UNIVERSAL MODEL AIRPLANE NEWS

MARCH

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FEATURING NATIONAL AERONAUTIC ASSOCIATION JUNIOR MEMBERSHIP NEWS

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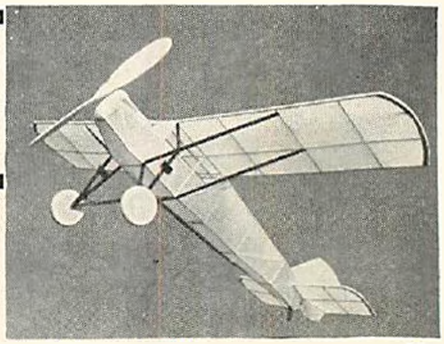

24" CURTISS ROBIN 25c

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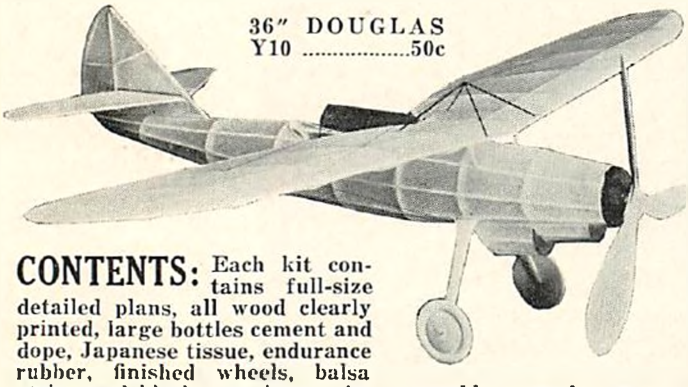

36" DOUGLAS Y10 .... 50c

CONTENTS: Each kit contains full-size detailed plans, all wood clearly printed, large bottles cement and dope, Japanese tissue, endurance rubber, finished wheels, balsa strips and blocks, washers, wire, moveable controls, etc.—a liberal supply of everything to build perfect G.H.Q. flying models.

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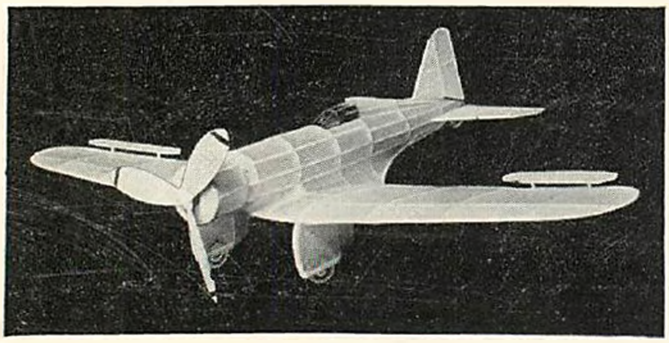

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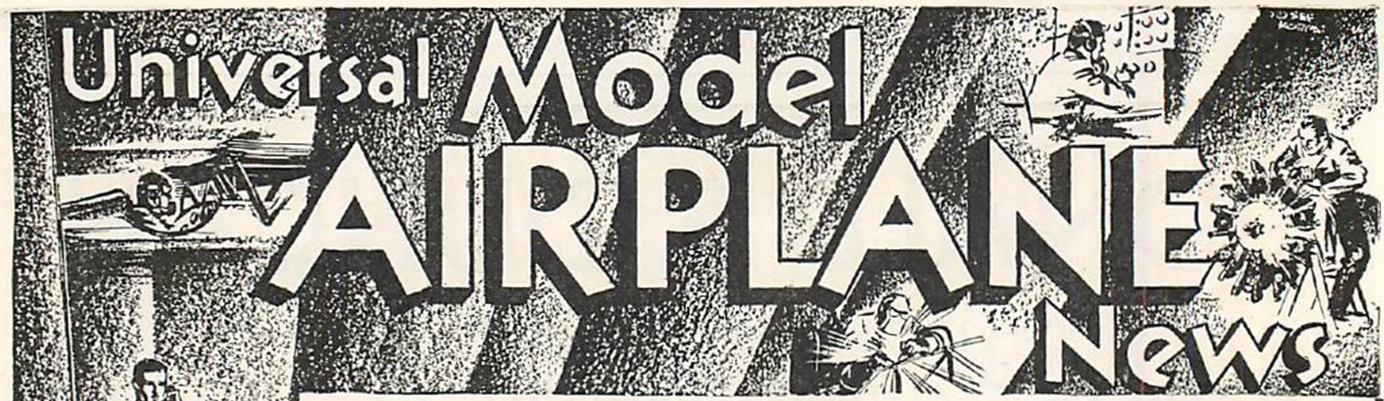
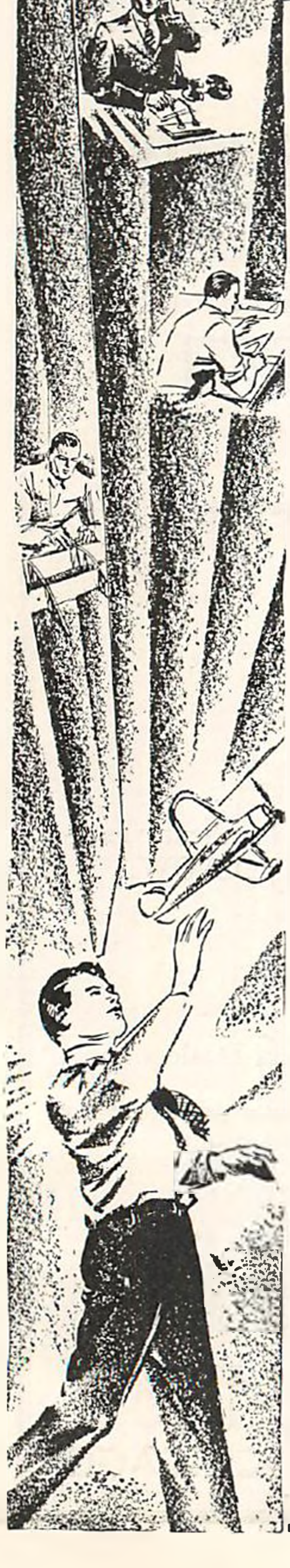


Universal Model AIRPLANE News



VOL. XII *NO. 2*

Edited by Charles Hampson Grant

CONTENTS

MARCH, 1935

NRA MEMBER U.S. WE DO OUR PART

In Our Next Issue

Mr. H. Latane Lewis II in Speed Wings gives intriguing details of American planes and how our high speed ships of the present day have been developed from them.

On The Frontiers of Aviation, by Robert C. Morrison, as usual gives the latest highlights of airplane development as well as instructions and plans from which you can build a scale model of the new Martin Flying Boat.

Fundamentals of Model Airplane Building, by Robert MacLean, shows the experimental model builder how to build a trim all-balsa model with fine flying qualities.

At last the advanced model builder will find plans and instructions to build a successful gas model in **How to Build a Reliable Gas Engine Model**, by Joseph Kovel.

More interesting facts appear in **Albatros Fighters on Parade**, by Joseph Nieto.

Other items as, **Air Ways, Slipstreams, N.A.A. Junior Membership News, Aviation Advisory Board**, and **Aerodynamic Design of the Model Plane**, make the April issue of MODEL AIRPLANE NEWS a necessity to model enthusiasts.

Order your copy of MODEL AIRPLANE NEWS from your newsdealer now or send $1.65 for your year's subscription to this office, 551 Fifth Avenue, New York City. Canadian subscriptions $2.50 per year. All other countries, $2.50.

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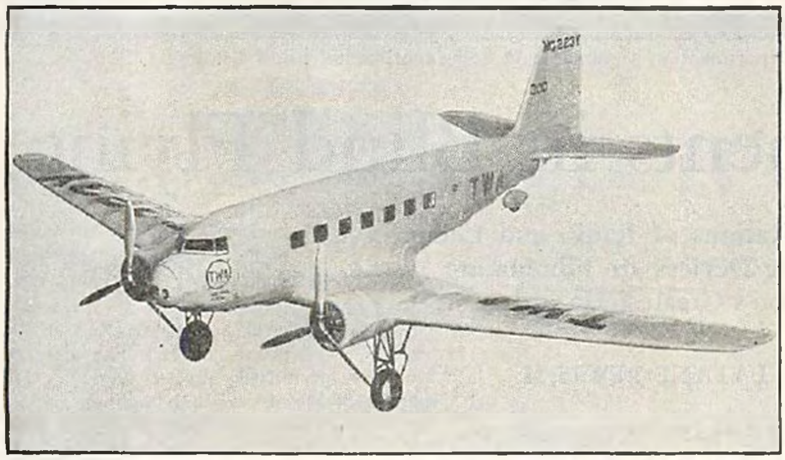
ARE ACCURATELY DESIGNED FOR DETAIL AND FLIGHT. Simple directions, clear accurate drawings, authentic details, formed wire parts and many other exclusive features make National models easy to build. You can't go wrong—and they fly!

ASK YOUR DEALER TO SHOW YOU THESE NEW NATIONAL KITS. If he can't supply you, send your orders direct. Do not accept substitutes and be disappointed.



NEW BEECHCRAFT A-17-F

A 4-passenger high speed ship

A true ¾" "National" scale model. Wing span 25¾", length 18" wgt. 2½ oz. Colors red and black, silver trimmed. Faithful in every detail including wing and tail controls, deep cowl, navigation and landing lights. Many simplified construction features, safety motor tube, turned cowl and wheels, stations and ribs, and parts neatly printed on clear white balsa, easy to cut out. Kits contain ample cement, colored dope, Japanese tissue, formed wire parts and props. Full size plan detailed instructions. A ship every model builder will enjoy building and flying. (Plus P.P. 25c) **$2.50**

DOUGLAS TRANSPORT

Wing Span 42½ Inches; Length 29¾"; Weight 8 oz.

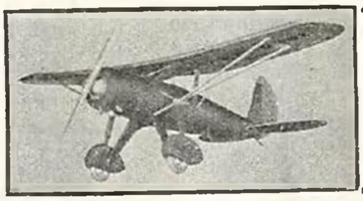
What a Model! The giant Transport which is attracting the eyes of the world as "Monarch of the Skies." Broke its own record for flight over TWA between Los Angeles and New York. It proved the outstanding commercial transport of all entries in the recent England to Australia race.

National's big three view, fully detailed plan, instructions, make it easy to build this beautiful model for exhibition or flight. The most realistic model you have ever seen.

Powered by New Flexible Shaft Gearless Transmission

The kit includes plans, special cambered balsa for fuselage and roof covering, printed wood parts, turned motor cowls, nose block and wheels, three bladed laminated props (for flying model), window materials, gearless transmission, Jap paper for covering, cement, gray-silver dope, full insignia, lights, venturi tubes, windows, doors which open, the new split trailing edge flaps (air brakes), complete kit. Plus 50c packing and mailing charge! **$5.00**

Fully detailed plans and instructions sold separately 2 sheets 34x44-25x33 $1.10 postpaid



Fairchild 22, Model C7-F

½" Scale Model

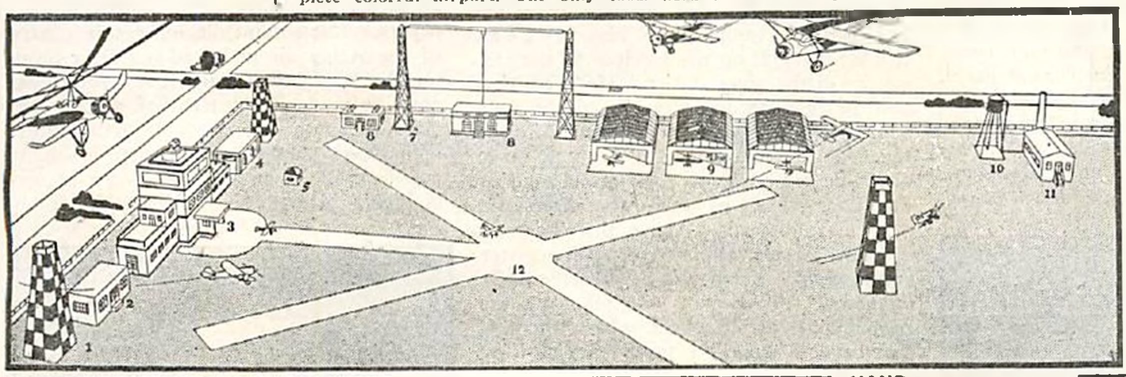
Span 16½". Lgt. 12¼". Wgt. ¾ oz. Colors: green fuselage, orange wing and tail silver trim. Features: Hollow Motor Tube, adjustable elevators and rudder, fully-detailed 3-view plan and instructions. Complete Kit. (Plus P. P. 15c) **$1.00**

NATIONAL MODEL AIRPORT

This carefully detailed model airport *(an exclusive National development)* is taking the attention of model builders everywhere. It is providing the individual, schools and clubs with a most interesting and educational project.

NATIONAL MODEL AIRPORT is so complete that you will feel yourself right in the atmosphere of the great airports of the country, as you build and arrange this colorful miniature layout.

