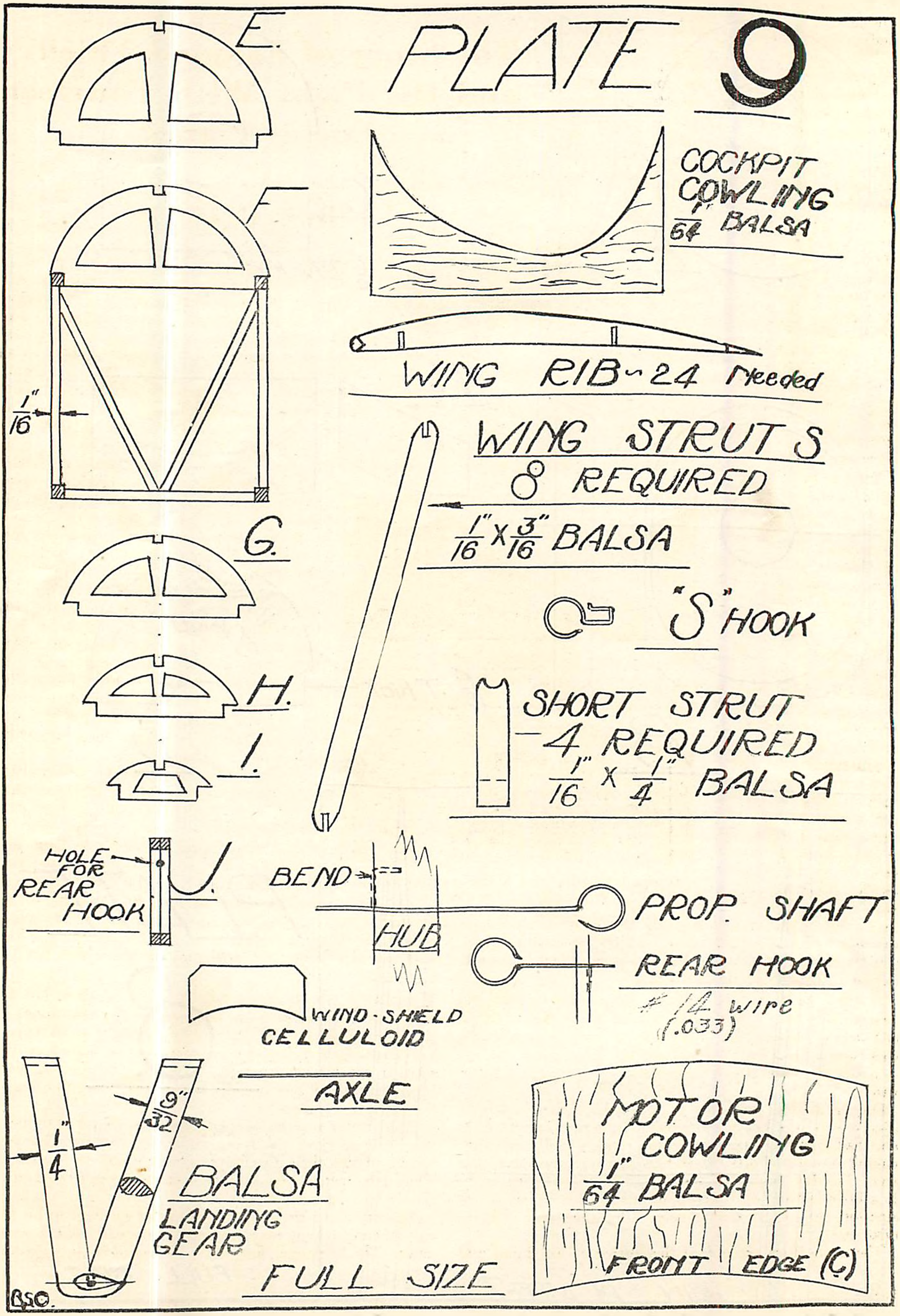


PLATE 9
E.
F
1/16"
G.
H.
I.
COCKPIT COWLING
1/64" BALSA
WING RIB ~ 24 Needed
WING STRUTS
8 REQUIRED
1/16" x 3/16" BALSA
"S" HOOK
SHORT STRUT
4 REQUIRED
1/16" x 1/4" BALSA
HOLE FOR REAR HOOK
BEND
HUB
PROP. SHAFT
REAR HOOK
#14 wire (.033)
WIND-SHIELD
CELLULOID
AXLE
9/32"
1/4"
BALSA
LANDING GEAR
FULL SIZE
MOTOR COWLING
1/64" BALSA
FRONT EDGE (C)
BSO.

Belgium's Greatest Ace

The Story of Edmond Thieffry and His Fight With Fourteen Enemy Planes

By F. Conde Ott

WHEN his native land, Belgium, recoiled to the first shock of the early Boche attacks in 1914, Edmond Thieffry immediately entered the armed service to do his bit in repelling the foe. However, before the air service finally claimed him for their own, his adventurous spirit was whetted by many thrilling experiences.

A "hither and yon life" in the motorcycle corps, a German prison camp, an escape into Holland and finally back into Belgium, his native land, afforded a unique training for his aerial activities to follow.

Not satisfied to be a ground hog, crawling and wallowing day after day through the stinking mud of Flanders, his gaze was continually turned skyward. Overhead the sky knights roared back and forth, dipping, turning, fighting, in a wild round of adventure and intense activity. Thieffry followed their maneuvers with longing eyes. At last, after much red tape and delay, he was granted the transfer for which he had applied.

He began his flying career as a bomber. A great deal of the work was done at night when the ever watchful invaders from across the Rhine had less chance of spotting the planes as they flew toward Germany with their deadly cargoes of explosives.

Thieffry had a number of successful bombings to his credit, his skill in reaching isolated destinations in the darkness being particularly marked. More than one German or Austrian munition dump or supply depot went up in smoke and flames as the result of his skillful work.

Edmond Thieffry, one of the greatest World War aces and his mascot

His officers recognized the inherent ability of the crafty flier as a pilot so he was given a number of important reconnoitering missions for the purpose of spotting enemy strongholds during the hours of daylight. This work was very important and took a great deal of cool courage and skill to accomplish. Often times when German ships rose up to drive the invader off or destroy him Thieffry would coolly complete the studies he was making of the land below, utterly neglectful of the vain attempts that zooming Boche airmen about him were making to bring him down.

Thieffry kept up the valiant service throughout the greater part of 1916, making almost daily flights either on bombing expeditions or varying it with reconnaisance work when the General Staff wished some particular information that was desperately needed to carry out a battle plan.

During all this time, the gallant Belgian flier had been subjected to some heavy punishment from the German fliers who had come to know his extraordinary skill and were making unusual efforts to get him permanently out of the way. Thieffry thought it was about time that he began to do a little fighting on his own account so he applied to his superiors for a second transfer—this time with fighting aviators.

The authorities recognized the justice of his claims and in the December of 1916, Thieffry began training on a Nieuport. Thieffry had a perfect makeup for a combat flier. A man of extreme patience, he was willing to wait an almost endless time for his quarry without the traces of nervousness or impatience that had sent others to an untimely death through some tiny slip. To this valuable asset, Thieffry added the qualities of boldness and valor and an utter disdain of death, once he had finished his combat training, that soon made him feared among the Germans. He was untiring and aggressive.

Almost daily it was Thieffry's ship that was first wheeled out of the hangar at the break of dawn. Every minute of daylight was precious, and even the last late moments of evening twilight usually found him up in the suntinted clouds scouring the fast darkening sky for one last shot at a German.

In between the rise and fall of the sun, he was at his controls constantly, the only respites he allowed himself from his self-appointed gruelling labors being the necessary stops now and then for a meal, or gas, oil and mechanical attention to his trusty craft. The latter received the best of care for Lt. Thieffry was too seasoned a campaigner to be caught in a fray without perfect equipment.

Had this untiring Belgian officer been stationed in a sector where heavy engagements were constantly taking place it is hard to conceive what a great score of enemy ships he might have rolled up with this constant vigil of the skies he so faithfully maintained. As it was, however, Thieffry was assigned to a quarter of the front that was comparatively quiet and half of the job of getting his man was finding him. But the unceasing efforts that the able lieutenant put into his tasks bore fruit in any event.

BRUSSELS was in control of the Germans when Thieffry entered the fighting end and one of the first things he did was to head for the city and fly over it at an extremely low altitude, dropping cheering messages of hope and consolation for his countrymen. These he interspersed with other offerings of less friendly nature that were directed at the German invaders.

These early months of 1917 with its bitter European winter were none too good for flying and the Germans were confining their air efforts to more productive quarters. Thus it happened that the first victory did not come until the 15th of March.

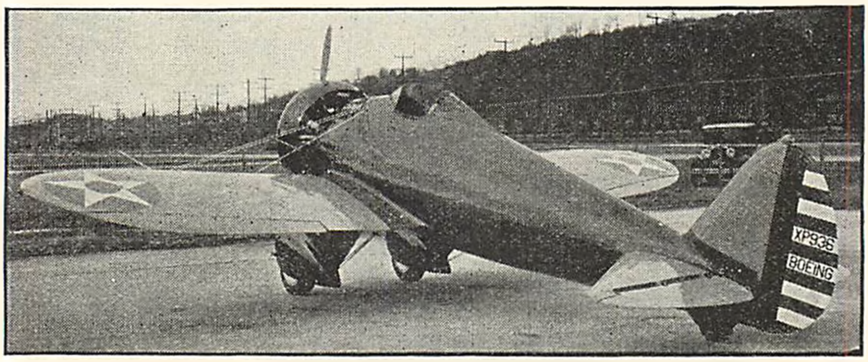
Thieffry had been awaiting this great moment in his flying career so long that his initial conquest was a short affair. The lieutenant first saw (*Continued on page* 39)

Build the World's Fastest Pursuit Plane

Here You Have Instructions and Plans to Build a Solid Model of the U.S. Army's Latest High Speed Pursuit Ship

By Robert Morrison

THE Boeing Airplane Company of Seattle, Washington, one of the leading airplane manufacturing organizations in the world, has just completed a new pursuit plane for the army, the XP-936. It is a radical departure from the famous P-12 series, having only one wing and built entirely of metal. The fuselage is a clean, highly streamlined monocoque structure, the semi-low wing having a smooth metal skin covering. The XP-936 is rated as one of the fastest pursuit planes in the world and is now undergoing tests at the Material Division. The power plant is a new supercharged Pratt & Whitney "Wasp" engine. It is expected that the new supercharger will afford the plane greater speeds than heretofore at high altitudes. A new tail device is incorporated in the design, the stabilizer being fixed while the longitudinal balance is obtained by means of trailing edge stabilizing flaps on the elevators.



The Boeing low-wing all-metal monoplane, XP-936, powered with a supercharged Wasp engine

The model may be made from white pine or balsa wood. Plans No. 2 and 3 are full size and if you follow instructions carefully, you will have no trouble. Be neat and accurate.

MATERIALS NEEDED

WOOD

No. of Pieces	*Size*	*Part of Plane*
1	16" x 3" x 1/2"	Wing
1	9" x 2¾" x 3/8"	Tail surfaces
1	9½" x 2½" x 2"	Fuselage
1	3/16" x 2" x 5"	Landing gear
1	1/16" x 1/16" x 6"	Windshield, etc.
1	4½" x 1/4" x 1/4"	Propeller
1	12" x 1/2" x 1/2"	Cylinders
1	2" x 1" x 1"	Miscellaneous
2	5/8" radius, 1/4" tread	Wheels
1	1/4" radius, 3/16" tread	Wheel
1	Spool of black thread	Guy wires
1	2 oz. can	Ambroid
1	2 oz. can	Olive drab
1	2 oz. can	Orange
1	Smallest possible	Blue
1	Smallest possible	Red
1	Smallest possible	White
1	Smallest possible	Black
1	Smallest possible	Silver

Wing (No. 2 plan)

No. 2 plan gives you the outline of the right wing. Trace top view of this outline on board and cut to shape with jig saw. As you note on No. 2 plan, there are *four* sections to wing, two sections of the wing proper and two stub wings. In making these, be sure that one wing and stub are for the right hand side of fuselage, while the others are for the left hand side. Next draw front view of wing on leading edge of the four sections. Then, using small chisel or sharp knife, cut entire wing to shape. Take plenty of time and shave down the wood in the direction of the grain. It is not imperative that you carve the bulge in the stub wings where they meet the fuselage as you may use putty to make the streamlining effect after the assembly of the model is completed.

The dowels are not absolutely necessary but they will add to the strength of the construction of the plane.

Cut slant in wing proper where it connects with stub wing as shown in front view so as to give a 3° dihedral angle when assembled.

Sandpaper four sections first with coarse sandpaper and then with fine sandpaper.

Make two lights out of scrap wood and ambroid them to wing tips.

Pressing heavily on pencil, make groove in wing, outlining aileron. The insignia will be put on when painting.

Go over all parts once more with fine sandpaper, giving them a smooth, clean finish.

Make air speed indicator with razor blade. Round it out with sandpaper. Inject two pieces of bent wire (pins) in front end.

Tail Surfaces (No. 2 plan)

The tail surfaces are made in a similar manner as the wing. The fin and rudder are all one piece, also the elevators and stabilizer sections. The hinges that are shown in plans are artificial and will be put on after tail units are constructed.

Take the piece of wood that you obtained for the tail units and cut off a section large enough for making the rudder and fin. Draw outline of these on piece and then cut to shape as you did on the wing. A razor blade comes in handy when carving the tail units.

Streamline rudder and fin with coarse sandpaper and then smooth over the surfaces with fine sandpaper. Make sure that you have no slight dents as they will become noticeable after plane has been painted.

Draw groove separating fin from rudder as you did aileron from wing.

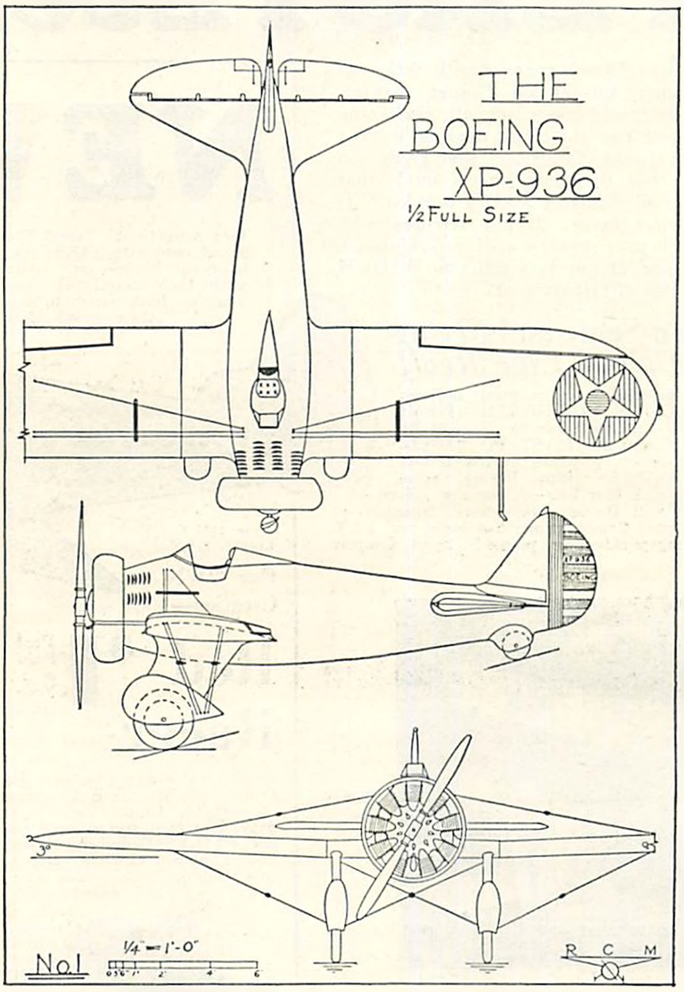
Make small tail light with razor blade and ambroid it to top of fin.

Next proceed to carve out the horizontal tail surfaces, that is, the stabilizer and elevators. After sandpapering them, make groove dividing stabilizer from elevators. Out of a ⅛ square inch strip, make six artificial hinges as shown on detailed plans. Ambroid them in place. Then draw outline of stabilizing flaps on elevators. Make four horns (see end view of elevator) and ambroid them on top and bottom of flaps. A small piece of black thread tied to the top of the horn and pinned fast to the elevator will act as control wire.

Fuselage (No. 3 plan)

The fuselage will not be difficult to build if you work slowly and follow plans and instructions carefully. No. 3 plan shows details of fuselage.

It is made in exactly the same fashion as wing and tail units. Draw side elevation, cut; draw top elevation, cut; then give it its monocoque shape by referring to fuselage forms No. 1, 2, 3, 4. *Broken lines* on side elevation of fuselage indicate sections that forms illustrate.



A small sharp chisel is preferable for rounding out the fuselage. Always cut with the grain. After chiseling, most of the rough spots may be gotten off with coarse sandpaper.

The tail wheel housing may be made separate or as part of the fuselage. Do which ever suits you better. The head rest at top of fuselage may also be made separate. Hollow out housing in order that tail wheel might fit.

Hollow out cockpit. This may be done easily and neatly by starting at top of fuselage with jig saw and cutting down along two broken lines, one formed by back of pilot's seat and other directly in front of dashboard. Saw down as far as floor of cockpit. Then cut along floor. Sandpaper inside of cockpit thoroughly. Then, taking block that you have just sawed out, cut off the two sides with razor blade, allowing them about an eighth of an inch thickness. Put ambroid on the bottom edge of the two sides and join them in their former position on fuselage. Putty up all cracks. The cockpit will then be ready for the installation of controls and seat. Sandpaper whole fuselage once more.

The seat may be made from a solid block of wood with a razor blade. The two rudder pedals, "joy" stick, and dashboard may be made from scrap pieces of wood. They will be installed when assembling model.