The complete kit features ten buildings, three pylons and radio towers. A large ground plan 44"x62" with its soft green background, runways, aprons and location of buildings marked out. And, of course, a fleet of modern tiny replica planes to take their place about the field or in their hangar. A full size, fully detailed plan with instructions guides you in the simple and accurate construction of each unit. The wood for each unit is cut to correct thickness, all details neatly printed out to assure correct size of windows, doors and other details. Glazing for all openings, an assortment of brilliantly colored lacquers and quick drying cement to build this complete colorful airport. The only tools needed are a sharp knife and paint brush.



Entire outfit sold complete to the last detail as shown or each kit sold separately as listed below:

1. Three Pylons .... $ .35
2. Post Office .... .25
3. Administration Bldg. 1.00
4. Gas Station }
5. Refreshment Stand } .... .50
6. Machine Shop .... .50
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13. Six Commercial Model Kits .... .35
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Airport construction kit, complete, as shown and listed above (plus P. P. 35c) **$5.00**

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Quality Kits and accurately designed plans at prices to attract the thrifty and those who want the best.

CLUBS—Here's your Chance! (All special prices expire March 15th. Minimum orders on sale specials 50c).

National's 12" Flying Scale Models

3 Complete Kits $1.10 post paid

AKRON FIGHTER
LOCKHEED VEGA
BOEING P12 E
CURTISS FALCON
CURTISS HELL DIVER
BELLANCA AIRBUS
POLISH FIGHTER
GEE BEE 1931

NATIONAL'S DETAILED PLANS

Hell Diver, Curtiss Falcon, Boeing P 12E, Akron Fighter, Laird 400 — 3 for 10c Plus 3c postage — Hawker Fury, Gee Bee 1931, Lockheed Vega, Polish Fighter, Bellanca Airbus

24" Curtiss Hawk	15c
24" Lockheed Sirius	15c
24" Sikorsky	15c
36" Lockheed Vega	15c
25' (1" scale) Gee Bee 1932	20c
12½' (½" scale) Gee Bee 1932	20c
18" British Supermarine	10c
18" Curtiss A-8	10c
18" Curtiss Bomber	10c

COLORED INSIGNIA ON WHITE GUMMED STOCK: British 1½" circle, ¾" circle and tail stripes; French ::: U. S. Army and Navy Official; American War Time ::: Black and White German and Maltese Crosses. Per strip **5c**

HAND CARVED PROPELLERS

at new low prices

Smooth hand finished true pitch props to make your models fly better.

5"—10c
6"—15c
7"—20c
8"—25c
10"—30c
12"—10c

Metal Parts Assortment

Contains:—4 large and small bearings: 4—No. 6 and No. 12 prop shafts; 4—No. 6 and No. 12 rear hooks; 10⅛" Pin hole washers; 10 small and large steel beads—total, 32 pieces **10c**

$ Win Cash Prizes $

26 Grand Prizes Including

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Everyone can enter—anyone can win. Every plane entered gets a prize! Contest closes March 16th. There's still time left for your entry. Act at once!

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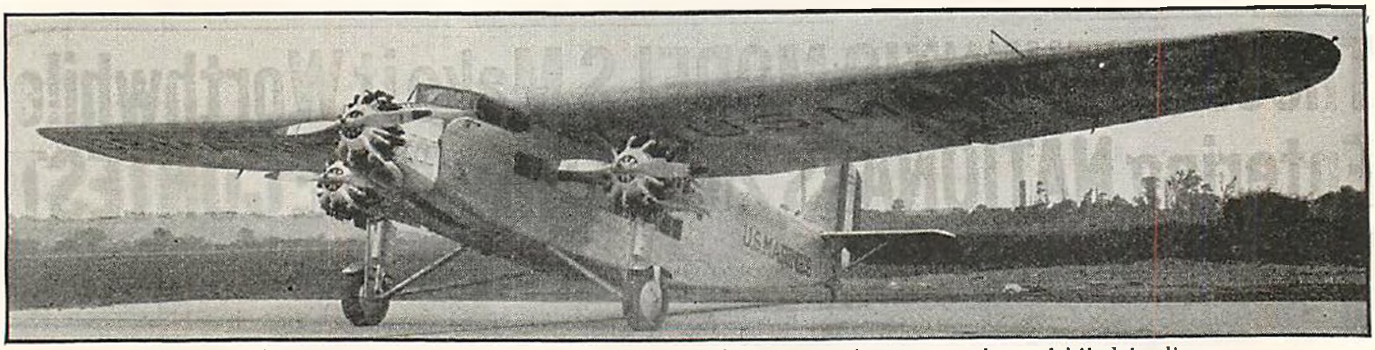


The type of Ford Transport used by the Department of Commerce in 150 experimental blind landings

New Developments in Blind Flying

How New Applications of Radio and Chemical Fog-Fighting Devices are Eliminating Aviation's Greatest Hazard

By H. LATANE LEWIS II

A BLINDING winter blizzard was lashing the earth all along the trans-continental mail run one night last winter. High over "Hell Stretch" in the treacherous Alleghanies, a tiny Army pursuit plane loaded with letters fought its way eastward, the roar of its engine drowned out by the fury of the storm.

Inside the cockpit of the plane the young officer was bent over his controls struggling to keep the elements from hurling his fragile craft out of the sky. Jagged mountain peaks were close beneath him he knew but he passed over them without ever seeing them.

Soon his clock told him that he was approaching Newark Airport the end of his run. He raised his head into the stinging snow and looked downward. Somewhere in that black void below him was the landing field but it would take X-ray eyes to see it through this storm.

But the pilot did not need to see anything outside his cockpit to get down safely, for a few days before, Army mechanics acting on wise orders from the high command, had installed on his instrument panel several special instruments, including an artificial horizon, directional gyroscope, airspeed indicator, sensitive altimeter, boundary marker indicator and radio compass. And near the airport down below him, he knew that two radio transmitters had been set up on a line projecting into the wind, the first station 1,000 feet from the edge of the field, and the second, about one and a half miles away.

He tuned his receiving set to the inner station and immediately fastened his eyes on the radio compass. The needle on the dial of this instrument had to be kept pointed at zero to keep his plane headed for the broadcasting station. A deviation of the needle to the reading "R" or "L" would indicate that the plane had swerved to the right or left of the proper course.

Jockeying stick and rudder, he approached the first transmitter. Suddenly there was a flash of light on the instrument panel. He was directly over the transmitter. Immediately his fingers twirled the dial on the receiver to the frequency of the outer station. He knew now that he was headed away from the field and flying downward. To come towards the field and into the wind, he must make a 180-degree turn, or complete change of direction. That is where the directional gyro plays its part. When this little instrument is set at zero, it will register accurately the number of degrees the plane is turned. As soon as the pilot got the second flash on his panel, which told him that he was above the transmitter farthest from the field, he began banking to the left. Slowly the gyro swung around until "180" appeared on the indicator. The plane was now headed back toward the first station and on a line that would bring it directly into the field.

During this time, he had throttled down his engine and was gradually losing altitude. When he passed over the outer station, he was at about 500 feet. Then he glided down at such an angle that when he reached the station nearest the airport he was at about 150 feet.

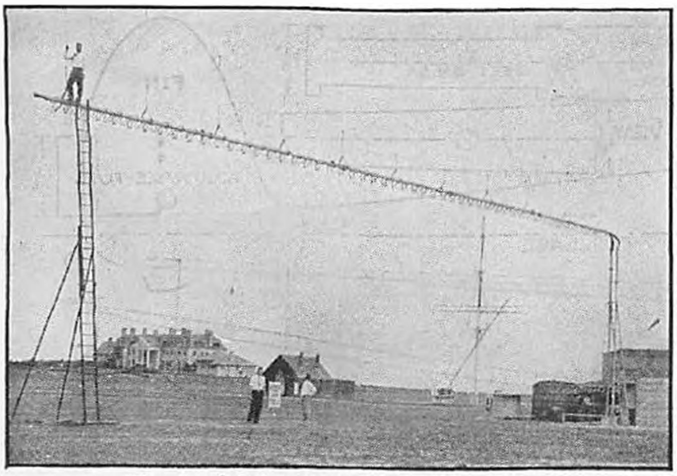
Again there was a flash and he prepared to make the actual landing. This he did entirely by his instruments and not by radio. The directional gyro kept him headed for the runway. The artificial horizon, with its miniature plane suspended before a make-believe horizon, enabled him to keep his wings level and to descend at the proper angle. The airspeed indicator permitted him to keep a safe margin of speed. (Blind landings are always power landings, and are made with the tail slightly below line of flight position.) The supersensitive altimeter showed him just how far above ground he was and told him when to level off.

Skimming along at express train speed, the pilot still could not see anything outside his cockpit, although he was only a few feet above ground. The air that was whistling by him was laden with fine, wet snow. He cut the gun and eased back on the stick. There was a jolt, the plane bounced a few times and then rolled to a stop.

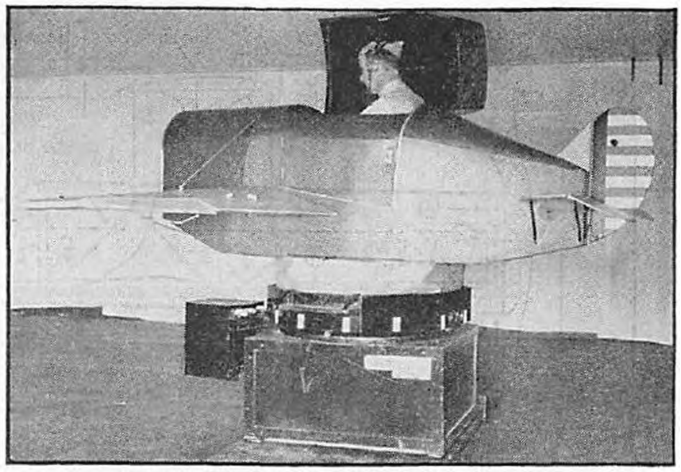
If this flight had occurred a few weeks earlier, the pilot would have been out of luck and perhaps there would have been another tragic story in the morning newspapers. But meanwhile officers in charge of the Army air mail had put their heads together and had decided that Army pilots must be made independent of the weather man—that they must be able to land their high-speed planes even though visibility outside made them as blind as the proverbial bat. And Captain Albert F. Hegen-

Capt. Albert F. Hegenberger, inventor of the blind landing system. (Official Army Photo)

H. G. Houghton, Jr., inventor of the successful fog-fighting apparatus



The fog-fighting equipment at Round Hill

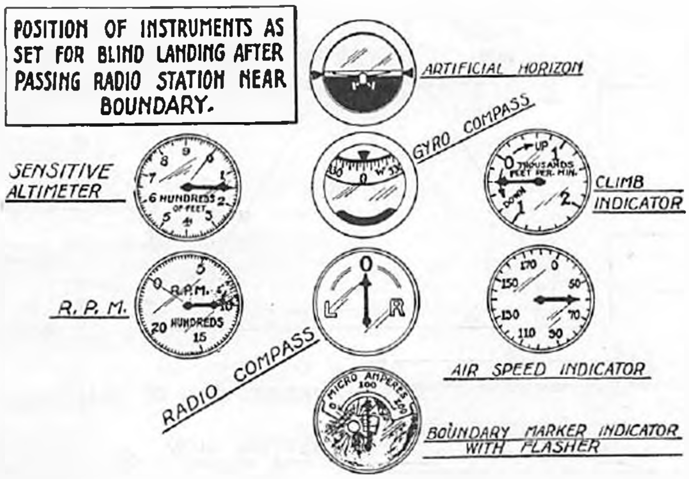


A ground trainer for blind flying pilots

berger, a quiet-mannered, modest chap who had been tinkering around with blind landing apparatus out at Wright Field for several years, was called upon to find the answer.

Perhaps that pilot tossing about in the storm over Newark that night blessed Hegenberger as he slid down onto the field safely. He should have. For "Hegy" has devised the first system of blind landing that has proved itself satisfactory under all conditions.

Just before the Army gave up flying the mail, it had arranged to install blind landing transmitters at all stops along the transcontinental route so that operations could go on regardless of weather. When the transportation of mail was turned over to civilian contractors, the project was dropped. A few weeks ago, however, the Department of Commerce announced that it planned to carry on where the Army left off and would install the Air Corps blind landing system all the way across the continent for use by commercial air lines. This is probably one of the most important steps forward that has yet been made in transport flying. Present regulations prohibit a passenger plane from flying into an airport with a ceiling of less than 500 feet, but with the installation of the blind landing equipment, the regular arrival and departure of airliners in fog or mist completely blanketing the landing area will be realized.



There is a good deal of romance surrounding the development of the Army's system. Captain Hegenberger was navigator on the first flight from the United States to Hawaii. They ran into a lot of dirty weather on that trip and Hegenberger had plenty of time to think about the virtues of a system of instrument flying and landing.

Once back at Wright Field, he went to work on such a system. When he had it pretty well doped out, he proved his faith in it by voluntarily going up in a dense fog and making a landing under actual blind weather conditions. On this same flight, he led to a safe landing another pilot who was caught above the cloud bank and who probably would otherwise have been forced to jump with his parachute.