The windshield is the next thing to be constructed. It is made from a 1/16 square inch strip of wood. Use razor blade for cutting up strip. Ambroid parts securely in place on fuselage. Wait a few moments for connections to dry and then apply isinglass or heavy cellophane to take the place of glass on the windshield. Colorless ambroid is preferable in cementing the windows.

Landing Gear (No. 3 plan)

In making the landing gear, make sure that the two "pants" on the wheels are exactly alike. The two forward wheels on the XP-936 are of the latest streamlined design and have not been used heretofore on any plane. They are very simple in design, and they may be made easily from pieces of wood left over from wing or tail units. Draw the circumference of the two wheels with compass and then cut, using razor blade. Then, using sandpaper, round off edges. Drill small hole in center for axle. Go over both wheels with fine sandpaper and that is all there is to them.

The tail wheel is of a small balloon "doughnut" type. This may be made or bought. Lay this wheel aside with the other two until you are ready to paint them.

The rest of the landing gear, which consists of two "pants" and two streamline fairings that cover struts on real plane, are made next from solid wood. The "pants" and strut fairings may be made all as one or separately—separately preferred. Draw outline of direct side elevation, cut; then front elevation, cut; and then taper down pieces with sandpaper, giving a smooth streamlining effect. The next step is to hollow out "pants" for the installation of wheels which is done by slicing them in half vertically from nose to trailing edge, using only a razor blade in doing so. Cut out the inside of the pants, leaving planty of room for the wheels, and then ambroid the halves together again. When ambroid has dried thoroughly, go over all parts of landing gear with fine sandpaper. The wire bracing will be done later. The streamline fairings over landing gear cut down a great deal of wind resistance, thus affording the plane more speed.

Motor and Cowl
(No. 3 plan)

It is best to purchase the townsend ring (cowling over motor to cut down wind resistance) though one may be made from a thin strip of a good grade of cardboard. Bend the strip into shape and connect the two ends with ambroid. Let the ring soak in water a minute so it will retain its circular shape.

The whole motor may also be purchased if desired. If not, cut out nine cylinders from ½ square inch stick with razor blade. Leave heads flat but round out rest of cylinder. Smooth over with fine sandpaper and then apply ambroid to rounded part. Wrap black thread around cylinder before ambroid dries, leaving 1/16 inch space between rounds. Cut off eighteen push rods from 1/16 square inch strip. The push rods are the two struts in front of each cylinder. The motor will be assembled later.

The propeller is made with a knife. Plan No. 3 shows the details at the upper right hand side. Drill small hole for pin which will act as propeller shaft.

Painting

Go over all parts with fine sandpaper and then thoroughly brush off sawdust.

A lacquer or dope is best for painting the model. Many coats may have to be applied before you get a smooth, glossy finish. Paint the inside (*Continued on page* 39)

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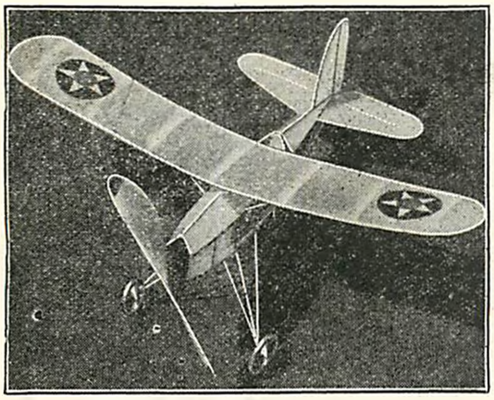

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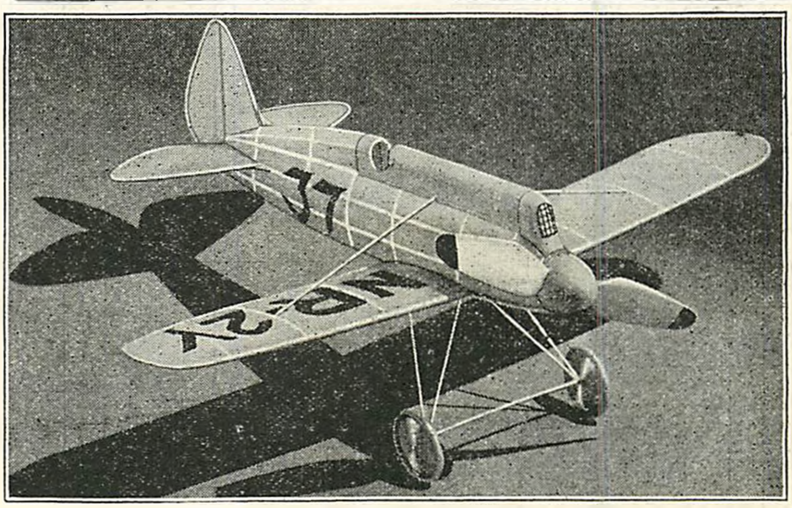

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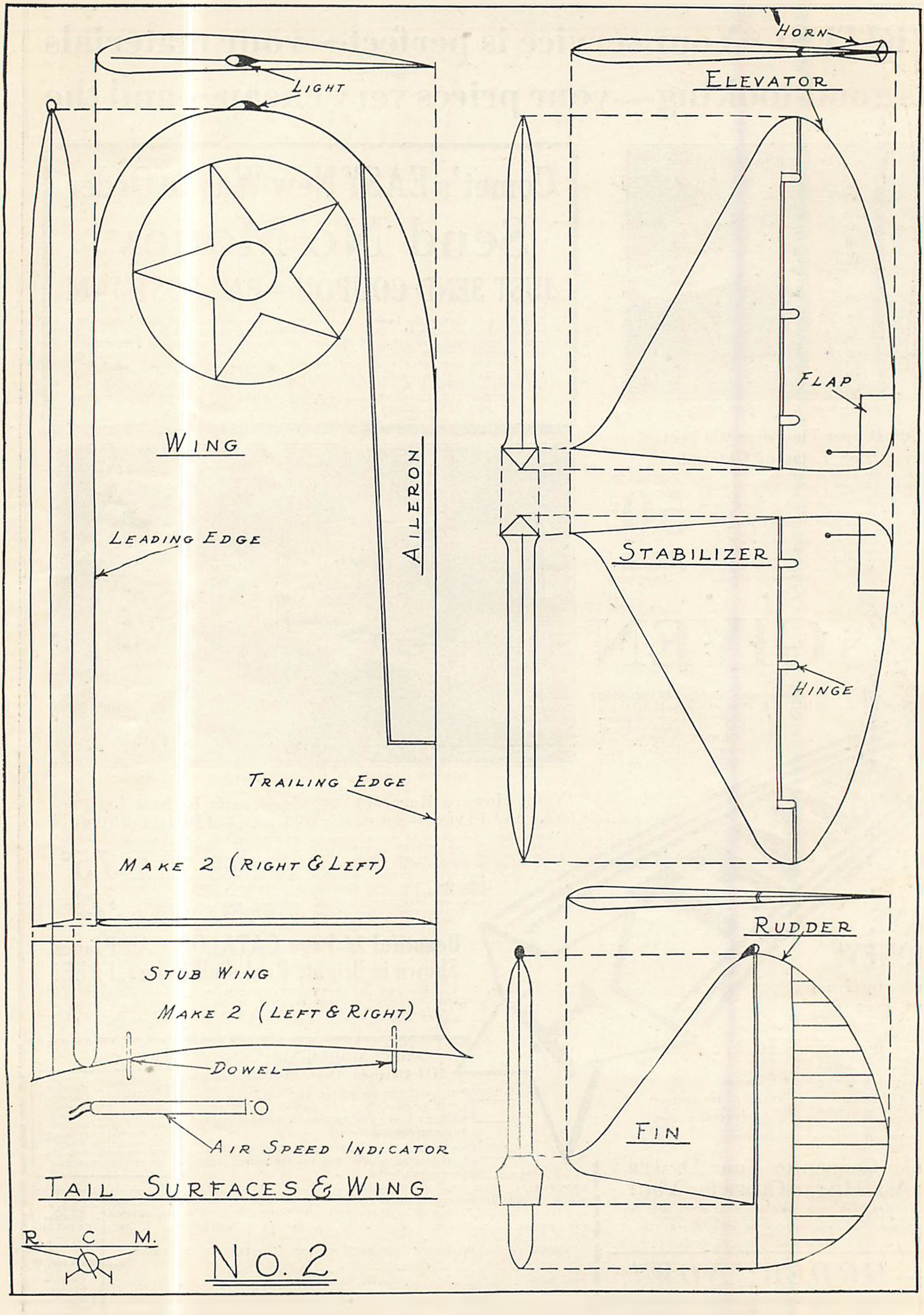
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WING
AILERON
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FLAP
STABILIZER
HINGE
TRAILING EDGE
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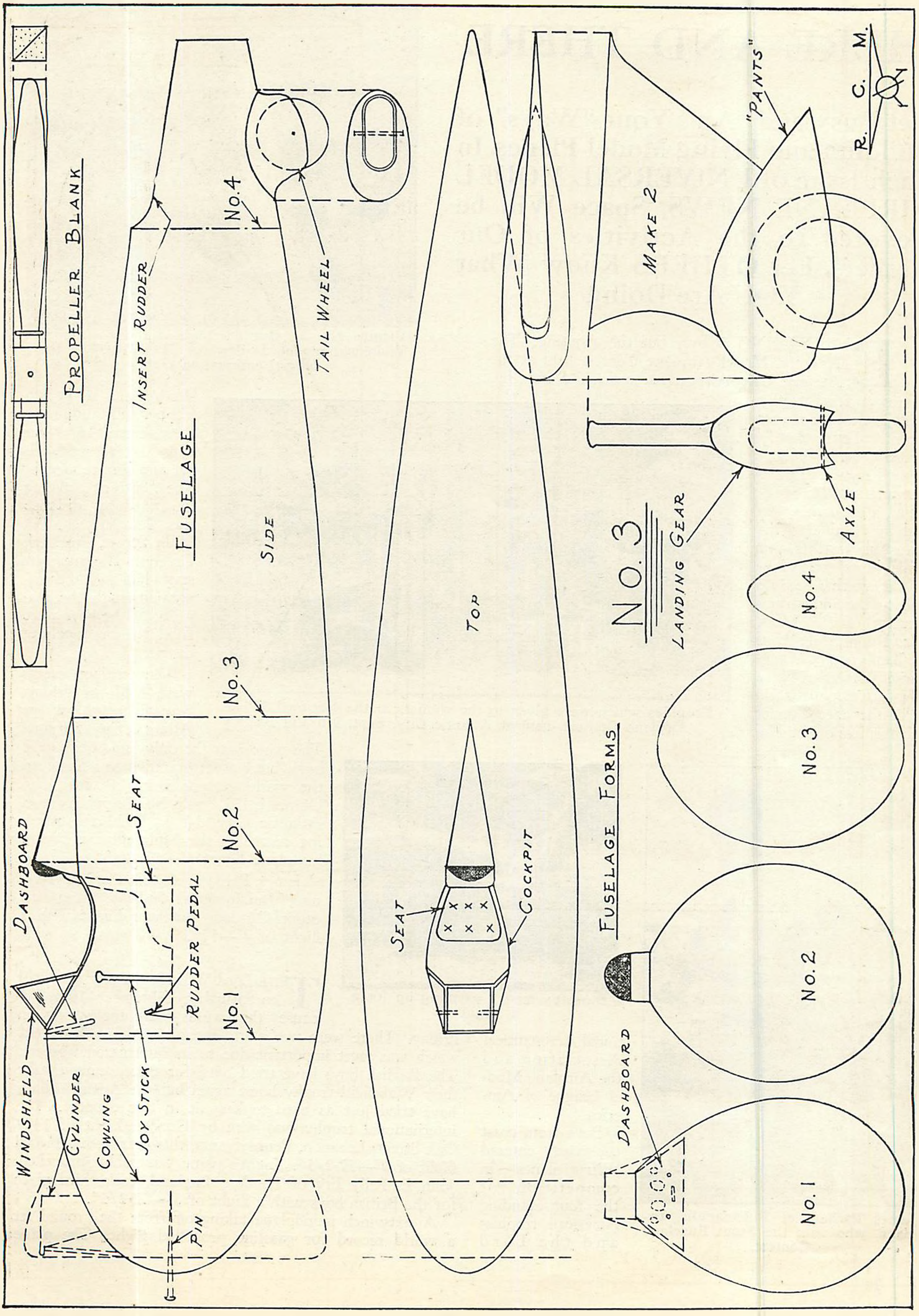
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CYLINDER
COWLING
JOY STICK
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SEAT
COCKPIT
FUSELAGE FORMS
DASHBOARD
No.1
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AIR—WAYS
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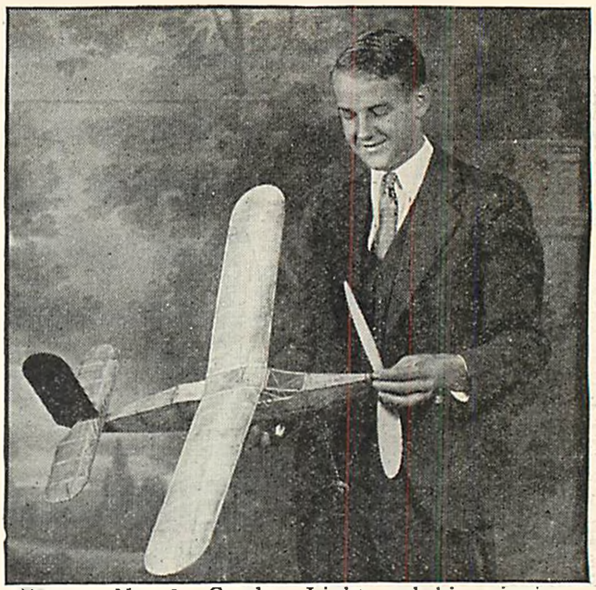
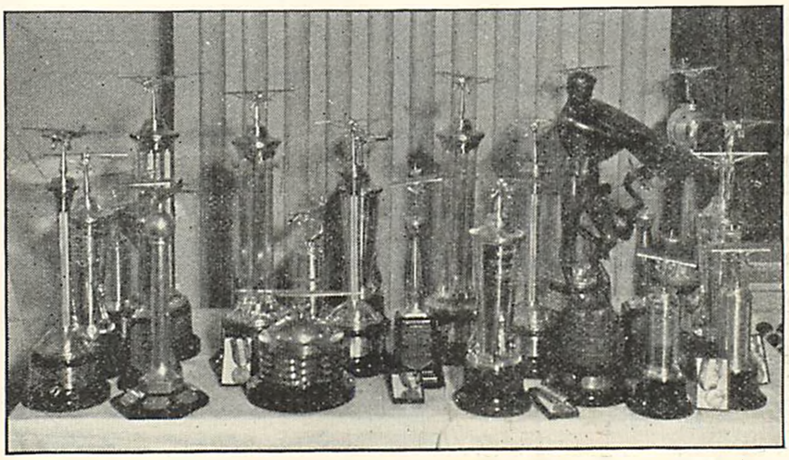


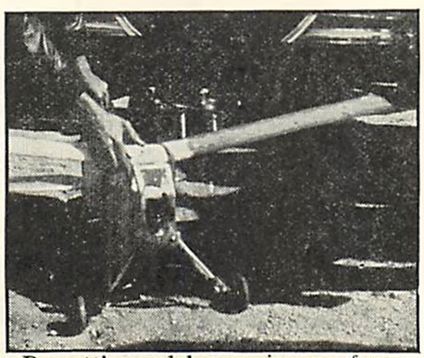
Picture No. 3. Gordon Light and his winning Wakefield model. It flew for 25' and 35" in the official elimination flights

EVERYTHING is over but the shouting. The National Model Airplane Contest held at the Atlantic City Airport has come and gone by, leaving a few healthy dents in the lists of past records. Four world's records were broken beyond repair. Taking everything into account, a great time was had by all due to the beautiful weather, our genial hosts, the Atlantic City Exchange clubs and to the industrious director of the Meet, Mr. Irwin S. Polk of L. Bamberger & Company, Newark, N. J. This latter organization held the meet under the auspices of the National Aeronautical Association and the Airplane Model League of America.



Trophies which were given to the winners at the National Model Airplane Contest, held at Atlantic City, Sept. 9th and 10th

James Parham of Indianapolis, Indiana, who won the Stout Fuselage Contest



Bassett's model warming up for a flight

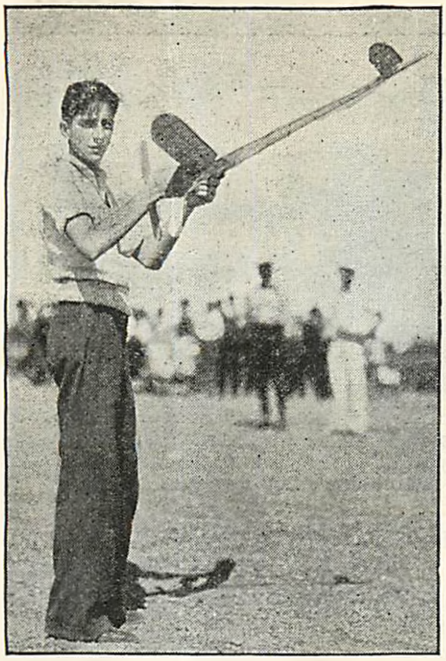
Boys from coast to coast entered their planes in competition for the four standing American trophies and the Lord Wakefield British trophy. In addition, there were 26 silver cups and 47 gold, silver and bronze medals. The entrant coming the farthest distance was Ted Jacques, 598 Main Street, Portland, Oregon. The mid-west states had a good showing, although the majority of the boys were from the metropolitan district.

The outdoor events were held on Friday, September 9th, at the Atlantic City Airport. The wind was the only handicap to the boys, but notwithstanding this handicap the world records were broken. John Ginnetti, 131 South Mississippi Avenue, Atlantic City, N. J., broke the standing record in the Mulvihill Event with his plane flying 6'—57-3/5".