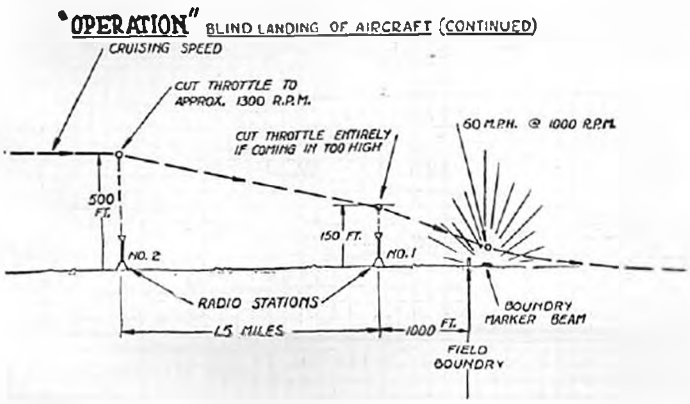
Hegenberger became schoolmaster for the Army mail pilots and set about the task of teaching them how to land blind. He probably will supervise commercial blind landing operations, too, until the air line pilots have acquired the knack of riding down invisible sky paths.

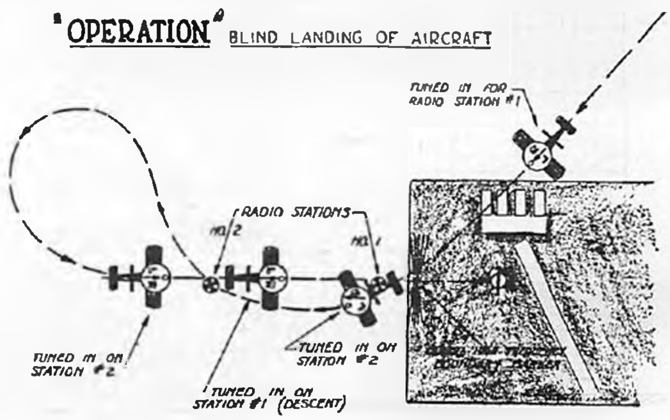
Making a blind landing is an eerie experience and it requires a good deal of practice for a pilot to gain complete confidence in himself. A man's senses play all sorts of tricks on him when earth and sky are shut off from view, and he must learn to rely on his instrument panel regardless of what his own sensations are telling him.

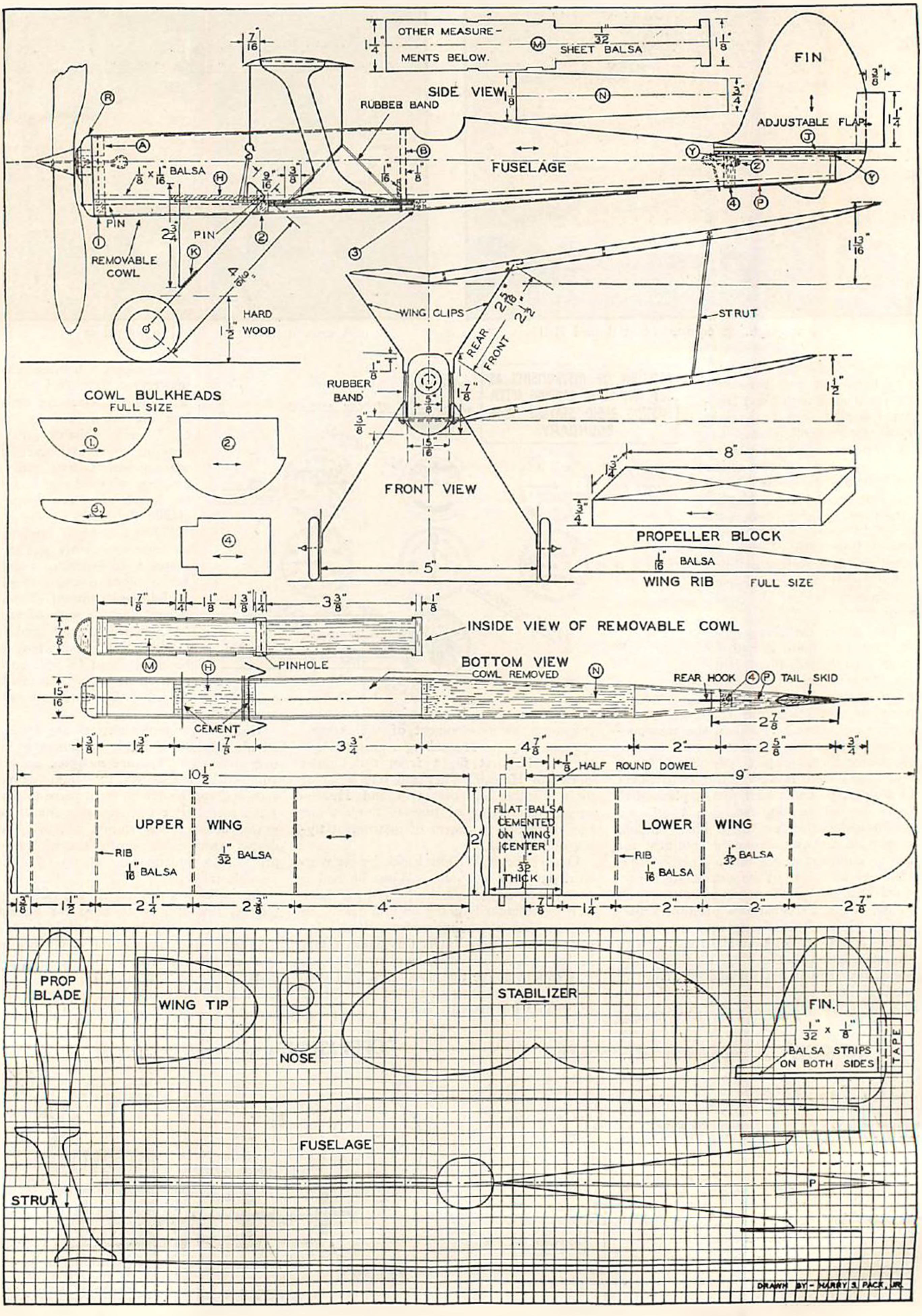
Hegenberger's transmitters are about as simple a piece of radio equipment as was ever devised. They are mounted on small automobile trucks of the light delivery type and can be driven from place to place. Each transmitter consists of a small, low-power broadcasting station run by a generator which is driven by a small gas engine. The antenna is set up from collapsible masts.

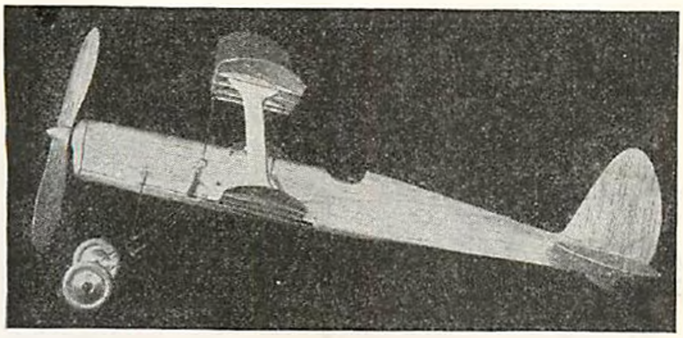
An important feature of the radio compass is that it may be used for guidance in cross country flying as well as for blind landings. This instrument is not confined to special beacons, as is the present airway radio receiver, but may be tuned to any commercial broadcasting station. The

(Continued on page 41)

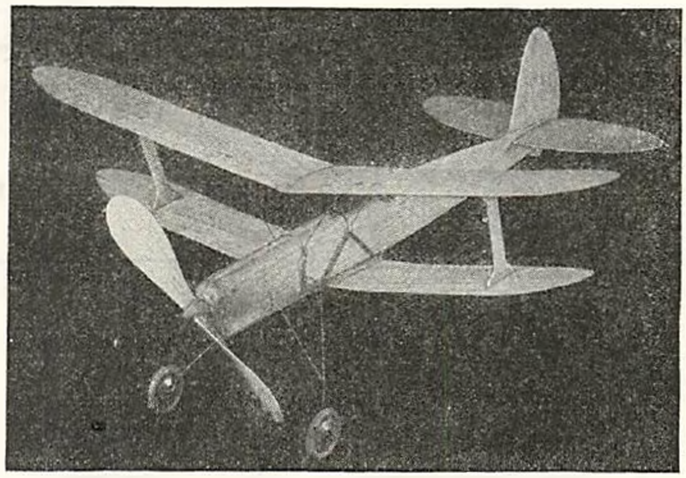





OTHER MEASUREMENTS BELOW.
1/32" SHEET BALSA
FIN
SIDE VIEW
RUBBER BAND
ADJUSTABLE FLAP
FUSELAGE
1/8" x 1/16" BALSA
PIN
REMOVABLE COWL
HARD WOOD
WING CLIPS
REAR
FRONT
STRUT
RUBBER BAND
COWL BULKHEADS
FULL SIZE
FRONT VIEW
PROPELLER BLOCK
1/16" BALSA
WING RIB
FULL SIZE
INSIDE VIEW OF REMOVABLE COWL
PINHOLE
BOTTOM VIEW
COWL REMOVED
REAR HOOK
TAIL SKID
CEMENT
HALF ROUND DOWEL
UPPER WING
RIB
1/16" BALSA
1/32" BALSA
FLAT BALSA CEMENTED ON WING CENTER 1/32" THICK
LOWER WING
PROP BLADE
WING TIP
NOSE
STABILIZER
FIN.
1/32" x 1/8" BALSA STRIPS ON BOTH SIDES
TAPE
FUSELAGE
STRUT
DRAWN BY - HARRY S. PACK, JR.



The completed all-balsa biplane model shows the trim lines of a racer and a most unusual performance



Good for a 600-foot flight and 40-sec. duration

Fundamentals of Model Airplane Building

How You Can Build an All-Balsa Biplane That Has Unusual Grace, Durability and Performance—Part No. 11

By GILBERT MacLEAN

Though this article and the ones to follow are being prepared by a new author, Mr. MacLean, a young man prominent in aeronautics, the series will continue on the same basis of presenting constructive models for the beginner who wishes to become proficient in the art of model building.

IN THE preceding articles of this series, all models which have been presented have been of the monoplane type. Readers, of course, recognize that it is easier to complete and attain successful flights from this type of machine. However, the time is opportune to present a model biplane which has unusual flying characteristics. Most model builders will contend that they can never attain as fine flights from a biplane as from a monoplane. However, those of you who build this ship, will be greatly disillusioned if you really believe this to be true.

The secret of successful biplane building lies in the correct size and proportioning of surfaces. This little biplane flies as well as any monoplane that you have ever constructed. If you doubt this, build it and determine for yourself whether this is true or not. Here are some of the results of tests made with it.

With the motor lubricated and wound to capacity by hand, it has flown 600 feet without the aid of a tail wind. It has climbed to an altitude of 70 to 80 feet in dead air. It will take off from the ground with but a few feet run; and, the most important point of all, it is one of the most stable airplanes that we have had the pleasure of presenting to our readers. It will fly in all kinds of weather and air conditions. Provided the landing place is smooth, it will come to earth just like a big ship. One of the remarkable features of the ship is its slow flying speed.

Though of all-balsa construction, anyone can keep pace with it by merely "jogging" leisurely alongside of it. We estimate the speed to be 8 miles per hour. The model when finished should weigh approximately 1.8 ounces. Other unusual features are its durability and likeness to a real ship when it is in flight. The training a builder will receive in constructing this model is extremely valuable. The operations are simple in themselves, yet offer the builder practice in shaping and handling all forms of balsa construction. Now, we will tell you how to proceed.

Fuselage

You commence your construction by building the fuselage. This is made by cutting out the outside balsa wood surface from a balsa sheet 1/32" thick. The pattern is given in graph form at the top of the following page. Cut the outline, as shown, very carefully. You will require a sheet of balsa wood 4 inches wide, or if you wish to make the body pattern in two halves, you will need two sheets of balsa 2 inches wide. These two sheets are joined together along the dotted line, as shown in the pattern, to form one sheet 4 inches wide. The two halves may be cemented together, the joints being covered with two strips of heavy manila paper 3/6" wide, one strip on the top and one strip on the bottom.

The next operation is to cement two balsa strips, each 1/8"x1/16" balsa, to the edges of the body pattern. These strips are to be on the inside of the fuselage. They are shown at the top of the page as strips running from the nose to the tail and marked near the front of the plane 1/8"x1/16" balsa. They are to "face" the edge of the balsa wood forming the body so that it will be strong and split-proof.