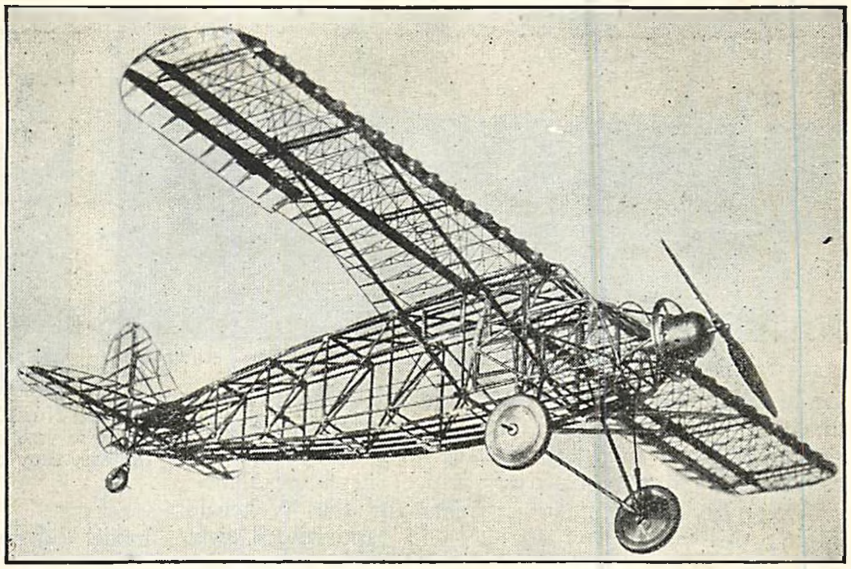
James Parham of 457 Arsenal Avenue, Indianapolis, Indiana, won the Stout Outdoor Fuselage Event with a flight of 4'—57".

THE Lord Wakefield Event was held on Saturday, September 10th, because the winds were too strong on Friday. There were two world records made in this event which was most important due to its international aspect. The English boys have tried hard for three years to take their Wakefield trophy home again but the American lads have tried just as hard to keep it in this country. The international trophy was won by Gordon Light of 1404 Oak Street, Lebanon, Pennsylvania, this year with a record flight of 7'—57-2/5". Light's plane was rubber-propelled. John E. Pelly Fry of London, England, took third place for the British boys with a flight of 3'—22-2/5".

A sixty-inch monoplane taking off from the ground set a world record for gasoline propelled flight. The plane



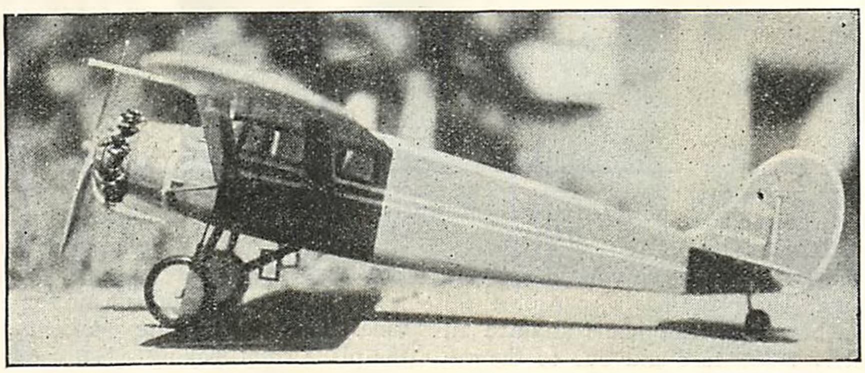
John Ginnetti of Atlantic City, won the Mulvihill Contest. His plane flew out of sight over the city



Picture No. 1. J. F. Roche won first place in the scale model contest with this built-up scale model of a Stinson Lycoming Junior. It is complete in every detail

was constructed by Maxwell B. Bassett of 11th Street and 6th Avenue, Philadelphia, Pennsylvania. The time was 2'—55", taking fourth place in the Lord Wakefield Endurance competition.

A new world record of 13'—3" for the Stout Indoor trophy was established by a tractor plane constructed by Joseph Kovel of 404 Bristol Street, Brooklyn, New York. This event was held on Saturday, September 10th, in the Ball Room of the Convention Hall. The planes in this contest flew two times as long with half the altitude as in the last national contest and it has given the boys a new theory to work on.



Picture No. 2. Roche's model covered. This looks to be the most detailed model ever built

The scale model trophy was won by J. F. Roche, Kansas City, Missouri, with a Stinson Lycoming Junior model. This model contains over three thousand parts and the motor contains over three hundred and fifty parts. Pictures No. 1 and 2 show the completeness of this model. There are elevator controls, rudder controls, adjustable stabilizer, adjustable fin and movable ailerons. The mechanical internal expanding brakes are operated to stop the wheels by pressing upward against the brake arm. Other features of this piece of construction are the shock absorbers, the movable nose shutter, door latches on each door, piano hinges on doors and cowling, upholstered cabin, safety belts, side pockets and cowling latches. The entire ship is built-up.

The boys had a grand time while in Atlantic City. Old friends met and new friends were made. They were introduced to Atlantic City by the most hospitable hosts and everything was done to make their stay interesting and pleasant. Many hotel rooms were rendezvous for the earnest competitors and many others met in workshops, knee-deep in balsa shavings. The boys had learned by past experience that atmospheric conditions warped and twisted their fragile planes, so they came equipped to build and rebuild their ships. Shops were set up almost upon arrival and the workers toiled long and late.

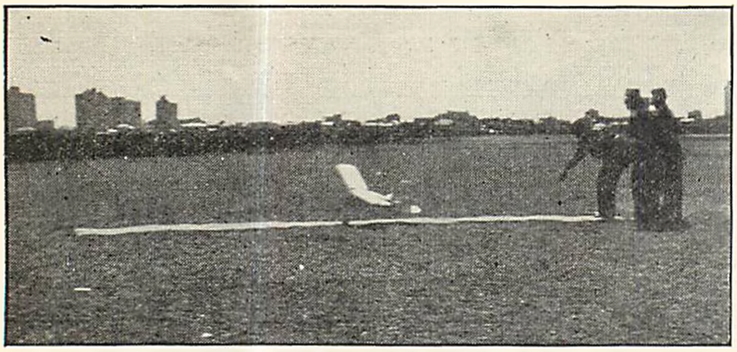
The trophies were presented by Major-General Benjamin D. Fulois, chief of the United States Army Air Corps, at a dinner held in the Hotel Jefferson, Saturday night.

Picture No. 9. Charlie Grant bashfully (or is it rheumatically) maneuvers Fry's (English) plane into position for a take-off

Gordon Light Breaks World Record

There were several features of interest which deserve special comment. One was the record-breaking flight made by the unusual cabin model built and flown by Gordon Light of Lebanon, Pa. Picture No. 3, shows Gordon hold-

Picture No. 11. Here he is at last, out of his hiding place, none other than your editor

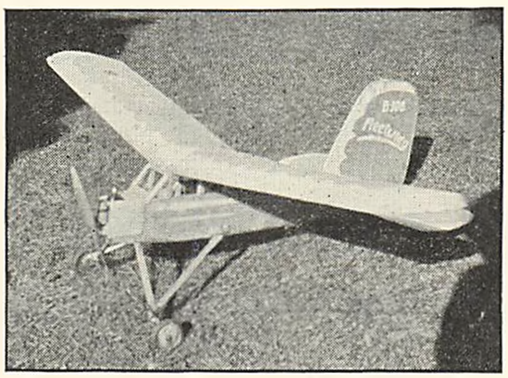


Picture No. 6. The gasoline model makes a quick getaway

ing his ship. One of the remarkable and interesting features of this plane is the fact that it resembles a scale model. It has a transport fuselage with cellophane windows. This did not take away any of its flying ability, however. In the elimination flights for the Wakefield trophy, this plane flew for 25′—53″ and landed eight miles from the airport. Luckily it was recovered without being damaged.

Gasoline Powered Model Plane Sets New World Record

Probably the most unusual exhibition at the contest, was the flights made by the gasoline engine model, built and flown by Maxwell B. Bassett of Oak Lane, Philadelphia, Pa. This clever little ship is shown in Picture No. 4. It is shown at the moment of take-off in Picture No. 5. This plane flew for a world record of 2′—55″. It was powered by a midget gasoline engine which had a bore of ⅞″ and a stroke of 1″, and only weighing twelve ozs. The tiny motor is of the two-cycle type, and with a fourteen inch propeller it will turn four to five thousand revolutions per minute. The plane is of the high wing or parasol type which gives it a great deal of its stability. The plane has a span of 4′ 9″ and is 3′ long. On its best flight this plane attained an altitude of approximately 3,000 feet and due to the velocity of the wind it was recovered several miles away from the starting place.



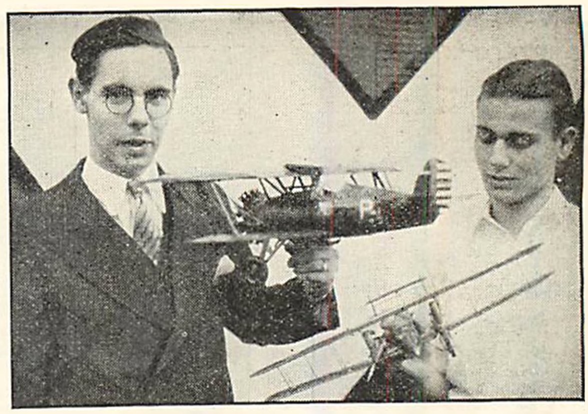
Picture No. .4 The record holding gasoline powered plane, constructed by Maxwell B. Bassett of Philadelphia, Pa.

It required three years of experimenting and building for the builder of the plane to finally develop it to a point where it was sure of flying and being stable in the air, the stability being the most essential thing to the successful flying of this type plane. The three things necessary for the stability of this type plane are the large tail surfaces, the parasol type wing, and the large dihedral. Although it is in its infancy this type of plane powered with a gasoline motor will, in the builder's belief, take the place of the rubber-powered model planes in the near future.

Engish Planes Compete

The Wakefield Trophy remains in this country, although the English boys, John E. Pelly Fry and R. N. Bullock, both of London, England, made a strong bid for it with two beautiful low-wing models. These were flown by Mr. Charles H. Grant, Editor of UNIVERSAL MODEL AIRPLANE NEWS. Fry's model made an excellent flight of 3′—22-2/5″. Bullock's

Picture No. 6. Mr. Fritz of the Philadelphia Model Club puts the finishing touches on the propeller ratchet of Bullock's (English) plane, before a flight



Picture No. 10. Forrest Seiple and Paul Seng of Allentown, Pa., the two villains responsible for Picture No. 9. Nevertheless, they are expert model builders and for that reason must have some good qualities

model did not perform so well. It flew for 1′—18-2/5″. This was not due to the lack of inherent flying qualities of the machine itself, but rather to the difficulty in getting the proper flight adjustment, due to the fact that the tail surfaces were badly warped. This condition evidently caused the ship to stall in flight even though every effort was made to correct it and the wing was carefully set at the marks indicated by its builder. Sea voyages are evidently not helpful in this respect.

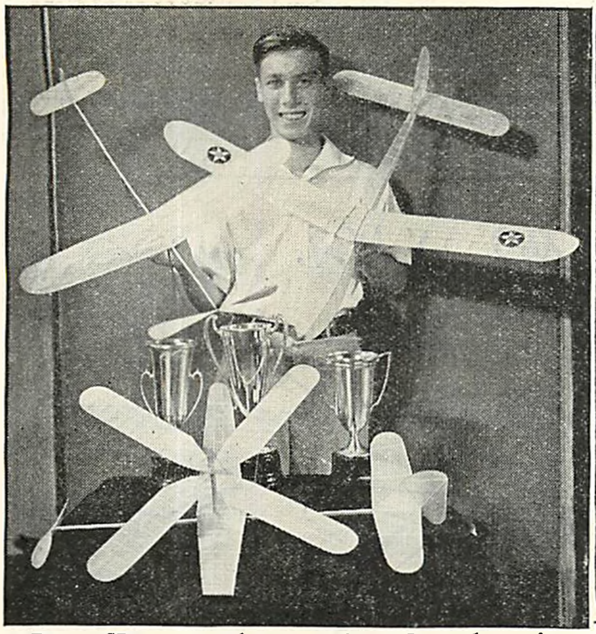
Further misfortune overtook Bullocks plane when the rubber broke while it was being wound and demolished the tail surfaces. It could not be understood why this happened as the motor had been wound only to 600 turns (120 winder turns) and the rubber did not appear to be under strain. The full capacity was 900 turns. The explanation may be that the rubber had been in the box for three months and had been subjected to the action of salt air for a considerable length of time. This unfortunate incident undoubtedly prevented the plane from making a better record on its third flight.

Picture No. 6 shows Mr. Fritz adjusting the propeller on Bullock's ship just before it was launched. In Picture No. 7 Mr. Grant has just finished winding Fry's entry, while Picture No. 8 shows this ship as it was getting away for its long flight.

Editor Makes Debut

Two young men, Forrest Seiple and Paul Seng of Allentown, Pa., at a very unfortunate moment during the big contest, snapped Picture No. 9. Apparently this picture has little value from a photographic standpoint, but I am going to let you in on the secret. The distorted figure is none other than your once respected editor. From appearances it would seem that he is a little bashful or afflicted momentarily with a severe case of rheumatism. However, actually neither of these afflictions is the cause of this super-dignified attitude. He was merely overcautious that the exceedingly long wing of Fry's model would surely clear his legs upon the take-off.

It is only fitting under the circumstances that he should retaliate against



Ralph Kummer, who won three first places in the contest held at Park's Airport, by Stix Baer and Fuller Co., St. Louis, Mo.

Ralph Kummer (left) and Richard Prough and the prizes they won at the St. Louis meet. Prough was high point winner

the perpetrators of this atrocity and show them up for what they are, so he is printing their picture. Picture No. 10, shows them, Forrest Seiple (left) and Paul Seng (right) with two models which they have bui't. This photo is also slightly distorted, so in order to compensate for this fact and get a true conception of their exact appearance, it will be necessary for you to view the picture of these two fiends through a concave or convex reading glass. If Barnum or Bailey should by any chance read this, let me state that Mr. Grant feels credit is due him for calling to their attention these two remarkable specimens.

However, he does not wish to be too severe as they have partially redeemed themselves by sending a *front* view of him which is a better likeness, Picture No. 11. Probably the inspiration to snap Picture No. 9 was caused by the fact that they are used to photographing airplanes, in which case it is desirable to include prominent views of the tail surfaces for technical reasons.

The following list, compiled by Mr. Irwin S. Polk, Director of the Fifth National Contest, gives all the awards won by the contestants:

WAKEFIELD.

Gordon Light, 7'—57-2/5", 1404 Oak Street, Lebanon, Pa.

Arthur Rugger, 4'—13-2/5".

J. E. Pelly Fry, 3'—22-2/5", London, England.

Maxwell Basset, 2'—55", 11th Street and 6th Avenue, Philadelphia, Pa.

Vernon Boehle, 1'—49", R. R. 1, Box 188, Indianapolis, Ind.

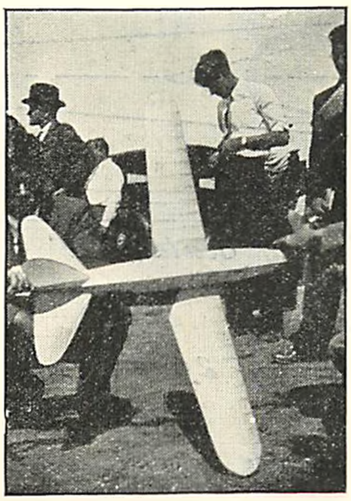
Stephen Faynor, 1'—44-2/5", 66 Congress Street, Newark, N. J.

Paul Schaefer, 1'—22", 3607 East 16th Street, Indianapolis, Ind.

R. N. Bullock, 1'—18-2/5", London, England.

John Young, 1'—15-2/5", 241 East 49th Street, New York City.

Picture No. 8. Fry's model climbs for altitude after the take-off. Charlie Grant (right) who flew the English entries, holds his breath until assured of the success of the launching



Picture No. 7. Preparing Fry's (English) model for its flight of 3'—22-2/5"

SCALE MODEL EVENT.

Stinson—J. F. Roche, 3027 Agnes Avenue, Kansas City, Mo.

Boring—Joseph Battaglio (21), 925—3rd Avenue, New York City.

Aronica—Frank Distler, 130 Tremont Avenue, Fort Thomas, Ky.

Fokker—Robert Crawford (16), 5319 Charles Street, Philadelphia, Pa.

Sirrius—H. W. Owen, 50 Mason Drive, New Britain, Conn.

Supermarine—John P. Tyskeericz, 12 Yoremer Street, Hartford, Conn.

MULVIHILL.

John Ginnetti (16), 6'—57-3/5", 131 South Mississippi Avenue, Atlantic City, N. J.

Henry Orzechowski (18), 5'—30", 411 South 18th Street, Newark, N. J

Vernon Boehle (17), 4'—50", R. R. 1, Box 188, Indianapolis, Ind.

Gordon Light (17), 3'—55", 1404 Oak Street, Lebanon, Pa.

Alton Du Flon (15), 3'—22", 561 Prospect Avenue, Ridgefield, N. J.

Joseph Kovel (17), 3'—09", 404 Bristol Street, Brooklyn, N. Y.

William Coughlin (18), 3'—06-4/5", 194 Warren Avenue, East Providence, R. I.

August Ruggler (16), 2'—50", New York, N. Y.

John Zaic (17), 2'—21-3/5", 328 East 6th Street, New York, N. J.

John Romanowski (16), 2'—14", 205 Railroad Avenue, Jersey City, N. J.

Dick Tremarco (20), 2'—11-2/5", 166 Elm Street, Newark, N. J.

Frank Zaic, 2'—08-2/5", 328 East 6th Street, New York, N. Y.

Edward Beshar, 2'—01", 76 Seneca Avenue, Tuckahoe, N. Y.