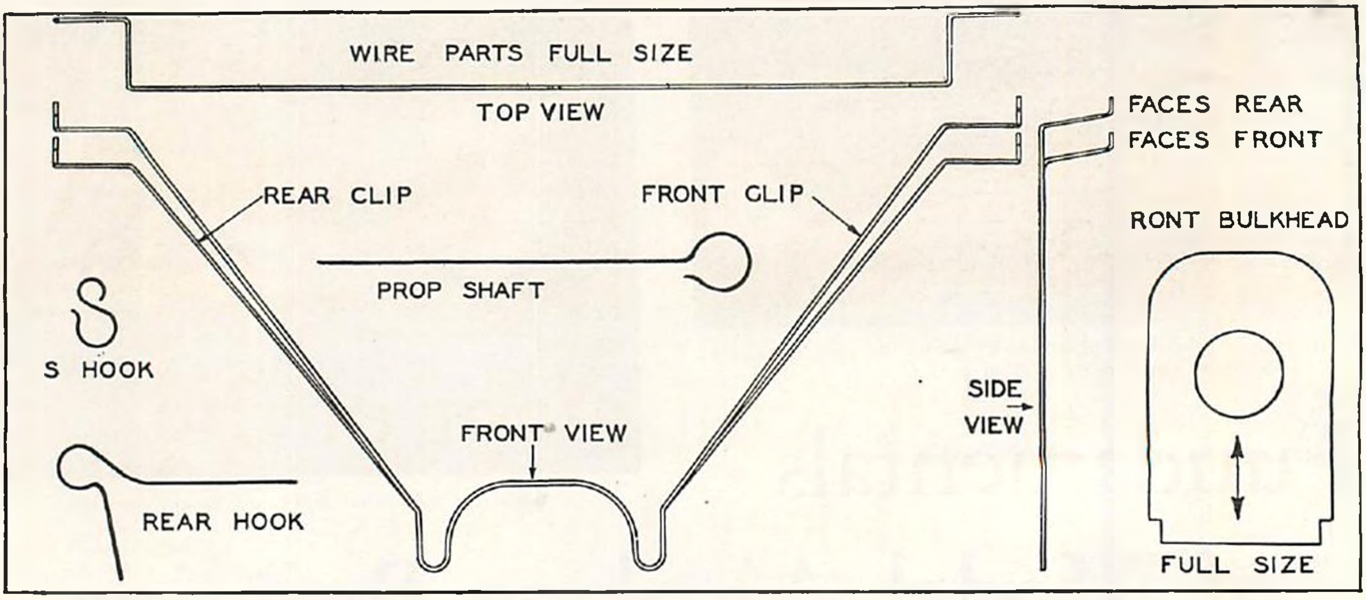
While the cement is drying, pin down the strips and the balsa sheet to some smooth surface so the strips will remain bent, following the edge of the body.

Meanwhile you can cut out the bulkheads shown at A and B in the side view drawing. A is the front bulkhead and is made by cementing together two pieces of balsa 1/8" thick and cut to the outline shown on the drawing marked "Front Bulkhead."

Next, bulkhead B is also cut from a piece of balsa 1/8" thick. It is the same width and has the same curves on the top as bulkhead A. Also, the lower rear corners are notched so that the balsa edge brace strips will fit into the notches when they are in place. However, bulkhead B is 1 5/8" high, 1/8" higher than bulkhead A. Across the bottom edge of bulkhead B a strip of balsa 1/16"x3/8" is cemented, running from one side of the bulkhead to the other across the grain. This piece prevents the bulkhead from splitting under extreme stress.

Now, if the cement is thoroughly dry in the joints of the fuselage sheet, wet it thoroughly through the middle from the nose to the cockpit on the outside of the body. This is the opposite side from the side on which the edge strips are cemented. Do not wet it over the entire surface of the fuselage sheet, but merely along a strip 2 inches wide at the center. By wetting it in this way, you will be able to bend the fuselage around into proper form. Do not try to bend it all at once, but gradually, wetting it repeatedly, preferably with hot water, until the two sides of the fuselage are parallel. The fuselage, after it is properly shaped, should be thoroughly dried, using some method to hold it in the proper form while it is drying. Mr. Grant, while building this model, placed the body between two flanges of a radiator. While it is drying, it is wise to examine it and be sure that it is drying straight so that the body will not be twisted when it is sanded.

Now you are ready to put in the bulkheads. The front bulkhead is cemented in place first. Pins should be used to keep the joint closed until the cement is dry. When



the bulkhead is in place, draw the two rear ends of the fuselage together and clamp them. Then, before the cement of the front bulkhead is dried, line the body up so that the vertical knife-edge of the rear of the fuselage is parallel and in line with a vertical line drawn through the center of the front bulkhead. In other words, be sure there is no twist in the body. When you are sure the body is true, pin the balsa sides tightly to the front bulkhead. Next bulkhead, B, is put in place. Apply cement to the edges and insert the fuselage, 7⅛" from the front face of bulkhead A. By running a little cement around the cracks between the bulkhead and the covering, a very strong joint may be made. Pin the sides of the fuselage tightly to the bulkhead.

Your next step is to put in the base plate Y of the stabilizer. This is shown in the drawing, pattern P. Cut out to the shape of the pattern from a piece of balsa 1/16" and insert it at Y between the two sides of the fuselage at its rear end. *The front end should be ⅜" wide.* The point of the V of the pattern should come flush with the rear of the fuselage. The top surface of this piece should be flush with the slot of the stabilizer. Cement the joints thoroughly. Hold the parts together with pins.

Next you can make the rear motor hook. Make this to the shape shown in the pattern from 1/32" steel wire. It is shown full size. Now cut out a small block of balsa to form bulkhead No. 4, to which the motor hook is to be fastened. This should be cut from a piece of hard balsa ¼" thick. It should be 11/16" long and ⅜" wide. Bevel it 1/32" on each side, as shown in the bottom view of the fuselage at X. The two lower corners should be notched so that the fastened strips of the fuselage fit into them when it is in place. Fit this part carefully in place before you cement it, cutting it as required. When you are sure it is the proper shape, force the end of the rear motor hook through the center of the bulkhead ¼" from its upper end. When it is in place, slip the bulkhead along the wire and bend up the end of the wire, as shown at Z. Before you pull the end of the wire back into the block, as shown at Z, cut a small piece and dowel so that it is ½" round and its length equal to the width of the bulkhead. Cement the flat face of this and pass it through the loop of wire as shown in Z, pulling the wire back into the balsa block. This hard wood piece of dowel prevents the hook from pulling through the balsa block when the rubber is wound tightly.

Cover the wire where it passes into the wood with plenty of cement, allowing this to dry thoroughly before it is inserted in place in the fuselage. It is put into the fuselage in the position shown at 4. Cement it carefully to the base plate of the stabilizer and to the side of the fuselage. Run plenty of cement into the cracks of the joint around the front face of the block. Pin the block firmly in place until the cement dries.

While the cement is drying, put in the balsa block H which forms the base for the landing gear. This is shown in side and bottom views of the fuselage. It is cut from medium hard balsa ¾" wide and 1⅞" long. Cement it firmly between the two edge strips so that its front edge is 1¾" from the front face of bulkhead A. Pin it in place until the cement is dry.

Tail Surfaces

While the cemented joints are drying, you may be cutting out the fin and stabilizer, as indicated by the graph drawing. Note when cutting the fin that a tab or tape is shown on the pattern. Do not cut the balsa wood to the outline of the tape. This small flap is added later to act as a rudder, enabling the ship to be steered to right or left. Smooth the tail surfaces carefully with very fine sandpaper and cement them in place, as shown in the drawing. The crosshatch line in the side view above the stabilizer base plate is the stabilizer. The front edge should be 2¾" from the rear end of the fuselage (not rear of fin). The stabilizer is held in place by cement applied to the top of the base plate. Adjust it so that it is straight with the fuselage and pin it in place.

Next cement two strips, J, flush with the lower edge of the fin which rests upon the stabilizer. These pieces are ⅛" high and 1/16" thick. One is cemented to each side of the fin. They extend from the front of the fin to the rear and are 3½" long. Hold these in place with pins while the cement is drying.

In the meanwhile, the small flap or tab may be attached to the fin. This flap may be made from ordinary brown gummed paper tape, 1¼" wide and 1¼" high. Crease it at the center with the gummed surface inward. Wet it thoroughly and fasten it to the fin. Allow ⅜" of the tape to extend out from the rear of the fin. The fin, of course, fits in between the two sides of the flap after it is creased. When the tab is in place, press the two surfaces tightly together, making sure that it is firmly fastened to the fin. When it is dry it may be easily bent from right to left.

Place the fin in position, cementing the lower edge to the top of the stabilizer and slotting the rear to the body so that the lower vertical piece of the fin will fit into the body between the two sides for about ⅛". When it is in place to your satisfaction, cement the joints and pin together tightly until the cement is dry. Before the "turtle-back," or rear part of the fuselage is joined together, it is necessary that, all cemented joints are thoroughly dry, so we will do this later.

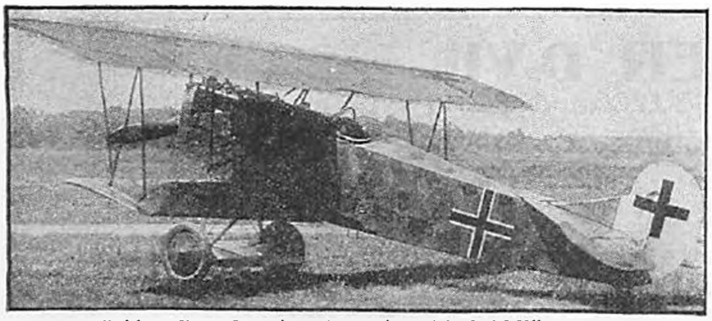
Wings

While the cement is drying, cut out the ribs for the wings. These are cut to the shape shown on the drawing from 1/16" hard balsa. Eight will be needed for the upper wing and six for the lower. Now the wing sheets are cut out to the dimension shown. The upper wing is 21" and the lower 18" in span. The sheet is 2½" wide.

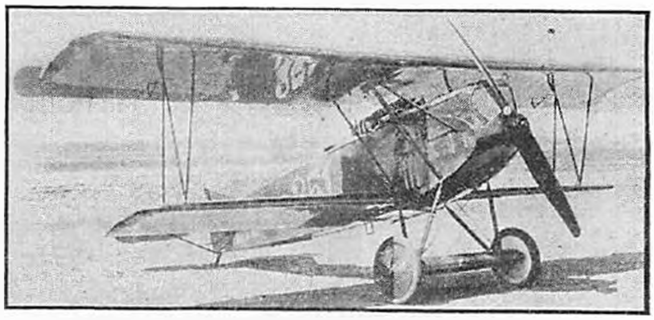
When the tips have been cut to the pattern given on the graph, cement the ribs of the upper wing in place in the position indicated by the dimensions. This is done before the wing is creased or bent for the dihedral. Previous articles have described this operation carefully. Use pins to hold the wing sheet tightly to the ribs.

While these are drying, cut out the lower wing from 1/32" balsa. Before the ribs are put in place, the wing is bent at the center by wetting the underside of the wing for a distance of about 1½" on each side of the wing center line, which runs from the front to rear. Bend the wing up into position to the proper dihedral, as shown in the front view, gradually. Then suspend the wing between two books

(Continued on page 42)



Fokker D.7. Speed 124 m.p.h. with B.M.W. motor



Fokker D.7. Speed 120 m.p.h. (Mercedes motor)

The Development of the Fokker Fighters

The First Complete Story of the Development, Testing and Acceptance of the Famous Fokker D.7, with Detailed Plans and Description

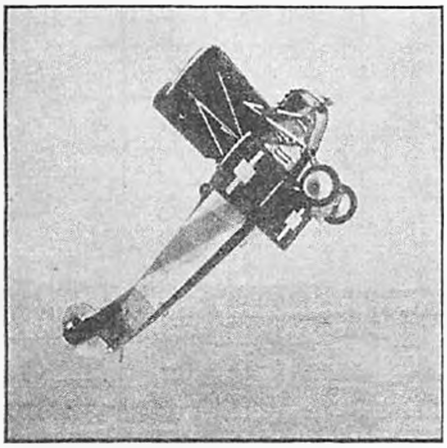
By ROBERT C. HARE

Author's note:
From time to time writers of historical aircraft features dealing with wartime airplanes will attempt to prove which of the German aircraft in use at the Armistice was the "best." There is no yardstick by which 1918 German fighting airplanes can be judged since each had certain inherent peculiarities. It is fitting to recall at this time however, the fact that the Fokker D.VII, perhaps the finest all-round scouting machine developed by the warring powers, was the only machine specifically mentioned in the Treaty of Versailles. Military Clause Four, which specifies surrender of weapons, reads in part: "Surrender in good condition. . . . 1,700 airplanes (fighters, bombers—firstly, all of the D.7s . . . .)"
It can be safely assumed, therefore, that the Fokker D.VII was the most feared of all German planes and that the victors considered the surrender of ALL the D.7s FIRSTLY, a guarantee that the Germans would not be able to resume hostilities in the winter of 1918-19.

AS THE year 1917 drew to a close, the Allied air forces held a reigning hand over the Germanic squadrons. New British ships, the improved Camel, the S.E.5A, Martinsyde and Vickers "Vampire" played havoc with the Albatros machines, then standard equipment of German circuses. New DeHavilland 9As, the Bristol Fighter and Vickers two-seaters were holding the high cards. Germany's aerial supremacy was waning.