Paul Schaefer, 2'—00½", 3607 East 16th Street, Indianapolis, Ind.

Henry Runkel, 1'—24", 10 Beechwood Pl., Elizabeth, N. J. (*Continued on p.* 41)

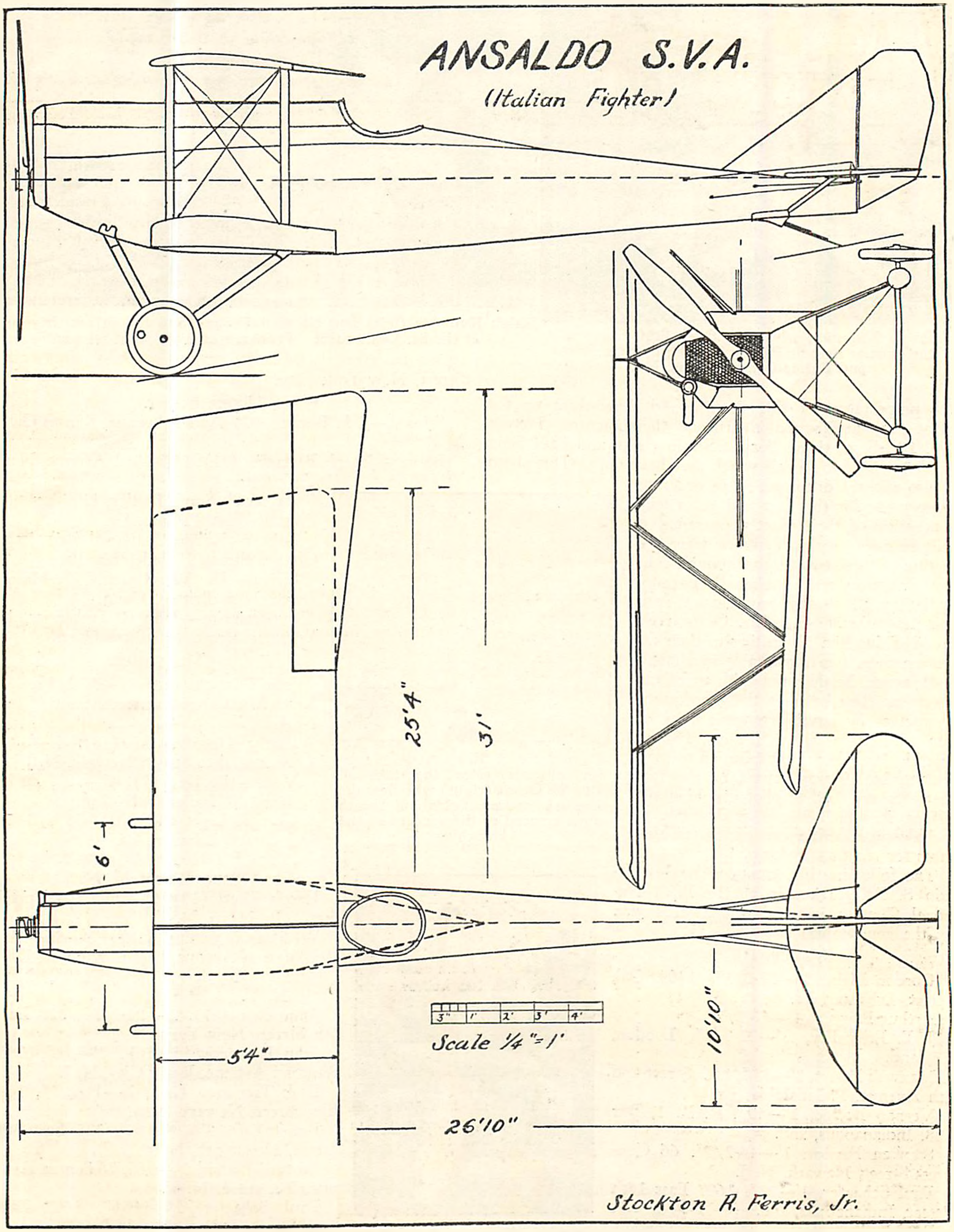
THE ITALIAN ANSALDO S.V.A. FIGHTER

This plane, while not as well known as some of the other war ships, gave a creditable performance, and was very popular with the Italian airmen.

Unusual among its features are the strut braced wings and the unusual fuselage shape. Note how the two lower longerons converge behind the lower wing. This causes the rear portion of the fuselage to be triangular.

The high narrow radiator was placed in front of an SIA engine of 210-220 h.p. This had six cylinders and was of the upright in-line type.

While this machine landed at only 45 m.p.h., it had a top speed of 140 and could climb more than 1000 feet per minute, a good performance even now.



Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board.
Formerly of
The Technical Section, Air Service, U. S. Army.

HELLO, readers. This month you can prepare yourselves for some very interesting questions. In order that we may answer a considerable number of them, we will be as concise with each one as possible.

John Trischka writes us from Bisbee, Arizona, and asks the following questions:

Question 1. I live in an altitude of about a mile. Will this effect the performance of my models?

Answer. Yes, the performance will be effected decidedly. Your models will have less duration, and more speed. This is due to the air being of lower density. While flying models at an elevation of 2,000 feet, I have noticed a marked difference in the performance, than when flown at sea level.

Question 2. Is it possible to prevent fuselage warp caused by stress from the wound rubber-band when no motor stick is used?

Answer. It is possible to make this warp negligible by building the fuselage sufficiently rigid. However, it is a distinct advantage to have the fuselage warp slightly. If the fuselage warps under the tension of the rubber, the stabilizer will be slanted slightly out of line with the wing. This slant causes the machine to have a tendency to turn to the right when a clockwise propeller is used. Now, here is the trick of the whole business. The clockwise propeller has a tendency to turn the machine over to the left, due to the propeller torque. If you build a fuselage so that it will warp just sufficiently to create a tendency to turn to the right, that will exactly balance the propeller torque trying to turn to the left, and your machine will fly an absolutely straight course. In other words, fuselage warp may be used to neutralize the turning tendency of the propeller torque. This has been tried out in practice many times and is very successful.

Question 3. What is the ratio between the length of the fuselage and span of the wing?

Answer. A ratio that will give you good proportion is a span of one and fuselage length of two-thirds.

Question 4. Is it possible to make an efficient propeller by warping sheet balsa over steam?

Answer. Yes. This depends entirely upon the ability of the workman. If you accomplish your task accurately and thoroughly, there is no reason why the propeller will not be most successful. However, the wood may have a tendency to spring back into its original shape, if after steaming thoroughly the parts are not baked in the oven while being held in the desired shape.

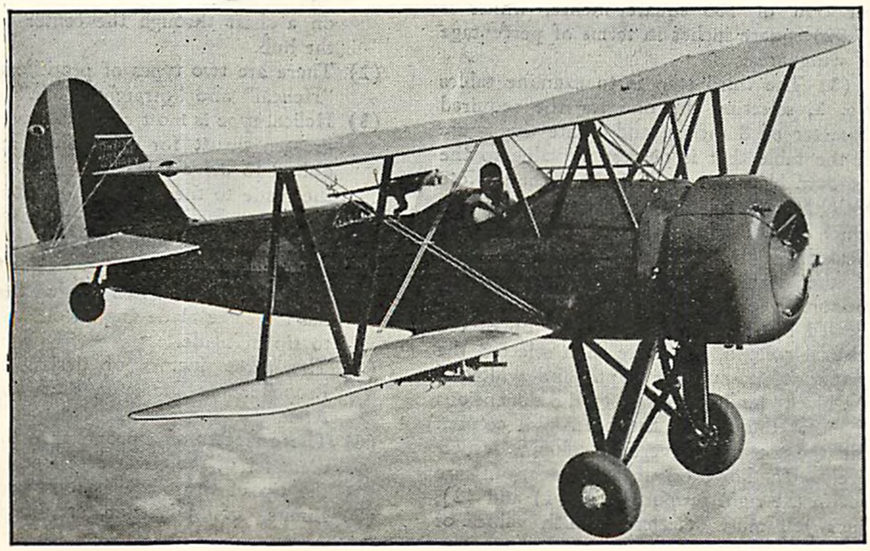
GERALD JENSEN of 4693 Marcy Street, Omaha, Nebr., requests information for a twin pusher, which he wishes to build sometime in the future. This may be of benefit to many of our readers, so we are publishing several of his questions.

Question. Should the main wing of the twin pusher be flat on the bottom or curved, if the ship is to be built for duration?

Answer. I believe that the main wing on such a ship should have a slight curve on the under surface. This decreases the sinking velocity as well as increases the lifting capacity of the airfoil. Ships that I have built with such cross-sectons have won every contest in which they have been entered.

Question. Should I use a high-lift airfoil?

Answer. Yes, I believe this is the proper thing to do. An airfoil should be used whose top surface has a maximum camber of one-eighth the cord. The lower surface should have a maximum camber of one-thirty-second the cord. By building a wing with a high-lift section, you will be able to get a greater amount (*Continued on page* 41)



The Curtiss-Wright "Osprey," a highly maneuverable 2-seat Pursuit, Observation, or Attack plane, has proven to be extremely popular in the export market. It gives an exceptional performance, having a top speed of 174 miles per hour and a climb of 1,620 feet per minute with full military load.

Its armament includes a fixed machine gun firing through the propeller and a flexible machine gun mounted on the rear cockpit. The flexible gun can be fixed in any one of seven positions. It is so arranged that it is possible to fire vertically, or over the sides of the fuselage, affording a very large arc of fire.

This plane is also capable of carrying five 50 lb. bombs under each wing.

The "Osprey" is powered by a 420 h.p. 9-cylinder Wright Whirlwind R-975E engine, the latest model.

Its length is 23′ 2″, height 9′ 1½″, wing span 31′ and wing area 244 sq. ft.

THE AERODYNAMIC DESIGN OF THE MODEL PLANE

A Complete Summary of Basic Facts of Model Propeller Design for Your Ready Reference and Tables of Values for Factors of Design That Will Simplify Calculations

By Charles H. Grant

Article 9 Chapter 2

LAST month you were given typical examples to solve, which pertained to the design of the propeller. One was solved by means of formulas that had been given previously, and the other was a similar problem which could be solved by using proper values selected from tables. As it was impossible to publish these tables in the last issue, you have had to wait for an explanation of the solution through the table method. However, I hope this time has not been wasted and that you have given some thought to the correct solution. If you have, the following explanation of the proper use of the tables will be fairly simple. At any rate, I am not disappointing you this month, for you will find these complete tables on the pages that follow.

How to Use the Tables

In order that you may understand clearly how to make use of the tables, suppose we restate the problem published at the end of the last instalment, and solve it by the table method.

Example.

You are designing a model of which the following factors are known:

1. The wing area is 100 square inches.
2. The propeller is to be 8 inches in diameter.
3. The propeller is to have a pitch of 12 to 13 inches.
4. The model is to be able to climb at an angle of about (10) degrees, a medium low angle of climb.

The propeller must be of a certain design in order that the model will function in the desired manner.

The facts that you wish to know in order to be able to build such a machine are:

(A) The proper amount of blade area for the propeller.

(B) The dimensions of the block from which you can carve a propeller of 8" diameter (12) to (13) inch pitch, and sufficient blade area to be assured of the desired performance.

THE procedure is as follows:

(1) From Table No. 1, determine the *proportion* of depth to width, of block, for a propeller of 8 diameter and (12-13) inch pitch.

In the left hand vertical column you will find the diameters listed. Follow out to the right horizontally from the 8 inch diameter notation until you find the pitch for which you are looking. Then note the (d-w) ratio at the head of the vertical column in which the figure of the desired pitch is located. In this case, the (d-w) ratio is (1-2). In other words, the width of the block should be twice the depth.

(2) Now in Table No. 2, locate the vertical column in which, (d-w)=(1-2), or in which the desired depth, width, ratio is located. Proceed along this column to the

Gordon Light of Lebanon, Pa., carefully designed his propeller for the record-breaking plane he is holding, by means of the formulas and data given in these articles. His ship flew officially for 25 minutes and 53 seconds, covering a distance of eight miles, and establishing a world record

horizontal column in which the desired angle of climb, of 10 degrees, is situated. The figure at the intersection of the two columns is the proper amount of propeller blade area to use. In this case it should be (7.92) per cent of the wing area or (7.92) per cent of 100 square inches, which is (7.92) square inches in terms of percentage of wing area.

(3) The third step is to examine tables No. 3, selecting the one for the required diameter of 8 inches, and locate the figure in the table that is nearest in value to the required blade area of (7.92) inches. Note both the vertical and horizontal column in which it is located. If the depth, as indicated by the dimension at the left end of the horizontal column, is the desired proportion of the width, i.e., (1-2), as indicated by the dimension at the top of the vertical column, you have then selected the proper value, and the depth and width of the block should be equal to the dimensions given at the left of the horizontal column and the top of the vertical column, respectively. If, however, these dimensions are not in the right proportion of (1) and (2), then you must determine which values of the depth and the width given in the table at the heads of the columns are in this proportion. You can then select the blade area value common to any one of these sets of horizontal and vertical columns of (1-2) ratio which is nearest to the required value of (7.2) square inches. The depth and width of the propeller block from which the propeller may be cut, will be indicated at the left and top of the table.

In this case, the value given in the 8" diameter table which is nearest to the desired blade area and of a (d-w) ratio of (1-2) is either (7.75) or (8.42) square inches. One is in the vertical column headed by (1½) and in the horizontal column headed by (¾). The larger value is in the vertical column headed by (1-⅝) and in the horizontal column headed by (13/16). Choose which you desire. The width of our block should then be (1½) and the depth (¾) or the width (1⅝) and the depth (1-3/16) inches. The length of the block should be equal to the propeller diameter you have chosen, i.e. (8) inches. The larger values will give a climbing angle of a little over 10 degrees and the small values an angle of a little less than 10 degrees. If the required area is not shown in the table for the chosen diameter, change the diameter as required.

Summary

FOLLOWING is a complete summary of the important points of propeller design. Given, as they are, in condensed form, these facts should prove valuable to the model designer, for they may be referred to easily and quickly to obtain necessary information, without taking the time to read at length the detailed explanation given previously.

(1) A propeller is a combination of two aerofoils disposed at similar angles of attack and radiating out from a central hub, which rotates in a plane, perpendicular to the line of motion forward, about or on a shaft through the center of the hub.

(2) There are two types of propellers, "Helical" and "Straight Pitch."

(3) Helical type is most efficient (gives greater thrust for the power required to drive it). The angle of the blade to the plane of rotation, grows gradually smaller, proceeding from the hub towards the blade tips.

(4) The "Straight Pitch" propeller has the same blade angle from hub to tip of blade.

(5) The three factors of design of Propeller, are Diameter, Pitch and Area.

(6) The diameter of a propeller is the diameter of the circle described by the tip of the blade as it revolves.

(7) Limits of Diameter are, from

(1/3) the wing span to (1/2) the wing span.

(8) The Pitch may be Actual Pitch or Theoretical Pitch.

(9) The Theoretical Pitch is the distance the propeller would screw itself forward in one revolution, if the blades pass through the air, as they revolved, at zero degrees angle of attack, and the chord of the blades is parallel to the line of motion (or the relative wind). The tables show the Theoretical Pitch.

(10) The Actual Pitch is the actual distance the propeller screws itself forward in one revolution. This is usually less than the Theoretical Pitch by about (25) per cent.

(11) The "Slip" is the difference between the Theoretical Pitch and the Actual Pitch.

(12) Limits of pitch are, from (once) the diameter to (twice) the diameter, as Diam. (10"), Pitch (20").

(13) The formula for Propeller Pitch, (*P*) is given by the following formula, in terms of the Propeller diameter, the depth (d), and the width (w), of the block from which it is to be cut. All dimensions should be in inches.

$$P = \frac{d\,D}{w}$$

(14) The *Area of the Propeller Blades* may be determined from the dimensions of the block from which it is cut, by means of this formula:

$$a = \frac{\sqrt{(d)^2 + (w)^2} + d}{2}(0.4)D$$

d—Depth, w—Width, D—Diameter or Length. All values in inches.

(15) The amount of blade area on any given machine determines the angle of climb.

(16) The amount of Blade Area required for any given propeller (Pitch-Diameter) Ratio, is proportional approximately to the Wing Area for any given camber and angle of incidence.

(17) The Blade Area required for the average model for average conditions of flight is from (10) per cent to (15) per cent of the total area of the lifting surfaces.

(18) In order to change the propeller on a model, which gives a satisfactory condition of climbing angle, to one giving the same performance in this respect, but of a different pitch and diameter, use the following formula:

$$a_2 = a_1 \frac{\sqrt{P_2^3} \times \sqrt{D_1^5}}{\sqrt{P_1^3} \times \sqrt{D_2^5}}$$

Where a_1, P_1, and D_1, are the "Old Propeller Characteristics" and a_2, P_2, D_2, are the new ones.

(19) The Blade Area required for horizontal flight, with no climb, for a model, with a propeller of the average pitch-diameter ratio of (1½) to (1), and with a wing whose camber is 1/12 and angle of incidence (2) degrees, is (3.64) per cent of the wing area. (These are average conditions.)

(20) *The Required Additional Blade Area* for each desired degree of climbing angle, with the conditions stated above, is (0.428) square inches.

(21) *The Required Blade Area* for a model with a *single surface wing* whose camber is (1/12) and angle of incidence (2) degrees and with a propeller of a pitch diameter ratio of (1½) to (1), (average conditions), is given by the following simple formula, in per cent of wing area,

$$a = \frac{(3.6)A + (0.414)U}{100}$$

For the value of (a) required for this same wing when it is of the *double surface type*, multiply the quantity (3.6) A, in the equation by (3/4). For Double Surface Wings the equation ·is then,

$$a = \frac{(2.7)A + (0.414)U}{100}$$

(22) *A Simple Approximate Formula for the Required Value of (a)* given in per cent of wing area, when the wing is of the single surface type, with a camber of (1/12) and an angle of incidence of (2) degrees, is as follows:

$$a = \frac{[(3.6)A + (0.414)U]\sqrt{P^3}}{100\sqrt{(1.5D)^3}}$$

This gives the value of (a) for any propeller pitch and diameter. For double surface wings, the quantity (3.6) A of the formula should be changed to (2.7) A.