With this ever increasing blow to the German Air Force came the proposed aerial expansion program of General von Höppner, commander of the German Air Force. This meant that someone would have to build new types of planes, and Anthony Fokker was determined to beat the competing firms for contracts. Still unable to get his supply of Mercedes Six motors, Fokker sought about for a solution to his problem.

Fokker's gift to von Richthofen of the Ace's famous red three-decker pleased the Red Knight so well, that several conversations were held between him and Fokker over the merits of fighting airplanes. During these visits, Foker became well acquainted with pilots of Richthofen's circus, and with technical officer Kreft, a member of Richthofen's staff. These friends among the aces proved very valuable to Fokker as he planned his attack to bring the motor supply controversy out into the open.



An early D.7 hanging on its prop during tests, moving forward at 30 m.p.h. under perfect control

Fokker's idea was to have an open competition in which all German manufacturers were expected, though not compelled, to submit entries. Only one requirement was made; competing planes were all to be powered with the coveted Mercedes Six engine.

Reminding his ace friends that this competition would also include that the planes be flown by the Front pilots, and that they would be allowed to choose the planes themselves, the members of Richthofen's circus immediately fell in with the plan and presented it to Berlin authorities for approval. Their pressure brought about a quick decision in favor of the plan and the first of January was set as the meeting time. Johannisthal aerodrome at Berlin was chosen as the field of competition.

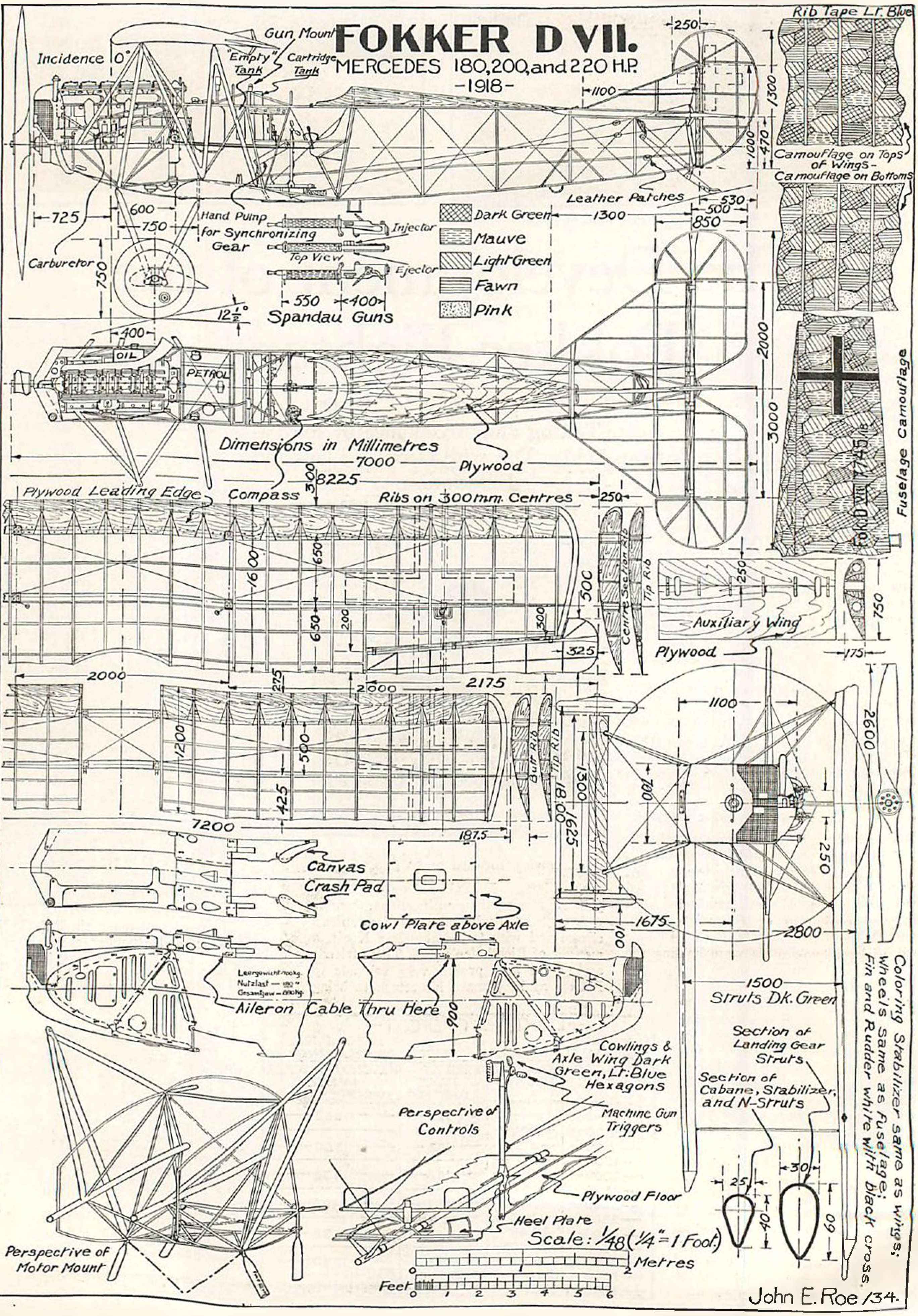
Every manufacturer in the field took advantage of this opportunity of displaying his planes, for they knew without a doubt, the winner would be rewarded with a nice fat contract and his airplanes would be cruising the Front skies in great droves by May and June of 1918. Experimental departments of all the German airplane factories began humming with activity. Within six weeks, the Pfalz Flugzeugwerke rolled out its sleek D.V type and test flew it with fair results. About the same time the L.F.G. concern produced the Roland D.VI, Albatross Werke entered the D.VI, Aviatik A.G. constructed their little D.II scout; A.E.G. and Rumpler each entered the field of single-seater construction with their D.I types. Included in the competition was the D.V biplane of L.V.G., the Schutte-Lanz D.I., the Dornier D.I, and the Kondor E.III.

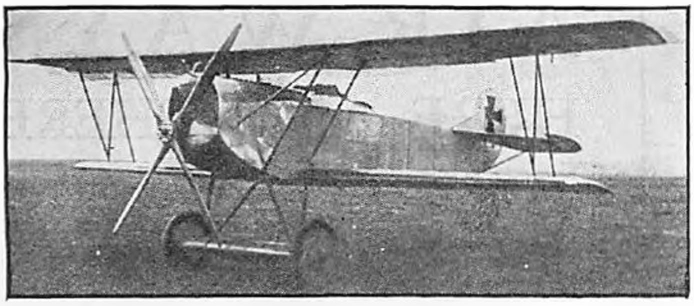
Taking time and pains to produce his entry, Fokker found the date of the contest slightly short of his scheduled time, and so finished off his machine in a hurry. The final result was not exactly what he had planned, and after a test flight at his factory at Schwerin, the plane eventually to become the Fokker D.VII was shipped to Berlin.

In the main, this new Fokker, the V.22, was an excellent machine in maneuverability, climb and in balance. After testing the ship for several hours, Fokker found that

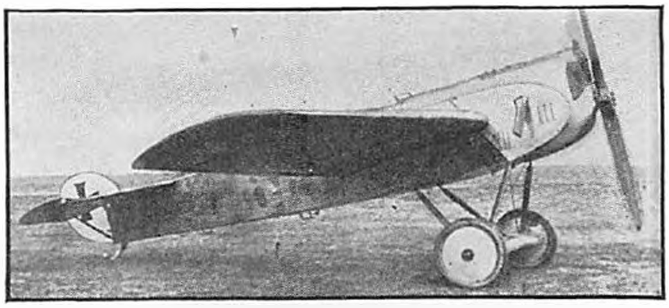
-FLIGHT TEST REPORT- RCM
ALDERSHOF MARCH 12, 1918
AIRPLANE: FOKKER D.VII PROPELLER: WOLF 2M80/1M81

ALTITUDES IN METERS	CLIMB IN MINUTES	SPEED AT ALTITUDES KILOMETERS	REVOLUTIONS PER MINUTE MERCEDES 160 HP.
0	—	192	1565
500	2'25"		
1000	4'15"	188	1550
1500	6'0"		
2000	8'18"	184	1530
2800	10'59"		
3000	13'49"	177	1490
3500	17'33"		
4000	22'48"	167	1430
4500	29'48"		
5000	38'05"	153	1360
5500	LANDING SPEED-FULL LOAD-97 KM/HR.		
6000	CEILING-6000 METERS IN 51 MIN 10 SEC.		


FOKKER D VII.
MERCEDES 180,200,and 220 H.P.
-1918-
Gun Mount
Incidence 0°
"Empty" Tank
Cartridge Tank
Rib Tape Lt. Blue
Camouflage on Tops of Wings-
Camouflage on Bottoms
Leather Patches
Hand Pump for Synchronizing Gear
Injector
Top View
Ejector
Carburetor
Spandau Guns
Dark Green
Mauve
Light Green
Fawn
Pink
OIL
PETROL
Fuselage Camouflage
Dimensions in Millimetres
Plywood
Compass
Plywood Leading Edge
Ribs on 300mm. Centres
Centre Section Rib
Tip Rib
Auxiliary Wing
Plywood
Butt Rib
Tip Rib
Canvas Crash Pad
Cowl Plate above Axle
Aileron Cable Thru Here
Struts Dk. Green
Coloring Stabilizer same as wings; wheels same as fuselage; Fin and Rudder white with black cross.
Cowlings & Axle Wing Dark Green, Lt. Blue Hexagons
Machine Gun Triggers
Perspective of Controls
Section of Landing Gear Struts
Section of Cabane, Stabilizer, and N-Struts
Plywood Floor
Heel Plate
Perspective of Motor Mount
Scale: 1/48 (1/4" = 1 Foot)
Metres
Feet
John E. Roe /34.



The original form of the Fokker D.7 which turned the tide of air supremacy (1918)



The Experimental Fokker V.23 with Mercedes 160 h.p. motor. (March 1918)

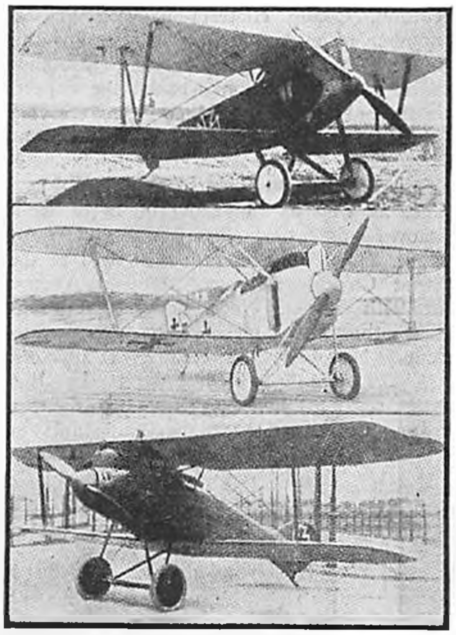
it was liable to spin in sharp turns and that its ability to swing around in a tight place might prove a detriment to an unsuspecting pilot during the tests to follow. Flying and sham fighting with the other entries, learning as much about his plane as he could, Fokker realized he had built another death plane: it was too maneuverable.

With the help of his two best welders, Anthony Fokker directed the reconstruction of the V.22 at the Johannisthal field. All Saturday night the three men worked on the new machine, welding in an extra length of fuselage and adding more fin area. Sunday noon the job was completed and patched so perfectly that nothing appeared to have been done. With one more chance to test his plane, Fokker flew the V.22 Sunday afternoon and found the machine to be no longer dangerous, but it retained all the characteristics of maneuverability, climb and quickness that had been displayed by the original machine. That afternoon, Fokker landed, confident of his machine's ability, and next day, Monday, turned the ship over to the contest authorities.

Monday morning the contest ships took off one by one, each piloted by a famous ace of the German Imperial Air Force. At 3,000 meters altitude, tests began. Looping, diving, turning on one another, the machines held mock battles, each trying to ride the other down to earth. Due to the thick upper wing of the V.22 it held its altitude in the thin upper air. The Rumpler was too heavy and responded badly in coming out of a dive. The Albatros and Pfalz machines could not climb fast enough to catch the Fokker V.22 and the A.E.G. could not hold its ground with any of the competing machines. The superiority of the Fokker V.22 was plain in every case, and the first day's contest narrowed down to the Rumpler and the V.22.

Tuesday the pilots changed mounts and again went through the battle maneuvers. But each time the Fokker machine was the last to land after forcing all the other competitors to the earth. The Albatros, Rumpler, Pfalz and Roland machines were several miles faster than the Fokker, but what good was this speed if you could not get above the Fokker to shoot at it? It was the opinion of von Richthofen, that aerial battle needed maneuverable planes during the few minutes of actual combat rather than speedy planes, that Fokker had considered when building the DR.I and carried on into the design of the V.22.