(23) *The Actual Blade Area in square inches necessary for any angle of climb*, may be determined by the following formulas, *for any model you may care to design*. For single surface wings:

$$a = \frac{AP^2(1/3+8c)(4+I)\left(1+\frac{U}{8.5}\right)}{160D\sqrt{(2D)^2+P^2}}$$

For double surface wings:

$$a = \frac{AP^2(1/3+6c)(4+I)\left(1+\frac{8.5}{U}\right)}{160D\sqrt{(2D)^2+P^2}}$$

This completes our chapter on the design of the model propeller. If it has been a little involved it has been because of the fact that propeller design is a very complicated problem and one which involves mathematics to a high degree. However, I hope that this treatise on the subject has helped to increase your understanding of it.

Next month the most important problem in aviation will be taken up; that is, STABILITY.

Pitch Tables
No. 1.

The following tables give the propeller theoretical pitch in terms of the dimensions of the "block" from which the propeller is carved. At the heads of the columns, the ratios of depth to width of block are given. At the left the propeller diameter or block length is indicated. The *values shown in the tables are the pitches for the various dimension ratios indicated.*

The formula by means of which the values are calculated, is as follows:

$$\frac{d}{w} = \frac{P}{\pi D}, \text{ or } P = \frac{d\,\pi D}{w}.$$

d = Block Depth.
D = Block Length, or propeller diameter.
p = Propeller Pitch.
w = Block Width.
π = 3.1416.

Diam.	d-w 1-3	d-w 1-2½	d-w 1-2¼	d-w 1-2	d-w 1-1¾	d-w 1-1½
6"	6.4	7.6	8.45	9.5	10.9	12.6
7"	7.33	8.8	9.8	11.	12.6	14.7
8"	8.36	10.	11.16	12.6	15.4	16.7
9"	9.43	11.5	12.6	14.15	16.2	18.9
10"	10.45	12.6	14.	15.75	18.	21.
11"	11.5	13.8	15.4	17.3	19.8	23.
12"	12.56	15.	16.75	18.9	21.6	25.2

Diam.	d-w 7/8-2½	d-w 7/8-2¼	d-w 7/8-2	d-w 7/8-1¾	d-w 7/8-1½	d-w 7/8-1¼
6"	6.65	7.4	8.3	9.54	11.	13.2
7"	7.7	8.57	9.62	11.	12.9	15.4
8"	8.75	9.76	11.	13.5	14.6	17.6
9"	10.05	11.	12.4	14.2	16.5	19.8
10"	11.	12.25	13.8	15.75	18.4	22.
11"	12.1	13.5	15.13	17.4	20.1	24.2
12"	13.1	14.65	16.54	18.9	22.	26.4

Diam.	d-w 3/4-2¼	d-w 3/4-2	d-w 3/4-1½	d-w 3/4-1½	d-w 3/4-1¼	d-w 1/4-1
6"	6.35	7.12	8.2	9.44	11.3	14.2
7"	7.35	8.25	9.44	11.1	13.2	16.5
8"	8.37	9.44	11.6	12.5	15.1	18.8
9"	9.44	10.6	12.2	14.15	17.	21.2
10"	10.5	11.8	13.5	15.75	18.85	23.5
11"	11.6	13.	14.9	17.3	20.8	26.
12"	12.6	14.2	16.2	18.85	22.6	28.3

Diam.	d-w 5/8-2	d-w 5/8-1¾	d-w 5/8-1¼	d-w 5/8-1¼	d-w 5/8-1¼	d-w 5/8-1
6"	5.93	6.84	7.86	9.42	10.5	11.8
7"	6.88	7.86	9.25	11.	12.2	13.75
8"	7.86	9.67	10.4	12.6	14.	15.7
9"	8.84	10:2	11.8	14.15	15.73	17.65
10"	9.84	11.25	13.	15.75	17.45	19.6
11"	10.8	12.4	14.4	17.3	19.25	21.65
12"	11.82	13.5	15.7	18.84	21.	23.6

Required Propeller Blade Area Tables
No. 2.

The figures in the table give the necessary total propeller blade area in per cent of the total wing area, when the wings are the single surface type, for the conditions noted at the head of the columns and at the left of the tables. The values shown are true for an angle of incidence of (2) degrees, and a camber of (1-1/12) the chord.

To obtain correct values of (a), for wings of the double surface type with a camber of (1-1/12) the chord, multiply the value of (a) given in the tables by

$$\left(\frac{6.4 - U}{8.5 - U}\right).$$

To obtain proper values of (a) for other cambers, multiply the values given in the table by (1/3 + 8C), substituting the desired value of (C), the camber, in the above quantity, as (1/8) in place of (C).

At the top of the columns, the pitch-diameter ratios, and the corresponding block depth-width ratios are given.

The angles of climb, corresponding to the various values of blade area, are shown at the left.

Table values have been calculated from regular blade area formular for single surface wings already given.

Where A = 100, and (a) = Propeller Blade Area in per cent of total wing area.

In order to calculate the value for (a) when the wings are *double* surfaced, use the formula given for double surface wings, where (C) is the heighth of the top surface camber in fractions of the chord.

Angle of Climb	Degrees	P = 1.045D d-w 1⅛-3⅜	P = 1.18D d-w 1⅛-3	P = 1.286D d-w 1⅛-2¾	P = 1.415D d-w 1⅛-2¼	P = 1.57D d-w 1⅛-2¼	P = 1.77D d-w 1⅛-2	P = 1.88D d-w 1⅛-1⅞	P = 2.02D d-w 1⅛-1¾
No Climb	0	1.84	2.33	2.60	3.06	3.64	4.39	4.84	5.38
Slight climb	5	2.92	3.70	4.14	4.86	5.79	6.98	7.70	8.55
Med. Low	10	4.01	5.07	5.66	6.66	7.92	9.56	10.53	11.70
Med. High	15	5.18	6.46	7.20	8.48	9.83	12.17	13.40	14.90
High	25	7.25	9.18	10.24	12.05	14.35	17.30	19.07	21.18
Extreme	35	9.43	11.94	13.31	15.68	18.65	22.50	24.92	27.55

d = 1⅛ I = 2° Cs = 1/12

		Low		Med.					High
Angle of Climb	Degrees	P = 1.04D d-w 1-3	P = 1.32D d-w 1-2½	P = 1.39D d-w 1-2¼	P = 1.57D d-w 1-2	P = 1.68D d-w 1-1⅞	P = 1.8D d-w 1-1¾	P = 1.93D d-w 1-1⅝	P = 2.1D d-w 1-1½
No Climb	0	1.84	2.62	3.01	3.64	4.06	4.51	5.24	5.70
Slight	5	2.92	4.16	4.78	5.79	6.46	7.18	8.34	9.07
Med. Low	10	4.01	5.70	6.55	7.92	8.84	9.82	11.40	12.40
Med. High	15	5.10	7.76	8.34	9.83	11.25	12.50	14.51	15.78
High	25	7.25	10.31	11.87	14.35	16.00	17.77	20.63	22.45
Extreme	35	9.43	13.40	15.80	18.65	2.800	23.10	26.82	29.20

d = 1 I = 2° Cs = 1/12

		Low			Med.				High
Angle of Climb	Degrees	P = 1.1D d-w ⅞-2¼	P = 1.22D d-w ⅞-2½	P = 1.375D d-w ⅞-2	P = 1.57D d-w ⅞-1¾	P = 1.69D d-w ⅞-1⅝	P = 1.835D d-w ⅞-1½	P = 2D d-w ⅞-1⅜	P = 2.2D d-w ⅞-1¼
No Climb	0	1.98	2.40	2.93	3.64	4.09	4.66	5.30	6.18
Slight	5	3.14	3.82	4.66	5.79	6.51	7.41	8.42	9.84
Med. Low	10	4.31	5.22	6.37	7.92	8.90	10.15	11.54	13.44
Med. High	15	5.49	6.65	8.12	9.83	11.33	12.90	14.68	17.12
High	25	7.80	9.46	11.54	14.35	16.10	18.36	20.88	24.35
Extreme	35	10.12	12.30	15.00	18.65	20.92	23.85	27.15	31.62

d = ⅞ I = 2° Cs = 1/12

		Low			Med.			High	
Angle of Climb	Degrees	P = 1.045D d-w ¾-2¼	P = 1.175D d-w ¾-2	P = 1.345D d-w ¾-1¾	P = 1.57D d-w ¾-1½	P = 1.71D d-w ¾-1⅜	P = 1.88D d-w ¾-1¼	P = 2.1D d-w ¾-1⅛	P = 2.35D d-w ¾-1
No Climb	0	1.84	2.23	2.816	3.64	4.165	4.84	5.70	6.71
Slight	5	2.92	3.55	4.47	5.79	6.63	7.70	9.07	10.67
Med Low	10	4.01	4.85	6.13	7.92	9.07	10.53	12.40	14.60
Med. High	15	5.10	6.18	7.80	9.83	11.54	13.40	15.78	18.58
High	25	7.25	8.79	11.09	14.35	16.41	19.07	22.45	26.43
Extreme	35	9.43	11.48	14.50	18.65	21.45	24.92	29.20	34.55

d = ¾ I = 2° Cs = 1/12

Angle of Climb	Degrees	P = 1.045D d-w ⅝-1⅞	P = 1.208D d-w ⅝-1⅝	P = 1.31D d-w ⅝-1½	P = 1.427D d-w ⅝-1⅜	P = 1.57D d-w ⅝-1¼	P = 1.745D d-w ⅝-1⅛	P = 1.963D d-w ⅝-1	P = 2.243D d-w ⅝-⅞
No Climb	0	1.84	2.30	2.69	3.11	3.64	4.29	5.16	6.30
Slight	5	2.92	3.66	4.28	4.95	5.79	6.82	8.21	10.15
Med. Low	10	4.01	5.01	5.86	6.77	7.92	9.34	11.26	13.71
Med. High	15	5.10	6.37	7.45	8.62	9.83	11.88	14.30	17.44
High	25	7.25	9.06	10.60	12.25	14.35	16.90	20.34	24.81
Extreme	35	9.43	11.78	13.87	15.93	18.65	21.98	26.41	32.25

d = ⅝ I = 2° Cs = 1/12

Blade Area and Block Size Tables

No. 3.

These tables give the area the propeller blades will be, when cut from blocks of various dimensions. A separate table is given for the various diameters that you may care to use. The dimensions given in the left hand vertical column indicate the DEPTH of the block. The dimensions given in the horizontal row at the top, show the WIDTHS.

For instance in the table for (6″) diameters: if a blade area of 4.08 is required, this area, which appears at the bottom of row number two, can be gotten by cutting the propeller from a block (5/8) inches deep by (7/8) inches wide, by six inches long.

TABLE FOR 6″ DIAMETERS

Depth in Inches	Width in Inches				
	¾	⅞	1	1⅛	1¼
5/16	2.69	2.98	3.27	3.56	3.86
⅜	2.91	3.19	3.47	3.76	4.04
7/16	3.14	3.41	3.68	3.97	4.23
½	3.37	3.63	3.89	4.16	4.43
9/16	3.60	3.85	4.11	4.42	4.64
⅝	3.85	4.08	4.33	4.60	4.86

TABLE FOR 7″ DIAMETERS

Depth in Inches	Width in Inches					
	⅞	1	1⅛	1¼	1⅜	1½
⅜	3.72	4.05	4.38	4.71	5.04	5.37
7/16	3.98	4.30	4.62	4.94	5.26	5.58
½	4.24	4.54	4.85	5.17	5.48	5.80
9/16	4.49	4.80	5.11	5.41	5.71	5.03
⅝	4.76	5.05	5.35	5.65	5.95	6.26
11/16	5.03	5.32	5.61	5.91	6.21	6.51
¾	5.32	5.60	5.89	6.18	6.48	6.78
13/16	5.62	5.89	6.18	6.46	6.76	7.06

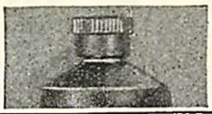
TABLE FOR 8″ DIAMETERS

Depth in Inches	Width in Inches					
	1	1⅛	1¼	1⅜	1½	1⅝
½	5.19	5.54	5.91	6.26	6.63	7.00
9/16	5.49	5.84	6.19	6.53	6.89	7.24
⅝	5.77	6.11	6.46	6.80	7.16	7.51
11/16	6.08	6.41	6.76	7.10	7.44	7.78
¾	6.40	6.73	7.07	7.41	7.75	8.09
13/16	6.73	7.06	7.39	7.73	8.06	8.42
⅞	7.07	7.39	7.72	8.06	8.38	8.74
1	7.72	8.03	8.34	8.65	8.96	9.27

TABLE FOR 9″ DIAMETERS

Depth in Inches	Width in Inches					
	1¼	1⅜	1½	1⅝	1¾	2
⅝	7.28	7.69	8.10	8.51	8.92	9.73
11/16	7.61	8.02	8.42	8.83	9.24	10.06
¾	7.95	8.36	8.75	9.15	9.56	10.38
13/16	8.30	8.70	9.09	9.47	9.88	10.69
⅞	8.65	9.04	9.43	9.80	10.20	11.00
1	9.36	9.74	10.12	10.46	10.85	11.65
1⅛	10.07	10.44	10.80	11.12	11.50	12.30
1¼	10.78	11.14	11.48	11.78	12.15	12.95

(Continued on page 38)



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BIG 10c Tube 'Dri-Qwik' CEMENT— 5c

Not more than 3 Tubes to a customer

MODEL BUILDERS OF AMERICA! To show our interest in you model builders and to introduce our quality line of supplies, we will allow you to purchase three (3) tubes of our secret, new "Dri-Qwik" Cement at 5c per tube—HALF the usual price! But you *must act immediately* as this "Get-Acquainted" Offer expires at midnight, November 10th. Our new, secret, cement-formula promises you the best model airplane cement you ever used. It is clear, extremely lite-weight, dries quick, holds tight, easy to use, and is *economical*. Made and intended *solely* for model building! Please NOTE: That no order for cement will be accepted without an additional order of at least 25c worth of model airplane supplies. Now order—and SAVE MONEY!

This Offer Good Only Till Midnight, November 10 - Order Now!

Actual Photo Shows Full Size Tube!

A Group of *Progressive* Business Men Have Joined Hands To Create This NEW Company *For The Purpose* of Giving The Model Builders of America *Not Only* Splendid Quality . . . *Not Only* Bargain Prices . . . *Not Only* Fast, Business-Like Service—but to *Also* GUARANTEE *Full Satisfaction or Refund Your Money!*

HOW IT STARTED

One evening a group of *business men*—all model airplane *enthusiasts*—were discussing their hobby at the home of a mutual friend. During their conversation, one of the group said: "Why not pool our *business* brains, experience, and model airplane interest together with our adequate capital, in organizing a company whose biggest aim shall be to SERVE THE MODEL BUILDERS OF AMERICA!" He continued: "By this I mean to give builders the best *quality* supplies possible, at the most *reasonable* prices, to give them the *quickest*, most *efficient* service, and above all, to absolutely GUARANTEE that all supplies sold shall be satisfactory to the buyer, or an exchange will be made, or the customer's money will be promptly refunded!" The idea was discussed thoroughly—and O.K.'d! The best possible machinery was installed, skilled workmen were hired, a business-like, efficient system was created . . . the best of merchandise was purchased. NOW we invite you—we URGE you—to *order at once* and enjoy the experience of doing business with a modern business organization!

BALSA STRIPS
24" Lengths

1/16" square, each.... .01 ....12 for 5c
1/16 x 1/8", each...... 1c ....10 for 5c
3/32" square, each .... 1c .... 9 for 5c
1/16 x 1/4", each...... 1c .... 8 for 5c
1/8" square, each...... 1c .... 8 for 5c
3/32 x 3/16", each..... 1½c .... 8 for 8c
1/8 x 3/16", each...... 1½c .... 8 for 8c
1/8 x 1/4", each...... 2c .... 5 for 7c
1/8 x 3/8", each....... 2c .... 5 for 7c
1/4 x 1/2", each....... 3c .... 5 for 10c
3/8" square, each...... 4c .... 5 for 16c
3/8 x 1/2", each....... 5c .... 5 for 20c
1/2" square, each...... 6c .... 5 for 25c
1 x 1", each...........13c .... 4 for 45c

Other sizes to order.

BALSA STRIPS
36" Lengths

1/8" square, each...... 1c ...... 6 for 5c
1/8 x 1/4", each...... 2c ...... 6 for 10c
3/16" square, each..... 2c ...... 5 for 9c
1/4" square, each...... 3c ...... 5 for 12c
1/8 x 3/8", each....... 2c ...... 5 for 9c

SHEET BALSA

	24"	36"
1/32 x 2"	3c	
1/16 x 2"	4c	5c
1/16 x 3"	6c	
1/16 x 4"	9c	
3/32 x 2"	4½c	6½c
1/8 x 2"	4½c	6½c
3/16 x 2"	6c	9c
1/4 x 2"		11c

PROPELLER BLOCKS

3/8 x 1/2 x 6", each.... 1c......6 for 4c
1/2 x 3/4 x 6", each.... 1c......6 for 5c
9/16 x 7/8 x 7", each.... 2c......6 for 10c
3/4 x 1⅛ x 8", each.... 3c......3 for 8c
7/8 x 1¼ x 8", each..... 4c......3 for 10c
3/4 x 1½ x 8", each..... 5c......3 for 13c
3/4 x 1¼ x 10", each.... 6c......3 for 15c
1 x 1½ x 8", each...... 7c......3 for 18c
1 x 1¼ x 10", each...... 8c......3 for 21c
1 x 1½ x 10", each...... 9c......3 for 24c
1 x 1½ x 12", each.....10c......3 for 27c
1¼ x 1⅝ x 12", each....13c......3 for 35c
2 x 2 x 12", each.......17c......3 for 48c

PLANK BALSA

1 x 3 x 36"................. 33c
1 x 6 x 36"................. 55c
2 x 3 x 36"................. 55c
2 x 6 x 36"................. 80c
2 x 6 x 40"................. 95c

JAPANESE TISSUE

White, 19x26" ..... 4c per sheet
36c per doz.