When the contest finally closed, the Fokker V.22 was judged winner by the unanimous vote of the pilots and Fokker was awarded with a contract for 400 machines of this type. This was indeed a victory to Fokker, who had been suppressed so long and denied the use of the Mercedes motor. In addition, he was told the Albatros factory was to build the new Fokker on a royalty basis as well as the A.E.G. factory. Von Höppner's program called for a standardization of equipment and the Fokker V.22 was chosen as the ship to replace all other pursuit types used in Germany at that time.



Planes competing with Fokker, Schutte Lanz D.1, (A.E.G.) D.1 and Roland D.6

Only one step existed between the V.22 and the D.VII machines, that of aileron attachment. In the V.22 the aileron was fastened to an auxiliary trailing edge spar in the upper wing and the aileron itself projected past the trailing edge of the wing. In the D.VII the aileron was attached to an independent spar near the rear spar and had its trailing edge even with that of the wing. Later a two-bladed propeller was found to work as well as the four-bladed type.

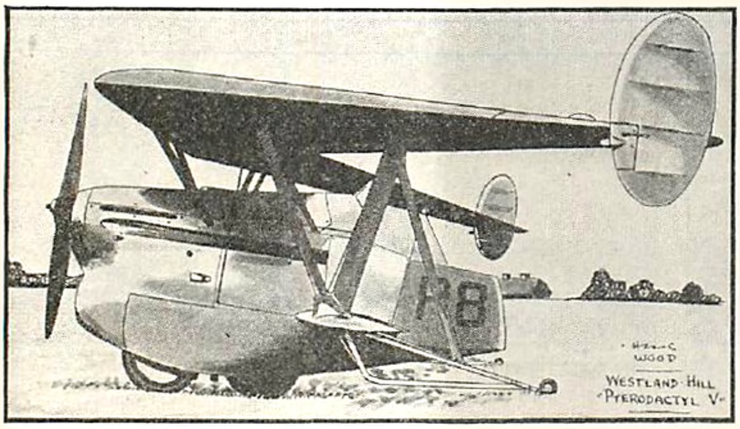
Several weeks were necessary to install equipment in the contracting factories which were to build the D.VII. For most, wood had been their only constructional material, while the Fokker steel fuselage called for specialized tools, jigs and skilled men. Fokker's welders entered the other factories and taught the workmen how to handle tubing and an acetylene torch, how to heat-treat the various components after welding, and disclosed the secrets of a good welded joint.

Consequently it was nearly four months before the Fokker D.VII began arriving at the Front in numbers. By June, full squadrons of D.VIIs were scouring the skies and putting the Allied machines of the time to shame. Rumors all along the Front warned French, British and American pilots to be on the lookout for the "new Fokker biplane." Like most machines, however, a Fokker D.VII was finally forced down intact, and was sent to Villacoublay for an official inspection by the Allied forces and to be run on test flights. What the Allied inspectors saw, to their amazement, was a graceful biplane so simple in construction that it put their Spads and Nieuports to shame, yet so efficient and flyable in the air that there was no plane in the Allied forces, save the S.E.5A, that could come anywhere near it. What made the D.VII more remarkable was the fact that it was not a revolutionary design, but one that had been developed over a period of nearly two years.

The fuselage of the Fokker D.VII

(Continued on page 38)

Herman Goring, Von Hoppner and Bruno Loerzer discussing the wonderful performance of the Fokker



AIR WAYS
HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Send Pictures and Details of Your Experiments

Pict. No. 1. Hyman Oslick launching his "hydro" which established a record

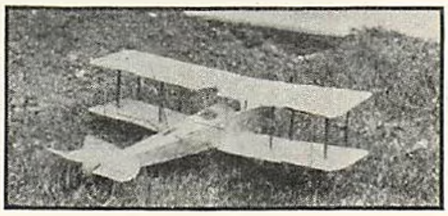
THE Indoor Eastern States Contest has come and gone. This is truly the mid-winter indoor classic of the Eastern seaboard. It is sponsored each year by UNIVERSAL MODEL AIRPLANE NEWS and sanctioned by the National Aeronautic Association. Many contests have a greater number of entries than this one, but this one may truly be called "classic" insomuch as it is a competition between the experts in the indoor model field. There were very few novices on hand at this contest. Young men came from Boston, Philadelphia, Atlantic City, Springfield, Mass., and Newark, as well as the usual quota of well-known builders who live in the vicinity of New York. The contest was held at the 101st Cavalry Armory, Madison Avenue at 94th Street, New York City. This was the only place that was available. However, the ceiling of approximately 70 feet and the dirt floor did not seem to dampen the ardor of the contestants or hinder the performances of their models.

Flying started early and progressed smoothly, apparently to the satisfaction of all concerned. A noticeable feature was the lack of confusion. The day was quite clear, though slightly muggy. This may have had something to do with the lack of record times. However, in one of the features of this Meet, the R.O.W. event, Hyman Oslick of Philadelphia broke the Junior R.O.W. record with a flight of 10 minutes, 59 seconds.

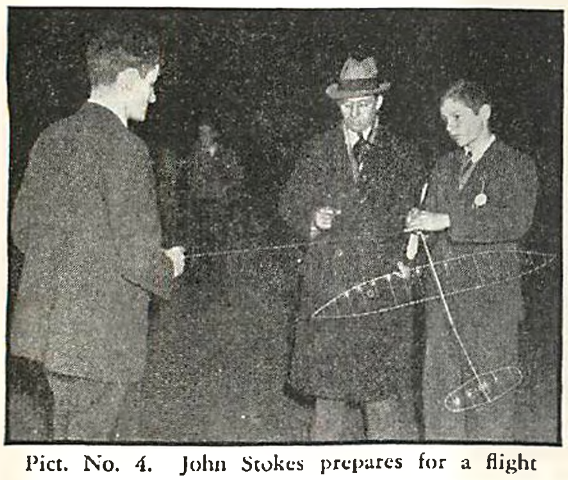
Picture No. 1 shows Oslick with his record hydro getting under way from the hydro tank, which was located at the center of the Armory floor. Mr. Condermann, known to our readers as F. Conde Ott, the war ace story-writer, is anxiously waiting to get the time for the flight. Immediately back of Hyman Oslick is Captain Claude M. DeVitalis, a noted war pilot who officiated as an assistant director at the contest.

The spirit of joy with which the prizes were received is reflected on the face of Oslick in picture No. 2, which shows him with the three trophies he won. We would say that he "cleaned up." He was awarded the Edward R. Mitton Trophy, donated by the vice president of the Jordan Marsh Company, Boston, Mass., to the high-point winner of the contest; the Megow Model Air-

Pict. No. 5. Irwin Ohlsson and his gas model



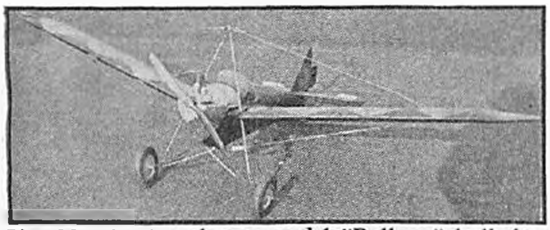
Pict. No. 7. A controllable model, devised and built by R. Becker. It can be guided in flight



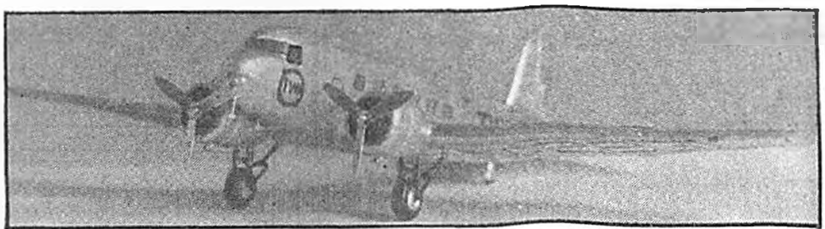
Pict. No. 4. John Stokes prepares for a flight

Pict. No. 2. Oslick won three trophies at the annual Eastern States Indoor Contest

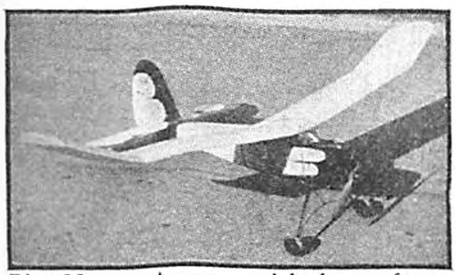
Pict. No. 3. Mayhew Webster won the *Stick Duration* event



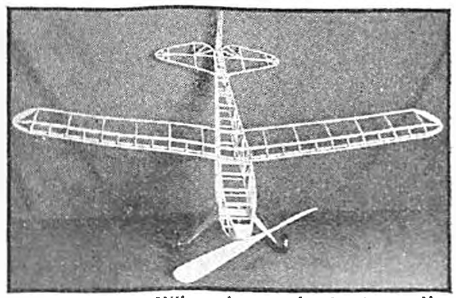
Pict. No. 6. A scale gas model "Bullpup" built by William Effinger. It is a fine flier



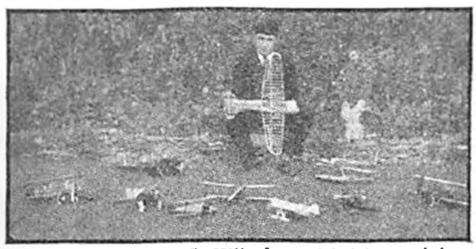
Pict. No. 9. A detail scale model Douglas D.C-1 by Arnold Smith



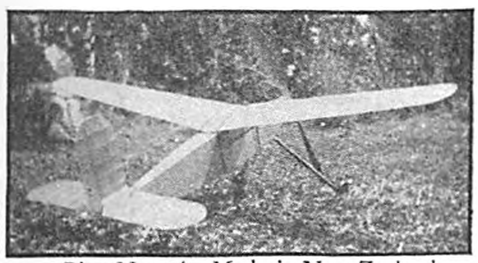
Pict. No. 8. A neat gas job that performs well, by Harold Mitchel



Pict. No. 13. What they make in Australia



Pict. No. 12. L. S. Wigdor with his models



Pict. No. 14. Made in New Zealand

plane Shop Trophy for winning the fuselage duration event and the Whitfield Paper Company Trophy for placing first in the R.O.W. event. This appears to be one time that there was absolutely no doubt as to the superiority of the winner.

Mayhew Webster of Philadelphia won the Universal Model Airplane News Trophy for hand-launched duration with a flight of 12 minutes, 2 seconds. Though this time was fairly good, it cannot compare with the record time of about 22 minutes, established by Carl Goldberg at the 1934 National Competition. Picture No. 3 shows Webster exuding pleasure while he is holding the trophy which he won.

Other prominent builders were at the contest. One of them was John Stokes of Huntington Valley, Pa., snapped in picture No. 4 while he was holding his duration tractor. The young man storing energy in the motor looks very much like Stephen Faynor. We are not certain as to his identity. Captain DeVitalis is patiently waiting to get the time of the flight.

Other well-known builders on hand were: Bruno Marchi of Boston, Mass., Stanley Condon of Glenridge, N.J., Raymond Steinbacker of Ridgefield, N.J., Herbert Greenberg of Newark, N.J., Alfred Rubin of Atlantic City, N.J., Kenneth Ackerman of Camden, N.J., John Ginnetti of Atlantic City, N.J., Hewitt Phillips of Belmont, Mass., Wilber Tyler of Boston, Mass., Theodore Golomb of Philadelphia, Joe Kovel of Brooklyn, N.Y., John Haw of New York City, James Mooney of Philadelphia, Pa., Louis Schumsky of Philadelphia and Stanley Jonik of Philadelphia. All of these contenders were prominent in the three events; which were Hand-Launched Duration, Fuselage Duration and R.O.W. Duration. Open events were held in these three classes for contenders 21 years of age or over.

Kenneth Ackerman was the second high-point winner of the Meet. He won the silver trophy donated by the Berkeley Model Supplies Company of Brooklyn.

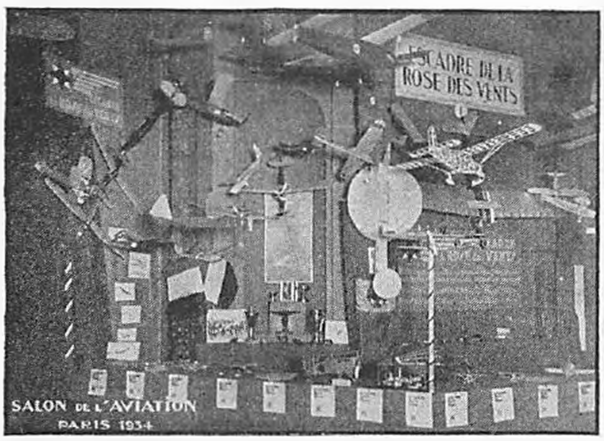
Joe Kovel of Brooklyn placed second in the Hand-Launched Duration with a flight of 11 minutes, 9 3/5 seconds. This won the Bamberger Trophy donated by L. Bamberger and Company, Newark, N.J.