Red, yellow, green, blue, black, orange, and khaki colored Jap tissue, 20½x24".....5c per sheet
48c per doz.

BEST GRADE RUBBER

No. 20 sq. (.045")......3 ft. for 1c
1/32 x 1/16" ....3 ft. for 1c
1/32 x 1/8" ....3 ft. for 1c

BAMBOO

1/16x1/4x12".... 1c ea. 6c per doz.
1/16x1/4x15".... 1c ea. 8c per doz.
1/16 sq. x 12"....4 for 1c 36 for 8c

DRI-QWIK CEMENT

Large size tube 10c
Pint 85c

BANANA LIQUID

1 oz. bottle 7c
2 oz. bottle 10c
Pint 60c

ACETONE

2 oz. bottle 10c
Pint 75c

ALUMINUM TUBING

1/16" dia., per ft..................... 8c
3/32" dia., per ft..................... 8c
1/8" dia., per ft...................... 10c
3/16" dia., per ft..................... 11c
5/16" dia., per ft..................... 13c

CELLULOID WHEELS

Come in red, green, yellow, blue, white, and black.

3/4" dia. ....per pair 6c
1" dia. ....per pair 7c
1-3/16" dia. ....per pair 8c
1-3/8" dia. ....per pair 10c
1-7/8" dia. ....per pair 16c
3" dia. ....per pair 30c

CELLULOID DUMMY MOTORS—9 cyl

1½" dia. 18c
2" dia. 22c
3" dia. 22c

STREAMLINED WHEEL PANTS

Large size to fit 1¾" and 1⅞" dia. wheels, pair 29c
Small size to fit ¾" and 1" wheels, pair 15c
N.A.C.A. Cowling, 3" dia., each...... 25c

DOWEL RODS

1/16" dia., 24" long.............. 8 for 5c
1/8" dia., 30" long...............7 for 5c

THRUST BEARINGS

Small size.... 2c each; per dozen..... 18c

SHEET ALUMINUM

.006" thick, per sq. ft................ 12c
.010" thick, per sq. ft................ 18c

CELLULOID SHEETS

4 x 6" 3c

WASHERS

Per doz. 5c

PROPELLER SHAFTS

Pair 3c

MUSIC WIRE

Straightened and cut to 2 foot lengths.

.014" .020" .029"
.016" .022" .032"
.018" .024"

2c per length.

Quick, Easy Way to Order!

1. No order under 25c accepted. On supply orders up to $1.50 add 15c packing, postage charge. Add 10% on order over $1.50.
2. If west of Mississippi, add 10c extra to above charges.
3. We pay postage and insurance on orders of $4 and over except on balsa planks.
4. *Canadians* add 25c for packing, postage, on order up to $1.50. Add 15% on orders over $1.50 No postage or coin accepted.
5. Remit by postal or express money order. If you send check, add 15% to cover exchange.
6. Print Name, Address, items ordered, *clearly*.
7. Satisfaction Guaranteed, or Exchange Made, or Money Back.

"Dependable, Business-Like Service for The Model Builders of America!"

BALSA PRODUCTS CO. OF AMERICA

1319 SOUTH FIFTH AVENUE—DIV. M-210—MAYWOOD, ILLINOIS

Aerodynamic Design

(*Continued from page 36*)

TABLE FOR 10" DIAMETERS

Depth in Inches	Width in Inches					
	1⅜	1½	1⅝	1¾	2	2¼
¾	9.28	9.72	10.17	10.63	11.55	12.49
13/16	9.67	10.10	10.53	10.98	11.88	12.82
⅞	10.04	10.48	10.91	11.35	12.25	13.16
1	10.82	11.24	11.64	12.06	12.95	13.85
1⅛	11.60	12.00	12.38	12.78	13.67	14.56
1¼	12.40	12.76	13.16	13.51	14.40	15.30
1½	14.00	14.42	14.83	15.22	16.00	16.81

TABLE FOR 11" DIAMETERS

Depth in Inches	Width in Inches					
	1⅜	1½	1⅝	1¾	2	2¼
¾	10.20	10.70	11.18	11.70	12.71	13.72
13/16	10.62	11.11	11.60	12.09	13.07	14.11
⅞	11.05	11.52	12.00	12.49	13.46	14.48
1	11.90	12.35	12.81	13.28	14.25	15.24
1⅛	12.76	13.18	13.65	14.10	15.03	16.02
1¼	13.63	14.05	14.48	14.95	15.85	16.83
1½	15.40	15.85	16.30	16.76	17.60	18.50

TABLE FOR 12" DIAMETERS

Depth in Inches	Width in Inches					
	1⅜	1½	1⅝	1¾	2	2¼
¾	11.11	11.65	12.19	12.74	13.87	15.04
13/16	11.56	12.11	12.65	13.16	14.28	15.44
⅞	12.02	12.57	13.09	13.60	14.69	15.83
1	12.97	13.50	13.99	14.48	15.54	16.64
1⅛	13.95	14.46	14.92	15.38	16.41	17.48
1¼	14.93	15.41	15.86	16.32	17.33	18.37
1½	16.97	17.38	17.83	18.27	19.21	20.20

How Well Do You Know Your Airplanes

(*Continued from page 9*)

ance and features of the various machines. His work was excellent.

The winner of the third award of $2.00 is Mr. William Pinnell of 1319 Avenue L, Brooklyn, New York. Pinnell's answers were all correct and he gave a considerable amount of detail.

We wish to give honorable mention to the following contestants:

Douglas H. Gilmour of Brooklyn, New York.

Jarden McCorkle of Gladwyne, Pa.

G. Robert Knapp of White Plains, New York.

Richard Korns of Dayton, Ohio.

William Fraser of Brooklyn, New York.

Whats and What Nots

(*Continued from page 8*)

about one-half as high at the tips as they are at the inner wing ends. This taper shows on Fig. 5, the front view of the wing. Therefore, the nose end of each rib will be slightly smaller, this dimension being called B. Naturally, since we have a tapered wing, each rib will be lower over all, this dimension being A. A and B are taken from the front view. From the top

(*Continued on page 40*)

Build the World's Fastest Pursuit Plane

(Continued from page 23)

of the cockpit white and all fittings black in order that they may stand out. Instruments may be drawn on the dashboard if you wish.

The entire fuselage should be painted olive drab, as well as townsend ring, and landing gear fairings.

Paint the motor parts black, also tires of three wheels.

Wing, tail units, and hubs of wheels should be painted orange, also air speed indicator except for wires which are to be black. When paint on wing has dried, draw the insignias on the wing tips. Paint the star white, the small circle inside of it red, and the rest of the insignia blue. The horizontal stripes on the rudder should be red and white alternately while the vertical band should be blue. The lettering "XP-936" and "Boeing" should be printed in black on the rudder. Paint insignia on both sides of rudder and wing tips.

Paint the "prop" silver with a black shaft.

Paint flying lights black.

Assembly (No. 1 plan)

First attach stub wings to fuselage, using plenty of ambroid. You may have to cut a little off the stub wings so they will fit fuselage snugly. Be accurate!

When ambroid has dried, connect rest of wing. Place blocks under tips to give the wing a three degree dihedral angle.

Next ambroid horizontal tail pieces in place and then fin and rudder. Look at the tail units from all angles to see that they are not crooked.

Install tail wheel in fairing, using half a pin as axle.

Then proceed to ambroid cylinders to nose and connect push rods. Cement townsend ring over motor by means of pegs between one or two cylinders.

Install wheels in "pants" with pins and ambroid landing gear to stub wing where it joins main wing. Connect all guy wires, which may be supplemented by black thread. Pins may be used in holding them to parts. Ambroid small strips of wood in place as shown in three-view layout to hold thread firmly. Paint these pieces black.

Ambroid air speed indicator on leading edge of wing and install fittings in cockpit.

Pin "prop" to nose and touch up all spots with paint. The plane will then be completed. You could not ask for a better replica of that speedy pursuit, the XP-936.

Belgium's Greatest Ace

(Continued from page 21)

his foe, an Aviatic flying high some distance off to the east and immediately turned his Nieuport toward her in hot pursuit. When the German saw that his efforts to escape were futile he decided to turn and make a fight of it. Thieffry never gave him a chance to finish the maneuver, so fierce was his attack. Round after round of machine gun bullets burst into the Boche ship. She completed half the turn her pilot had put her into, shuddered as if feeling the impending disaster and then went into a nose dive from about 11,000 feet.

Thieffry started to follow her down still pumping lead into her tail. It was his first

(Continued on page 43)

Whats and What Nots

(*Continued from page* 38)

view, Fig. 6, we get the rib lengths, or C. Fig. 7 shows a rib with these dimensions indicated. Fig. 8 shows how the ribs are laid out. S is your strip of sheet balsa. The dotted lines indicate the No. 1 rib which is cut out first and smoothed to the correct shape. The lines first drawn on the balsa are indicated, the dimensions D, E, and F being taken from the front and top views as explained before. We are, of course, now making the No. 2 rib. Place the cut out No. 1 rib over the lines and slide it along until the top curve or camber touches at the points indicated X. Then draw along the No. 1 top curve with a pencil. If your ribs have a bottom camber, the same procedure is followed, but you will have one more dimension to handle. Cut out the No. 2 rib and use it, *not No.* 1, to make No. 3. Proceed this way, using each rib to make the succeeding one. (See also August issue, page 14, Fig. No. 4.)

To assemble the wing, lay out the exact top view on a board. Pin down the extreme leading and trailing edges and the extreme outer and inner ribs. The rear spar, being on the bottom, may also be put in place now. The remaining ribs may now be installed, the top spar being put on last. When making ribs for a tapered wing, it is a good plan to make them all a 1/16 inch or so too long, at the rear end. Then they cut be cut to fit. Any of you who have had tapered wing ribs come out too short when being assembled will appreciate this. Of course, it is presupposed that the slots for the various spars are cut before assembly, getting the dimensions from the top view.

The procedure for assembling tapered wings as given above, may very well be followed for straight wings, thereby assuring proper alignment of the finished wings.

Wing tips are usually made of bamboo, bending them all from one piece, then splitting it to get the same curve. If the tips of a biplane are all alike, as in the S. E. 5, all four can be made from one piece. For small models, such as those of one-foot span, 1/16 inch diameter reed is very useful for tips. When laying out the wing outline on your board, always draw the tip shape as it should be, then the bamboo or reed may be glued in place, using pins to hold them to shape.

Some builders prefer built-up balsa tips. Since cross grain balsa is weak, several pieces must be used, placed as shown in Fig. 9. Such tips may be cut out roughly and glued in place, to be finished and smoothed off when the wing is removed from the board.

Fig. 10 shows another form of tip, made from a block of balsa. This tip is best for use on tapered wings with a tip shape as shown. It cannot be used on circular or rounded tips because too much wood would be needed. The block of proper size is first cut to the proper airfoil shape, then the tip shape is cut out. Finish it off after the wing is removed from board.

Always brace the tips well, for they not only take up considerable shocks in landing, but, if unbraced, the paper or other covering will pull them out of shape when

(*Continued on page* 41)

Whats and What Nots

(Continued from page 40)

tightened. Fig. 6 shows a properly braced tip. L and M are continuations of the top and rear spars respectively, while N goes to the tip from the top of the rib the same as does L.

BEFORE going farther it may be mentioned that very good wings can be made of sheet balsa. These are best for small models, but wings up to two feet or more can be made this way. Usually only one or two ribs are needed, one at the center, and if the wing is long, one more about halfway to the tips. The sheet is first cut to the shape desired, and moistened lightly *on top*. It can then be bent to the proper curve and the ribs glued on the under side. The whole should be pinned to a board while drying. If dihedral is needed, make the wing in two halves, with an inside end rib on each. These ribs may then be sanded to the proper angle and glued flat against each other, the wing tips being propped up to the correct height and left to dry. It is not necessary to cover the lower side as this will add weight. Needless to say, the wood for a wing such as this must be selected with care in order to be light enough. Very thin balsa about 1/64 inch is sometimes used to cover the leading edge of a wing, going from the nose to about one-third the way back, or to the highest part of the rib curve. This makes a very fine job if well done, and yet adds but little to the weight.

If you wish to get a smoother front shape on your wing, and yet do not want to use a large number of ribs, the desired result can be obtained by using a nose rib between each two regular ribs. These nose ribs may be very thin and serve only to hold the paper out to the proper shape. On straight wings, they may have the same curve as the regular ribs. If the bottom of the wing is flat they do not need to extend down to it. Fig. 7 shows a nose rib to be used with the large rib shown. Of course,

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Aviation Advisory Board

(Continued from page 33)

of lift from less wing area. Thus, a certain amount of weight will be eliminated because of the cutting down of the amount of construction necessary, or vice versa, from the same amount of wing area at any given speed, you will get greater lift. On the other hand, with the same amount of wing area, you may reduce the speed considerably and yet obtain the same amount of lift.

Here is a question from Robert D. Bensel, of East Douglas, Mass. Those who are building gliders may be interested in it.

Question. What is the best kind of wood to use in the construction of the framework of the primary glider?

Answer. Spruce is the best material that you can use. It should be straight-grained and free from knots. Spruce has greater strength for a given weight than any other wood.

Question. What instruments would I need to construct such a machine?

Answer. I would suggest the following: wood saw, cross-cut and rip; small metal saw, wood plane, vise, wrenches, screwdrivers, flat and round files, small hammer, drills of various sizes with a brace or electric drill to hold them, small and large pliers, wire cutters, small anvil, needle and thread. Also materials which go into the construction of the ship, such as Casco Blue, Duco cement dope, small screws and brads, small rivets and bolts. There are many other conveniences in the line of tools and material that may facilitate your work.

AIR—WAYS

(Continued from page 31)

Steve Laynor, 1′—08½″, 66 Congress Street, Newark, N. J.
Leon Haynes, 1′—05″, 143 West 138th Street, New York, N. Y.
Ernest Shannon, 1′—12″, 85 Lenox Avenue, New York, N. Y.
Edward Grannis, 1′—11-2/5″, 1615 Kennedy Street, N. W., Washington, D. C.
Richard Lewis, 1′—03″, 49 Ardmore, Providence, R. I.
Bernard Collins, 1′—01″, 328 Plainfield Street, Providence, R. I.

STOUT INDOOR.

Joseph Kovel, 13′—3″, 404 Bristol Street, Brooklyn, N. Y.
Emanuel Enderlein (18), 12′—50″, 316 Fountain Street, Philadelphia, Pa.
Carl Goldberg (19), 12′—38″, Anderson Road, Purchase, N. Y.
Emanuel Radoff (17), 9′—05″, 535 South 16th Street, Newark, N. J.
Jessie Jessen (16), 9′—00″, 2853 North Marshall Street, Philadelphia, Pa.
Robert Wilde (16), 8′—54-4/5″, 3821 Dearien, Philadelphia, Pa.

(Continued on page 43)

Whats and What Nots

(Continued from page 41)

on a tapered wing, the nose ribs must be progressively shorter, just as the large ribs and may be made the same general way.

The writer does not advocate cut out ribs, except, perhaps, for exhibition models, as they are too fragile for continued flying use. Instead of cut-out ribs, you can save just as much weight with a lot less work by using thinner sheet balsa.

It is preferable to make wings detachable, especially in the larger models, as this system serves a dual purpose. The model is much more easily transported or stored if the wings come off. A more important point, however, is that detachable wings are a fine means of absorbing shocks. When the ship strikes an obstacle, the force of the blow which is used in moving the wing would otherwise break a spar or cause other damage. Of course, detachable wings are a little heavier than the fixed type, so if you want to save all the weight possible, do not use them.

On endurance models, especially of the single stick type, the wings are often fastened on with wire clips of various shapes which slip onto either the motor stick or a similar piece provided for the purpose.

Very often it is convenient, especially on commercial type endurance models, to hold the wing on with rubber bands around the fuselage. These bands may go over the wing, or they can be fastened to wire clips glued to edges or bottom of the wing. The latter scheme is much the neater.

The clip or rubber method of fastening has the added advantage of allowing fore and aft movement of the wing for purposes of balance.

However, when we come to strict scale copies of large airplanes, the best method is the use of wing pins on the fuselage or center section, which fit into holes in the spars, or much better, into pieces of small aluminum tubing bound to the sides of the spars. When holes are made in the spars, the pins always enlarge them after some use. With the tube method, this cannot happen, and the pins can be bent slightly in the middle so they will hold the wings firmly.

Another great advantage of the wing pin method over all others is that the all-important dihedral can easily be used, yet, if the model is to be used for exhibition, the wings can be flattened out to a very slight angle or none at all, as the big ships are usually rigged.

When the wing pin method is used on a low wing model where the wings come up against the fuselage, always use balsa spars across the fuselage and bind one wing pin to each end. The whole assembly may then be glued in place on the fuselage, on blocks or any other way. When bending pins installed this way, always grasp the pin as near the fuselage as possible with a pair of pliers. Then hold the pin on the other side, not the fuselage, when doing the bend-

(Continued on page 44)

AIR—WAYS

(Continued from page 41)

John Tyrrell (17), 8′—43-4/5″, Ruunemede, N. J.

George Meeks (18), 8′—37-3/5″, 2608 Myrtle Avenue, N. E., Washington, D. C.

Francis Schaider (15), 8′—36″, 41 West View, White Plains, N. Y.

Jimmy Throckmorton (18), 8′—28-2/5″, 122 North Congress Avenue, Atlantic City, N. J.

Thomas Donohugh (18), 8′—25″, Wesseley Avenue, Nat. Park.

Seymour Henig (13), 8′—06-4/5″, 166 Renner Avenue, Newark, N. J.

Lawrence Smithline (16), 8′—05″, 301 West 109th Street, New York, N. Y.

Blair Bennettt (15), 7′—56-4/5″, 1410 M Street, N. W., Washington, D. C.

Ted Jaques (20), 7′—42″, 595 Main Street, Portland, Ore.

Welcome Bender (16), 7′—37″, 699 Newark Avenue, Elizabeth, N. J.

(Continued on page 45)

Build a War Time Sopwith Dolphin

(Continued from page 12)

realistic. No bracings are used on the tail as it would be difficult to get at the rubber. The model is now complete except for the installation of the necessary rubber.

Flying the "Dolphin"

The motive power consists of six strands of 1/8 inch by 1/30 inch "Para" rubber (approx. six feet) for indoor flying or calm outdoor flying. Should the builder be desirous of flying the "Dolphin" in windy weather, which is not advisable, he may use eight strands of rubber which supplies the needed power. The rubber is rigged up in the usual manner and an "S" hook is employed so a winder may be used. By the use of a good rubber lubricant, more turns can be given the rubber, thereby increasing the duration. A winder of the five-to-one variety is used when winding the rubber, 500 turns can be given six strands and about 350 turns for eight strands. The last section is left open so that a winder may be used. Only a little slack is necessary.

The model should balance correctly, a heavy nose being built in. The original plane was perfect in balance, no adjustments whatsoever being made. Turning the rudder makes the model circle, but it may be left straight for distance. If the model does not balance corectly in flight, weight is added to the nose to stop stalling, or weight is added to the tail to stop diving (not likely).

Although the tests were made in cold weather the average duration was approximately sixty seconds. With the advent of warm weather, the duration should be about 25 per cent longer. A long steady climb is characteristic of this model as is also an exceptionally long and flat glide, which are both necessary to a flying scale model for duration. See the flying photographs for characteristic poses in flight, these were taken soon after it was launched.

Wind'er up and let'er go—good luck!

Belgium's Greatest Ace

(Continued from page 39)

conquest and he wished it to be a certain one. At about 9,000 feet smoke started trailing from the ship that bore the maltese cross and in another moment a streak of flame began issuing in her wake.

At the sight of the flames the Belgian nosed up. His first antagonist was doomed and he knew that proximity to an exploding gas tank might cause an unhappy ending for himself. He headed for home content and landed to find his initial conquest already on its way for official recognition and confirmation.

The second battle came soon enough when he ran against a pair of Aviatics on the 23rd of the same month.

Evidently feeling there was strength in numbers the two Germans made for Thieffry at the same time that he turned to meet them. The Germans opened fire first and bullets were tearing through the fabric of his wings long before the Belgian set his own gun into action.

When he did finally commence shooting at the nearer of the two Boche ships his aim was well nigh perfect and a pretty patter of holes began appearing against the fabric of the fuselage. From nose to tail, back and front the Belgian played his gun until finally he found the mark he was striving for. The petrol tank finally succumbed to the barrage of steel and in a moment the whole Aviatic was a seething mass of fire.

Meanwhile, the second German had begun a haphazard fire upon Thieffry who turned his entire attention upon his assailant. When the latter saw his comrade fall in flames he quickly lost heart in the engagement and dove away, heading for the friendly protection of his own lines.

(Continued on page 44)

It was not until the middle of May that this persevering flyer succeeded in bagging his third quarry and another month went by before the fourth German fell victim to his prowess.

This happy event occurred on July 3rd and not only did this battle loving Belgian succeed in entering the charmed circle but he broke away from it with a brace of victories. They came early in a prolonged fray that nearly ended in his own undoing.

It was early afternoon when Thieffry was returning home to Bruges after an idle morning during which he had not even sighted a German ship. The monotony of the day was suddenly shattered when a formidable group of fourteen Albatross appeared almost without warning from a heavy cloudbank above and surrounded him completely.

With ships all about him in this fashion, Thieffry's position seemed utterly hopeless. Under the circumstances Thieffry figured there was only one thing to do—attack. This, he reasoned to himself, would probably throw the Germans temporarily off guard and perhaps offer him an opportunity to escape from his unhappy plight. As soon as he had made up his mind he began operations. The suddenness of his act took the Germans entirely by storm and before any of them could avoid the murderous fire that Thieffry was dealing out, one of the fourteen was already dropping from the sky, the Belgian's bullets having almost taken one wing from the ship. This particular German barely had a chance to shoot in self-defense so suddenly and savagely had Thieffry thrust himself upon him.

This Albatross had hardly started its final descent before Thieffry was already wheeling about and adding further confusion to the ranks of the baffled Germans who had lost their close formation and scattered with the first onslaught of the lone Belgian. By this time the scattered forces of the enemy had begun to resume some semblance of order and started a concerted fire upon the Allied flyer.

Unmindful of the rain of shots that flew about him Thieffry again opened wide his own gun as soon as he could draw the bead upon another ship. His aim was still true and withering blasts that flew from his smoothly working weapon soon played havoc with the second ship he was engaging in as many minutes. Again success crowned his efforts and again a German ship parted company with its fellow fliers and dropped toward the shell pocked ground below.

Thieffry wisely headed for home immediately, knowing that with their still vast superiority in numbers, the Germans were too dangerous for any trifling. However, the enemy were content to see him go and so the brave, lone pilot brought his ship safely through the encounter and landed to receive the congratulations of his comrades upon having attained his acehood.

Lieut. Thieffry had taken an undisputed lead in the list of Belgian fliers with his tenth victory when, on the 23rd of February, 1918, he started out on one of his customary tours of the air seeking what foreign prey there might be lurking in the clouds. The day was cold and dreary and not a ship was in sight anywhere on the horizon. The lieutenant had just about decided that there would be nothing doing that day and that in such weather the cheery warmth of the barracks stove would make far more congenial surroundings than the ice laden clouds he was flying through, when he spied the dim outlines of two ships far to the westward scurrying toward the German lines.

The Boches had a good start on him and by the time that Thieffry had caught up with them all three were already over the German lines. Unmindful of his position the Belgian opened fire on the pair as soon as he caught up with them.

The Germans circled away at first, one turning right and the other to the left. The Belgian had no alternative then but to chase one at a time. Both being Fokkers, fast new ships with a high degree of maneuverability, Thieffry had a real fight on his hands. He dove in unflinchingly on one of them and poured a hail of lead into it that made the Fokker shudder from prop to tail. The German ship seemed to waver a moment at the impact and for an instant Thieffry forgot himself in anticipation of the "kill." He drew closer to finish his foe, completely unmindful of the fact that a second ship was in the air ready to strike.

It was just the moment the Boche was waiting for. He came up under the Belgian's tail and found a vital spot with practically his first round of shot. Thieffry's ship burst into flames and began to fall almost immediately. The Belgian made an effort to right his ship but the whole hull became a blazing mass with the lieutenant helpless at the control.

Finally it crashed well behind the German lines and the wreck was soon completely enveloped in flames. Allied observers who had viewed the combat from a distance were convinced that Thieffry had died instantly but within a few days reports came out of Germany that he had been taken prisoner. Apparently a miracle had happened and by some strange trick of fate he had escaped the torturous death that seemingly had befallen him.

However, no official confirmation of this report could be gotten from the German General Staff and so for a time the fate of Lieut. Thieffry lay in doubt. No direct word came from the Belgian officer himself either and the hopes his fellow officers were holding for his safety began to dwindle.

At last the announcement was officially given out from Germany that the Belgian hero had been killed in the crash. He had died as one of the leading aces of the Belgian Air Force and maintained his position of leadership with the first three of his fellow countrymen until the close of the war.

Whats and What Nots

(*Continued from page* 42)

ing. Thus the balsa spar connecting the two pins takes all the strain. Incidentally, the spar should be of the same size as the corresponding wing spars.

On a biplane model it is usually convenient to build a regular center section, separate from the wings, to the spars of which are bound and glued the wing pins. The center section scheme is also convenient where the wing rests on top of the fuselage as in a cabin monoplane.

In our next article we shall start with the subject of wing struts and their construction.

Air—Ways

(Continued from page 43)

John Young (17), 7'—34", 241 East 49th Street, New York, N. Y.

Edward Beshor (17), 7'—29", 76 Seneca, Tuckahoe, N. Y.

Frank Zaic (20), 7'—20", 328 East 6th Street, New York, N. Y.

Edward Mosca (16), 7'—13", 107 South Albion Place, Atlantic City, N. J.

John Zaic (18), 7'—00", 328 East 16th Street, New York, N. Y.

William Coughlin (18), 7'—05-2/5", 194 Warren Avenue, East Providence, R. I.

Lewis Millman (17), 6'—41-4/5", 132 Columbia Place, Atlantic City, N. J.

Alton Du Flon (15), 6'—30", 561 Prospect Avenue, Ridgefield, N. J.

Salem Barrack (15), 6'—22-4/5", 198 Baltic Street, Brooklyn, N. Y.

John How (17), 6'—17-1/5", 3169 Reach Street, Philadelphia, Pa.

Henry Runkel (18), 6'—16-2/5", 10 Beechwood Place, Elizabeth, N. J.

Henry Orzechowski (18), 6'—08", 411 18th Avenue, Newark, N. J.

Alfred Rubin, 6'—08", 112 Dewey Place, Atlantic City, N. J.

Merrell Malley (14), 6'—03-1/5", 31 North Penn Avenue, Atlantic City, N. J.

Jerome Kittel (16), 6'—00-1/5", 130 Winthrop Place, Englewood, N. J.

Harold Franke (14), 5'—57½", 822 Madison Street, N. W., Washington, D. C.

STOUT FUSELAGE.

James Parkam (16), 4'—57", 5536 Arsenal Avenue, Indianapolis, Ind.

John Zaic (18), 2'—57", 328 East 6th Street, New York, N. Y.

Henry Orzechowski (19), 2'—38-3/5", 411 South 18th Street, Newark, N. J.

Jesse Jessen (16), 1'—45-2/5", 2853 North Marshall Street, Philadelphia, Pa.

Gordon Light (17), Oak Street, Lebanon, Pa. (1440)

Paul Schaefer (16), 1'—18", 3607 East 16th Street, Indianapolis, Ind.

Dick Trimarco (20), 1'—13-4/5", 166 Elm Street, Newark, N. J.

Welcome W. Bender (17), 1'—08", 699 Newark Avenue, Elizabeth, N. J.

Michael Lichstein (19), 1'—03-3/5", 3099 Kensington Avenue, Philadelphia, Pa.

Frank Zaic (20), 59-1/5", 328 East 6th Street, New York, N. Y.

MR. CLAUDE E. CARMICHAEL, Director of the Stix Baer and Fuller Model Airplane Club, lets us in on some interesting activities which took place in the vicinity of St. Louis. He writes the following:

"We've just completed our annual summer contests—the 1932 Model Air Races. It was a four-event series lasting four days, July 21, 22, 23 and 24, and our club membership of nearly 500 boys gave us a crowded flying schedule for each day.

The events were: Indoor, Outdoor Commercial, Outdoor Autogiro and Outdoor Duration for twin-pushers and tractors. Three silver cups were awarded by Stix, Baer and Fuller in each of the contests and the two boys who made the best average time for the series were sent to Round-Up Lodge, Buena Vista, Colorado, for five weeks of camp life with all expenses paid. Stix, Baer and Fuller also gave each boy complete camp outfits as required by the lodge—high-top boots, 10 gallon hats, sweaters, etc.

(Continued on page 48)

A Pioneer Makes Good

(*Continued from page 5*)

argue him into sticking to the "regular" way of designing airplanes. As he explained years later, in his "Wings of Tomorrow":

"It would have been virtually impossible to have achieved any success with the idea of the Autogiro unless I had been able to calculate its basic design by mathematics before I began to build it. Success by mere experiment would have been as unlikely as the successful construction of a cantilever bridge without any previous engineering experience. More so, indeed, for the problem was far more complex and the risks of error far greater. Without a litttle certainty of science on my side, I might have spent my energies in a dozen different directions, all of them wrong, and never found the secret of the Autogiro."

THE long story of these calculations will never be told, and a story in figures and formulas would not be quite in keeping anyway. But as time went on Cierva got to rotating a hazy idea in his mind. Keeping an airplane up takes speed—but if you could get the air rushing past the wings *without* rushing your whole machine through the air, you'd have the whole problem solved!

The top helicopter seemed to prove that it could be done. When its rubber-band power was gone it would slowly descend, the whirligig vanes rotating in the air. Thus the "free-wheeling" rotor acted as a sort of air-brake, letting the toy down slowly and easily. Maybe you couldn't go straight up with a man-size machine like that because your motor would be too heavy. But couldn't you climb, descend, or fly level?

Telling no one of his fool idea, he went to work and figured out the size of a whirligig able to support a man-carrying machine. It would be like a big windmill turned flat, its blades sweeping over the pilot's head. Would the blades keep on turning—even when you turned the motor off? Could they be made strong enough? Could such a crazy rig be controlled? There were many such questions to be answered. In his new fish-pond, he didn't know whether he would catch a whale of a new idea or just minnows.

He figured his way up steep graphs and down the other side. He took sharp curves on high, crashed his way through bristling equations and wicked formulas. He used up reams of scratch paper and bales of pencils (he could afford plenty of those at least). He studied helicopters and wing-flappers, and finally shook his head at both.

His engineering training helped him immensely. He could make fifty models on paper for one in the shop. He saved months, perhaps years of valuable time, while he tried to grab out of thin air a brand-new idea. Eventually he evolved as "goofy" a rig as one could imagine: a windmill turned flat, attached to a fuselage, all the weight to be suspended from the windmill vanes. These were to be rotated by the air itself, just as moving air turns an ordinary windmill. What a freak!

He had to have something to make his rig go forward. Birds, with strong muscles to the very tips of their wings, fly by flapping, and fish swim just as successfully by

(*Continued on page 47*)

wriggling their tails. But men have found no way—perhaps never will—to make machines of similar strength with extreme lightness. Man and machine weigh far more than the greatest birds of today—whether nature *ever* made a true flying creature weighing tons, or whether those great winged beasts merely glided—science is not prepared to say.

So Cierva finally settled on the good old propeller, driven by regulation motor, to pull his theoretical machine along.

But a real difficulty had arisen during this building of an airplane on paper. As the rotor rotated like a windmill on its back, each blade as it advanced into the oncoming air would naturally have more lift than the blade retreating at the same instant. The other blades would be acting similarly, in lesser degree. The total result would be that the side of the windmill with greatest lift would always be trying to "hump itself," and the whole machine would tilt toward the side with least lift. That is the sort of thing the engineer finds out even before he *builds* his brain children.

Cierva thought it over for a long time. One day a brilliant solution popped into his head. Why not *two* rotors, one above the other, turning in opposite directions? Then the lopsided lift of one would (theoretically) balance the other.

IT WAS a weird and complicated machine which he finally began to put together. There was a lot of work to be done before the first whirligig aircraft was erected, with its funny wings carried on a mast braced to the top of an ordinary fuselage. Those first wings were stiff and rigid, solidly fastened to bearing and hub. There was no aeronautical reason that anyone knew, why stiff wings, rigidly fastened, would not work. It was some twelve years ago that this strange bird was finally hatched.

They pushed the contraption out of the shop, warmed up the motor, and got the two rotors turning in opposite directions (it made you dizzy to watch it). A regular pilot climbed in and tried to taxi for a take-off.

The machine trembled. Then, before anyone could do anything, it laid down weakly. Its vanes hit the ground and broke off with loud cracks. They had exhibited no more lift than if they had been made of stone. The bottom rotor, in the slipstream, had turned much faster than the upper one, working in undisturbed air. All this was very discouraging, or would have been to a weak-kneed inventor.

But Cierva, being an engineer, went back to his aerodynamics and lift tables and stress calculations. The rules, including his well-oiled slide-rule, said those rotating vanes should have lifted his machine easily.

BUT the weakness he had tried to correct with the double rotor still remained. The tendency to tip over on the side of least lift was to plague him a long time and cause his hair to grow thin in places.

At length, with the help of capable, if sceptical mechanics, he had a new full-sized model ready to fly. This one had only one rotor, but the blades were rigidly fastened. He still did not know whether it was possible to keep the machine right-side up.

The rather nervous pilot took it out and taxied. A few yards of run, with the rotor

(*Continued on page* 48)

DEPARTMENT OF AERO-PHILATELY

(Collecting of Air Mail Stamps)

Builders of Model Airplanes will discover that the collecting of Air Mail Stamps opens a new field of extraordinary interest. It is at the same time, a most fascinating and educational hobby.

A fairly complete pictorial history of aviation may be gleaned from the little bits of paper known as Air Mail stamps. Most of the famous aircraft and flyers figure on the stamps. Wright, Lindbergh, Graf Zeppelin, Santos-Dumont, Dornier, Fokker, Curtiss, Hawker, dePinedo, and most of the others will be found pictured on the various issues. Surely a most striking gallery of aviation miniatures which is bound to stir the imagination of anyone.

Most of us have been interested in stamp collecting at one time or another, and doubtless a good many readers of "Universal Model Airplane News" are philatelists, but it is a very large undertaking to attempt a general collection today. Only the very wealthy can hope to make an impressive showing, unless the collection is limited along certain lines, but it is not hard to make a good showing in Air Mail Stamps.

The first Air Mail Stamp was issued in 1917, and since then only about 1,700 varieties have appeared. Most of them are quite cheap, but the common stamps of today are sure to become much rarer as time goes on. Everything has been made inviting for the collector. Splendid albums ranging in price from $3.00 up are on the market as well as catalogs devoted exclusively to Air Mail Stamps. Air Mail Stamps are doubtless the most delightful branch of Philately and consequently every day more collectors are being attracted to this specialty.

How many readers know that the great painter and all-around genius da Vinci spent a great deal of his time discovering a method of flying? Only recently a great European government saw fit to issue a special series of Air Mail stamps in honor of the great da Vinci.