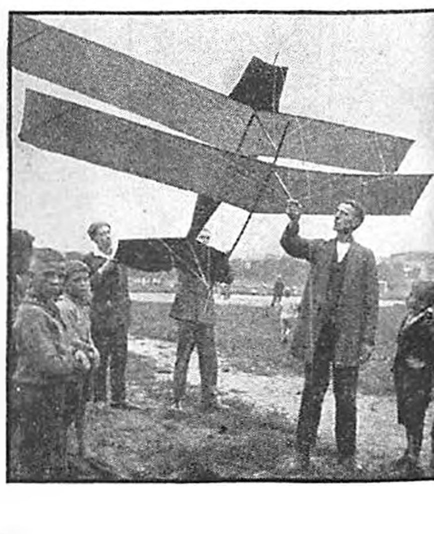
The winners in the Open Class were: Hand-Launched Duration, Jesse Bieberman with a flight of 9 minutes, 34 seconds. He won a silver trophy donated by the National Aeronautic Association. In the Open Fuselage Event, William Latour took first place with a flight of 6 minutes, 10 seconds, also winning a silver trophy donated by the N.A.A. Mr. E. A. Walen of Springfield, Mass., took second place with a flight of 3 minutes, 24 1/5 seconds, winning a silver trophy donated by the N.A.A.

Second and third place were honored by medals donated by Universal Model Airplane News and kits donated by Berkeley Model Supplies of Brooklyn and the Scientific Model Airplane Company of Newark. A complete record of winners and times appears at the end of this account.

Some of the prominent leaders in model airplane activities who were kind enough to assist in the successful operation of the contest were: Captain Willis Brown, head of the Jordan Marsh Boston Traveler Junior Aviation League; Mr. E. A. Walen, Director of the Springfield and Westfield, Mass., Model Airplane Clubs; Mr. Jesse Bieberman who lead a group

(Continued on page 34)

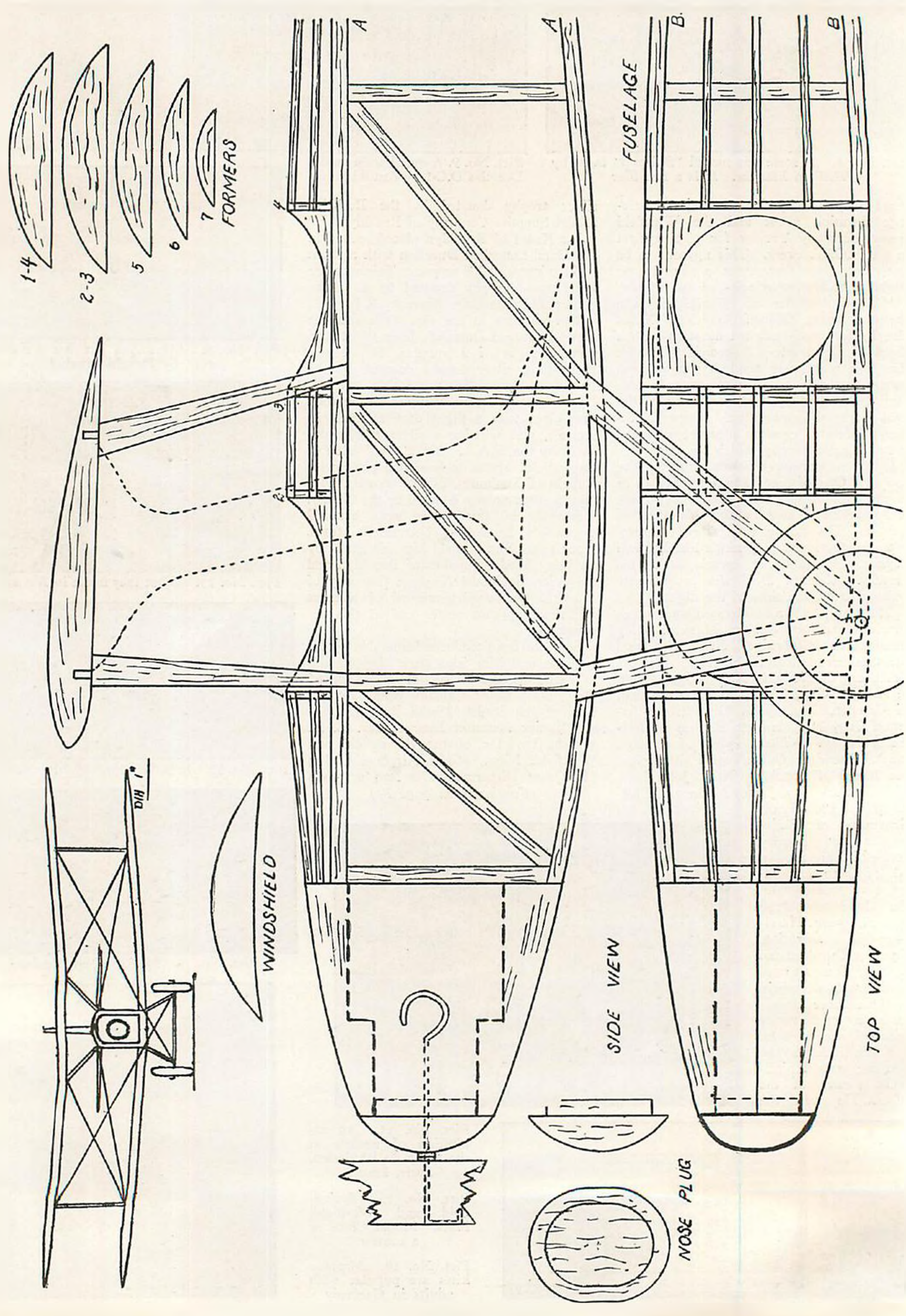


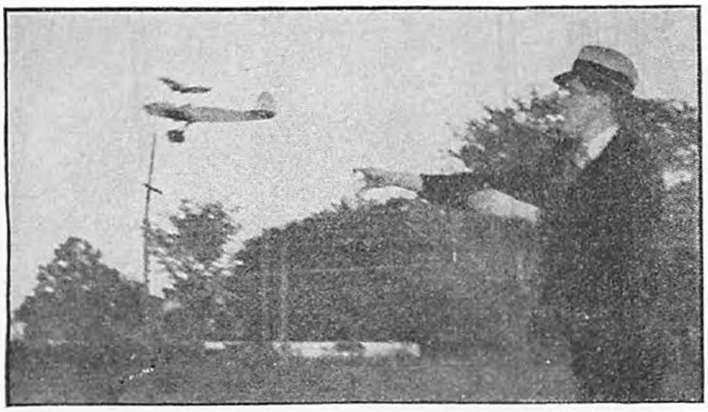


Pict. No. 11. An exhibition of models at the Salon de l'Aviation, Paris, France

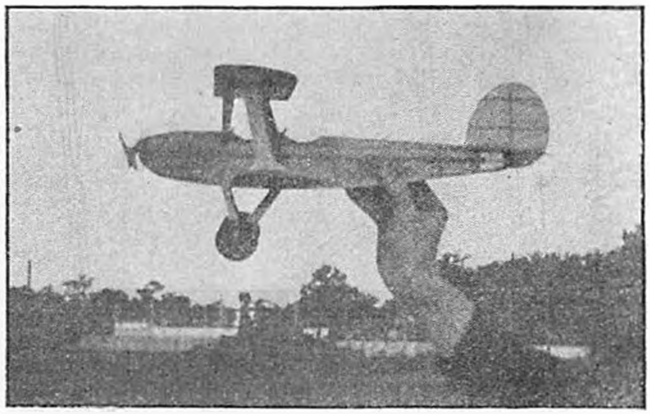
Pict. No. 15. Springfield and Westfield, Mass. Model Clubs at a contest

Pict. No. 10. Airplane kites are popular with adults in Germany


FORMERS
1-4
2-3
5
6
7
FUSELAGE
A
B
SIDE VIEW
TOP VIEW
WINDSHIELD
NOSE PLUG
DIH 1"



The model takes the air for a long and steady flight

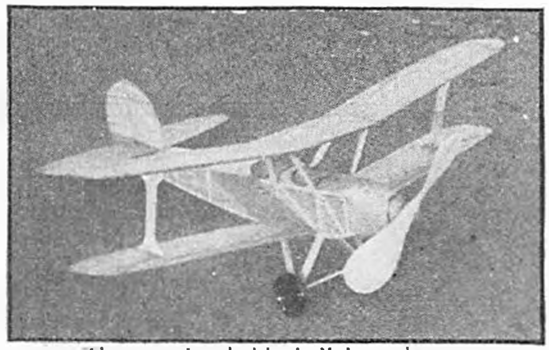


The finished model ready to hand-launch

Building the Famous Udet Flamingo

How You Can Build a Model of the Unusually Fine Flying Plane Used at the National Air Races by the Famous War Ace, Udet

By WILLIAM WINTER and WALTER McBRIDE



The completed ship is light and strong

The Udet Flamingo

THE Flamingo, a popular German light plane used for school and acrobatic work, is known to all of us through the spectacular stunts performed by the great German war ace, Udet, at the National Air Races in the past few years. We all can recall the dead stick acrobatics performed at low altitude. Despite the fact that it has only one hundred horse-power, it is one of the best combination school and stunt planes of the last 10 years. To date about eighty have been built.

The model is rugged and is an excellent flyer. It has a very steep climb with quick recovery.

Fuselage

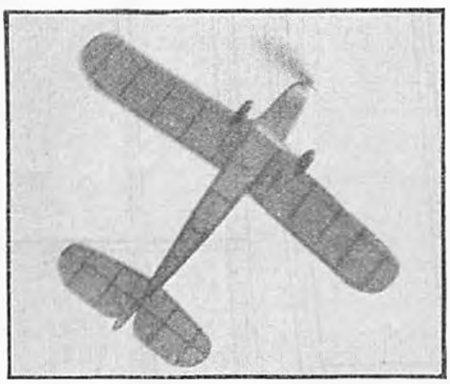
(Note: Both sides are assembled at once)

It is advisable to cover drawing of fuselage with waxpaper to prevent sticking. The longerons of 1/8" sq. should be a soft grade. They are pinned down on the side view. All cross pieces are cut to size and cemented in place. When dry remove pins and separate fuselage sides with razor blade. Widest cross pieces are cut to size as shown in top view and glued in place. Pins will hold work in position. When dry, draw rear together and cement. Add remaining cross pieces at designated positions.

Cut T section from a 7/8" piece of 1/4" sq. and cement in place. Rear hook might now be added. Formers are cut from 1/16" sheet and cemented at stations shown. Cut notches to receive 1/16" sq. fairing strips and cement fairing in place. 1/32" sheet is bent between cockpit formers and cemented. When dry, mark out cockpits and cut with a sharp razor.

It R.O.G.s with ease and grace

The nose block is cut from a soft block 1 7/8" x 2 1/16" x 1 1/2". Cut top and side patterns, mark and cut block to suit. Round edges as shown in nose detail and sand. Cut block in half and hollow out. Leave block heavy as it balances plane in flight. Cement halves together and finished nose block to fuselage.



An unusual "shot" of the model in actual flight directly overhead

Cut a piece of tissue for *each* side and bottom of fuselage. Leave it long enough to cover nose block in order to match color of fuselage. Dope a few cross pieces at a time and starting at one end, work paper toward the other. Trim loose edges. The fairing is covered with narrow strips to avoid wrinkles. Cover both cockpits in order to match colors. Trim excess paper and dope-frayed edges down. Cement windshields in place. Bend tail skid from 1/16" bamboo, point one end and insert in proper cross piece. The surface is doped lightly.

Landing Gear

Streamline an 1/8" x 1/4" strip and sand. Cut struts as shown in detail and bevel edges (both ends) to fit flush with fuselage and each other. Use pins to hold in place while cement is drying. Bend .028 music wire for axles, mount wheels, and fasten with thread and cement to spreader bar.