Do you know that the famous old Columbia was the only plane that ever crossed the Atlantic twice? I'll bet it will be no easy matter for you to recall who was the pilot and navigator to take her across the pond the second time.

As far back as 1870, many thousands of letters were sent through the air by regular balloon service. No other way was possible because the place was besieged.

Only fourteen years ago the country which has the largest air mail service in the world could only boast a route approximately 250 miles in one direction. Today this same country has air routes in every direction over thousands of miles.

All of these wonderful historic facts and many more which mark the progress of aviation are well-known to Aero-Philatelists.

Why not make a start and see what this fine hobby can do for you? We will be glad to help you in every way we can.

This department will be devoted to stories about Air Mail Stamps, news issues, important flights, etc., and will undertake to answer questions of general interest to collectors, but only Air Mail Stamps will be considered. Address communicatons to Mr. L. W. Charlat, care of "Universal Model Airplane News," 125 West 45th Street, New York City.

A Pioneer Makes Good

(Continued from page 47)

up to a fair speed—and the whole thing just turned over and fainted, like a very sick cow. The blades snapped short. There were snickers. Perhaps Cierva said something — an old Spanish custom at such times. Many inventors would have had more than enough—going on two years—and this the best he could do!

But he went back to drawing board and slide-rule, scratching his massive head for new ideas.

His final No. 3 machine had five blades in the rotor, and he had on this an ingenious device whereby the pilot could change their angle of incidence at any time, thus varying their lift to right or left. "That should work," he told himself, to prevent tilting from side to side. But he was not so optimistic now. Was the test to fail—prove a regular "three times and out?"

(To be continued.)

Air—Ways

(Continued from page 45)

Ralph Kummer, 16 years old, and Richard Prough, also 16, received these two grand awards. Kummer set a new record in the indoor contest with a flight of 11'—55-4/5". (Editor's note. At the National Contest at Atlantic City, September 10th, Joseph Kovel flew his plane 13 minutes 3 seconds, Stout Indoor.) Prough was able to bring his average to the winning point with a twin-pusher flight of 21 minutes. His plane was lost. Kummer also took first in the Commercial contest with a flight of 7'—45", and first in the Autogiro with 2'—6". Not satisfied with that, he ran away with third in the Outdoor Duration event with a flight of 12 minutes.

The Indoor was the first contest scheduled and was held in the St. Louis Arena. Ralph Kummer launched his model for the prize-winning and record-breaking flight of practically twelve minutes. Kummer's plane had a built-up or hollow motor stick and hollow wing spars formed by wrapping paper-thin balsa around a bicycle spoke. Many of the indoor models were covered with Microfilm.

THE Commercial and Autogiro contests, held at Parks Airport, East St. Louis, furnished thrills aplenty. This was the first autogiro contest ever held in St. Louis and it served as a novel and exciting experiment. Nearly 100 boys were entered but most of them had difficulty in getting more than delayed flights. We feel, however, that the diversity of original designs displayed in the contest was well worth the experiment. Contest regulations made it necessary for models to have rotor vanes with twice the area of the main wings.

Sunday was a big day. The Outdoor Duration contest was held at Parks Airport and we were extremely busy "from dawn to dusk." A bright, cloudless sky cheered the hearts of the contestants. It was about the middle of the afternoon when Richard Prough launched his model for its record flight of 21'—35". Fifteen minutes later William Exner got his plane off for a flight of 13'—37", taking second place."

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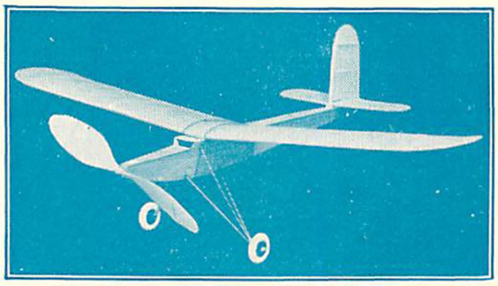

Outdoor Cabin Tractor

One of the snappiest flying models in its class, proper engineering and all balsa construction does it. This plane has a double surfaced, high lift wing, 30 inch span, all balsa fuselage, extra strong landing gear to withstand the shocks of outdoor flying, and a large, wide bladed propeller to keep it up for long endurance flights. The Kit contains complete plans and instructions, stamped ribs, large tube cement, 1 oz. bottle clear dope, pair celluloid wheels, and all materials needed to complete the model.

Price **$1.50** Add 10c for Postage.

TWO-IN-ONE KIT

Contains the around-the-world "Winnie Mae" and the "Trans-Atlantic Bellanca." Both 15″ wing spans. Kit contains full size plans, bulkheads, large tube of cement and all other materials needed to complete these two wonderful models. Get yours now.

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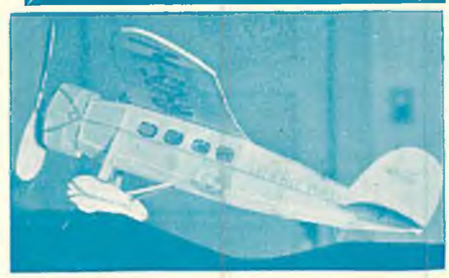

Outdoor Twin Pusher

A twin pusher that has actually flown 12 minutes not once—but several times! This plane has several features which cannot be found elsewhere. It has a 40 inch "A" frame that is a marvel for lightness and strength, a 36 inch, high cambered, tapered wing, and two 12 inch, high pitch props powered by 68 feet of ⅛ flat rubber. The kit contains complete plans and instructions, stamped ribs, and all other materials needed for the construction of the model,

Price **$1.50**

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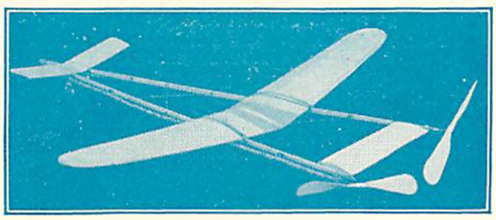

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36″ Strips

1/16 x 1/16 .... .01 7 for .05
1/16 x 1/8 .... .01 7 for .05
1/16 x 1/4 .... .01 6 for .05
1/8 x 1/8 .... .01 6 for .05
1/8 x 3/16 .... .01½ 6 for .08
1/8 x 1/4 .... .02 5 for .09
1/8 x 3/8 .... .02 5 for .09
3/16 x 3/16 .... .02 5 for .09
3/16 x 1/4 .... .02 5 for .09
1/4 x 1/4 .... .03 5 for .12
1/4 x 3/8 .... .03 5 for .12
1/4 x 1/2 .... .04 5 for .18
3/8 x 3/8 .... .05 5 for .22
3/8 x 1/2 .... .06 5 for .25
1/2 x 1/2 .... .08 5 for .35
1 x 1 .... .17 2 for .30

40″ Strips

1/8 x 3/8 .... .04
1/8 x 1/2 .... .04
3/16 x 3/8 .... .04
3/16 x 1/2 .... .05

Sheet Balsa

1/32 x 2 x 36 .... .04½
1/16 x 2 x 36 .... .05½
1/8 x 2 x 36 .... .06½
3/16 x 2 x 36 .... .09
1/4 x 2 x 36 .... .11

Plank Balsa

1 x 3 x 36 .... .33
1 x 6 x 36 .... .60
2 x 3 x 36 .... .60
2 x 6 x 36 .... .90
2 x 5 x 40 .... .90

Balsa Propeller Blocks

1/2 x 1 3/4 x 5 .... 3 for .04
1/2 x 3/4 x 6 .... 3 for .05
5/8 x 1 x 7 .... 2 for .05
5/8 x 1 x 8 .... 2 for .05
3/4 x 1 1/8 x 8 .... 2 for .07
3/4 x 1 1/8 x 10 .... 2 for .09
3/4 x 1 1/8 x 11 .... .06
7/8 x 1 1/2 x 11 .... .07
5/8 x 1 1/4 x 12 .... .07
7/8 x 1 1/2 x 12 .... .08
7/8 x 1 1/2 x 14 .... .10

Dowels

Straight-grained genuine birch dowels in the following sizes:
1/8 diam. 18″ long 6 for .05
3/16 diam. 36″ long 3 for .05
1/4 diam. 36″ long 2 for .05

Bamboo

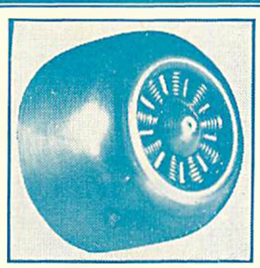
TONKIN straight-grained, no-knot bamboo in the following sizes:
1/16 x 1/4 x 15 .... .01
Per doz. .... .08
1/32 x 1/4 x 8 .... .00½
Per doz. .... .04
1/16 x 1/16 x 9—doz .... .03

"Alco" Colorless Cement

Absolutely the strongest, lightest and fastest drying colorless cement on the market! Try some NOW!
2 dram tube .... .05
1 oz. tube .... .13
2 oz. can .... .17
4 oz. can .... .32
Pint 1.00

Madison "Ace" Rubber

Delivers more turns to the foot. Four sizes to select from at the lowest prices in America!
.045 square ...... 3 ft. for .01
3/32 flat .... 3 ft. for .01
1/8 flat .... 3 ft. for .01
3/16 flat .... 2 ft. for .01



ALUMINUM N. A. C. A. COWLING AND THRUST BEARING WITH DUMMY MOTOR

Size of Cowling: Diameter, 3″—Depth, 2″. Packed in cardboard box with mounting instructions. If ordered separately, add 5 cents for packing and postage **50c**

Compare Our Quality Materials — then You'll Understand Why Our Prices are "LOW"

Celluloid Wheels

3/4 diam.—Pair .... .06
1 diam.—Pair .... .08
1 3/8 diam.—Pair .... .11
1 7/8 diam.—Pair .... .17
Bushings .... 4 for .02

Dummy Radial Engines

Celluloid, 9 cylinders, 3″ diam. Each .... .30

Music Wire

Strong, light and stiff. Sizes: .014, .020, .028, .034. 5 ft. packages .... .02

Aluminum Tubing

1/8 Outside diam. per ft... .07
3/16 Outside diam. per ft... .11
1/4 Outside diam. per ft... .13

Sheet Aluminum

12 inches wide
.005 per ft. .... .12
.010 per ft. .... .19

Thrust Bearings

Strong and light. Large size .02
.035 hole. Each .... .02
Per Doz. .... .20
Small size, .025 hole. Each .02
Per Doz. .... .20

Washers

1/8 O. D. Brass for light indoor models. Per Doz. .. .01½
1/4 O. D. Copper for outdoor models. Per Doz. ...... .01½

Acetone

To thin out your heavier liquids.
2 oz. can .... .11
4 oz. can .... .20
Pint .... .80

Covering Material

Newest thing in covering your models!

Aluminum Leaf

This material is pure sheet aluminum .0003 of an inch in thickness. Think of it, only one-tenth the thickness of writing paper. It is light, strong and makes a beautiful covering job. 3½ inches wide 5 ft. for .05

Xtra-Thin Tissue

Absolutely the lightest covering material known to be had anywhere at any price. Use it for covering your endurance models.
Sheet 20 x 15 .... .05
Doz. .... .50
Japanese Tissue. A strong, light tissue for covering your commercial models.
Sheet 20 x 24 ...... 2 for .05
Doz. .... .25

Colored Jap Tissue

Colored Jap Tissue, Red, Blue, Orange, Brown. Sheet .... .07
Per Doz. .... .75
Wood veneer paper for scale model work.
Sheet 20 x 30 .... .15

Clear Dope

This is real nitrate dope thinned down to meet the requirements of model airplane usage.
2 oz. can .... .13
4 oz. can .... .25
Pint .... .90

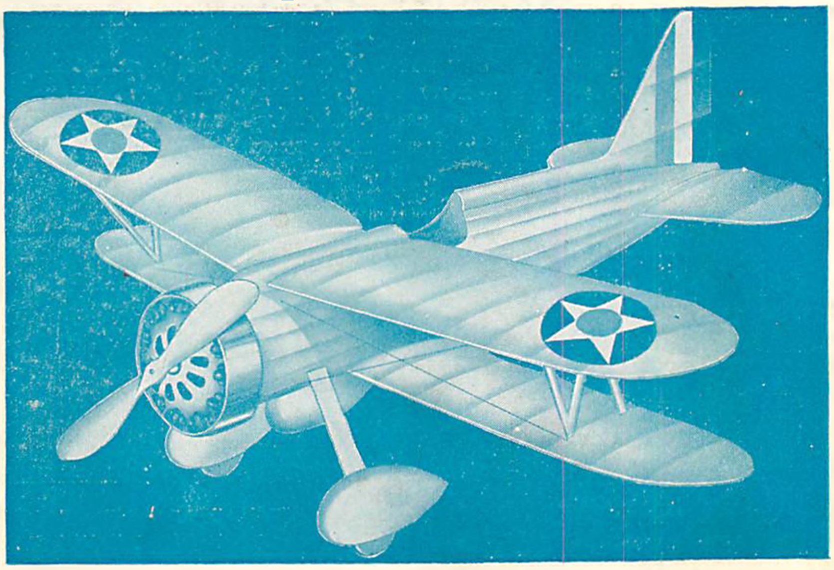
Colored Dope

Real pigmented aircraft dope. Do not confuse this with dopes of inferior quality. Red, Blue, Yellow, Orange, Black, Olive Drab, and Silver. Order by color. 2 oz. can .... .13
4 oz. can .... .25
Pint .... .90

MADISON MODEL AIRPLANES, Inc., 134 Livingston St., Brooklyn, N. Y.

Our Kits and Supplies Are Handled by Leading Department Stores—ASK FOR THEM

Another Winner in the IDEAL Series of 18 in. Flying Models . . .



Curtiss Ship Board Fighter

F9C-2

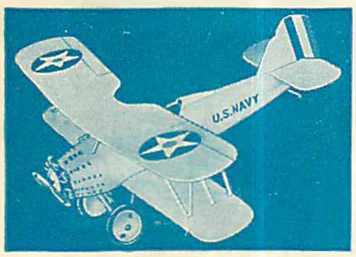
The Newest Navy Plane
Carried on the U. S. S. Akron

Ideal-Designed Construction Kit

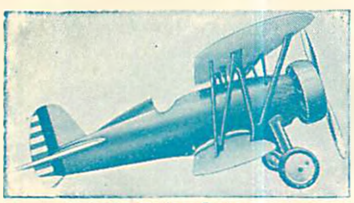
$1.10 POSTPAID

This is the third in the Series of Ideal-Designed, 18 in. Flying Models (the Supermarine and the A-8 Attack are the other two) which we have developed specially for builders who want beautiful, accurate and easily constructed Models at the Popular Price of one-dollar-ten cents each. This one is a realistic reproduction of the midget ship used on the dirigible Akron; remarkably true in every detail and a wonderful flyer.

The Kit contains all parts, fittings and materials. Fuselage with Balsa Bulkheads; Built-up type Wings; aluminum Drag Ring and Motor Plate; new type carved Balsa Propeller; all Balsa parts printed and ready to cut to shape; all wire parts formed ready to use; cement; dope and everything else needed to build the Model, including Full Size Plans and Complete Instructions. Get your Kit now and build a model of this interesting little ship!



13—Vought Corsair



14—Boeing Fighter

Six New Miniature Replica Model Kits

6 IN. SIZE

Solid Balsa, Hand Carved, Miniature Duplicates of Famous Airplanes; perfect copies in every detail, colored and decorated like the originals. Anybody can make them; they're fine for your den, camp, or for exhibition anywhere. Fuselages are carved from solid blocks of balsa; wings, tail assembly and other parts cut from sheet balsa. Each one comes complete in a dandy Kit containing everything needed: Balsa Blocks, Sheet Balsa with printed patterns for all parts, Wood Wheels, Aluminum Props, Cement, Coloring-Decorating Materials, Sandpaper and Full-Size, three-view drawings with Complete Instructions.

Your choice of 20 Different Models

1—Curtiss Fledgeling	6—Gee Bee	11—Hawk P6-E	16—Albatross
2—Pitcairn Autogiro	7—Nieuport	12—DeHavilland	17—Fokker Triplane
3—Ideal Spad	8—Supermarine	13—Vought Corsair	18—Curtiss S. B. Fighter
4—Laird	9—Hell Diver	14—Boeing Fighter	19—Pfalz
5—British S. E. 5	10—Lockheed Vega	15—Howard Racer	20—Sopwith Camel

Any 2 Kits for 65c

6 for $1.65 12 for $3.00
20 for $5.00 All Postpaid

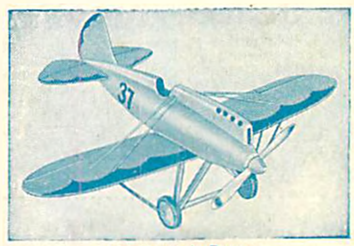
4 Famous 12 in. Replica Models

Solid Balsa, Hand Carved Models in 12 in. size; Larger, more Beautiful and with greater detail. Four dandy Ships to select from:

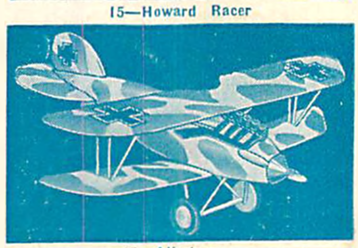
Curtiss A-8 Attack
Tri-Motor Transport
Sikorsky Amphibian
Condor Bomber

If you want a larger and more interesting Replica Model, get one of these four.

Kits 65c each
Postpaid

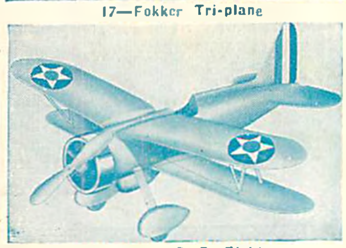


15—Howard Racer



16—Albatross

17—Fokker Tri-plane



18—Curtiss S. B. Fighter

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