Tail Assembly

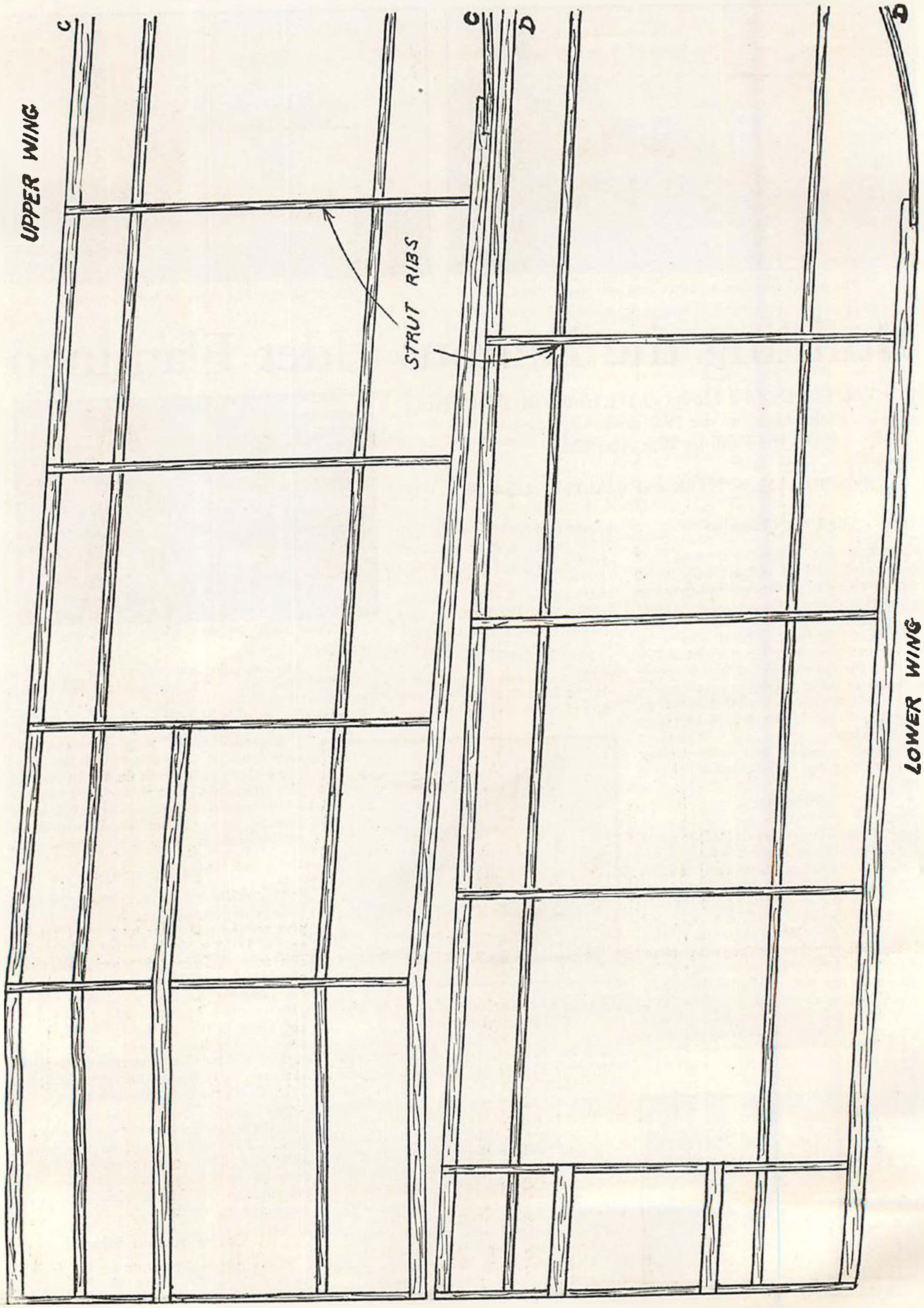
The stabilizer is built much in the same manner as the fuselage. It is laid on the plan and held in place by pins. First the spar of 1/16" x 1/8" is located and then the ribs are cut from 1/32" sheet balsa and glued in place. Their sizes can be found in the stabilizer detailed plan. The edge is 1/16" bamboo bent around a candle flame and glued to the cross pieces. A sheet of tissue should be cut to fit either side of surface and by doping a few cross pieces at a time, cover in same manner as fuselage. Trim all edges and dope surface lightly.

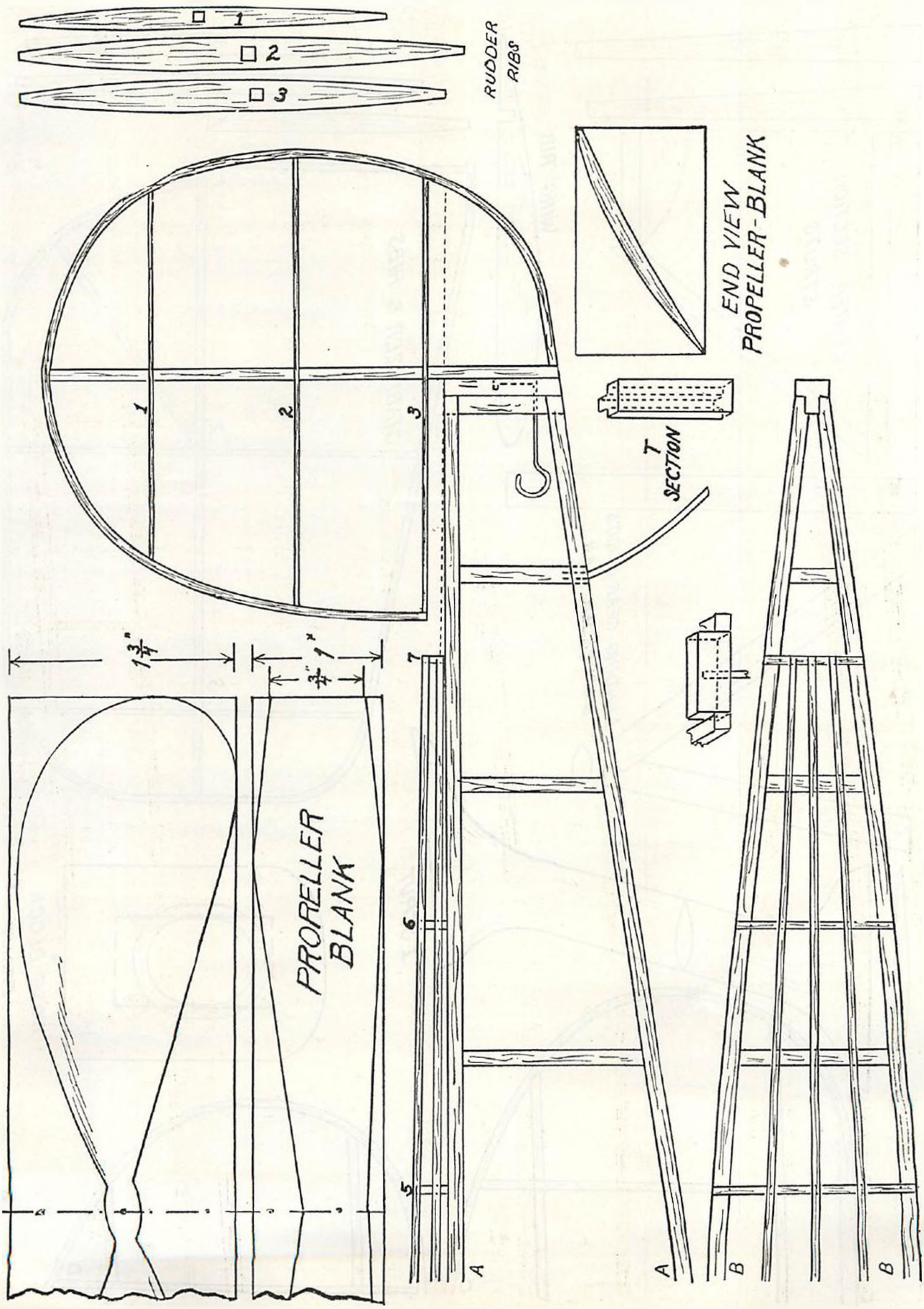
The rudder is built in the same manner with the exception that the ribs are in one piece. They are cut out to receive the 3/32" spar. Ribs are cut from 1/32" sheet. Spar passes through holes in ribs. The tail surfaces may be pinned in place while cementing to fuselage.

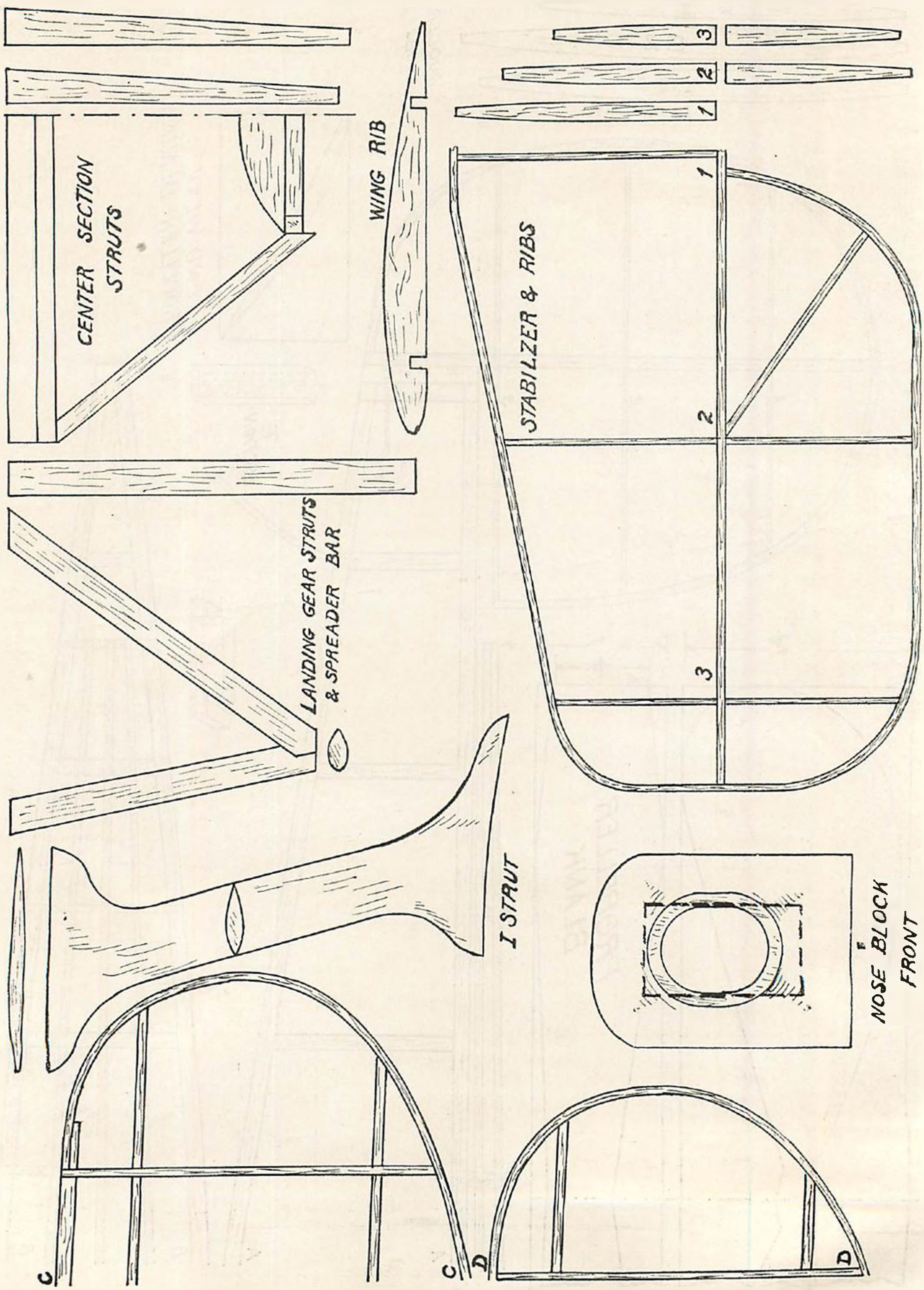
Center Section Struts

The center section struts are cut from a piece of 1/8" x 1/4", streamlined and sanded.

(Continued on page 35)


UPPER WING
STRUT RIBS
LOWER WING
C
C
D
D


RUDDER RIBS
1
2
3
END VIEW PROPELLER-BLANK
T SECTION
PROPELLER BLANK
1 3/4"
1"
3/4"
5
6
7
A
A
B
B


CENTER SECTION STRUTS
WING RIB
STABILZER & RIBS
1
2
3
LANDING GEAR STRUTS & SPREADER BAR
I STRUT
NOSE BLOCK FRONT
C
D

Aviation Advisory Board

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

THIS month we have some very interesting questions that we take great pleasure in answering.

Fred Smith of 95 Washington Avenue, Waltham, Mass., writes us asking the following questions. The first one is rather astounding and perhaps is not so easily answered as one would imagine. These questions pertain to aeronautical engineering.

Question: Of what use is this work to the world?

Answer: An estimate of the value of the use of this work to the world depends upon the viewpoint of the person who answers it. The word "use" infers some aid to a process which is moving in a definite direction of development. Whether it is of "use" or not depends whether or not the person feels that the ultimate accomplishment is worth while. One man might argue as follows:

Aeronautical engineering merely makes life more complicated. It does not give us greater health or happiness; it merely gives us thrills and the opportunity to work harder than we are working now. After all, what good does flying do for man except to make life more intense, more wearing and complicated? It merely intensifies the struggle of life.

A man replying in this manner has many powerful arguments and he is absolutely right if he desires a simple life rather than a complicated one. To such a man aeronautical engineering is worthless. However, since the beginning of time, man has been passing through a process of converting his physical energy into mental energy. He has taken simple things and made them more complicated, making the struggle more upon a mental plane than upon a physical one. The more physical a man is the less he can conquer mental problems successfully. The man with a brain accomplishes his goal easily. So, it seems that nature is taking away our physical stamina and in return is giving us greater mental powers.

To people of the mental type, aeronautical engineering has a great place in the world. Conquering of natural forces pleases him and any mental effort and struggle involved, also gives him pleasure. From this standpoint let us see of what value it is.

First of all, it increases the speed of transportation so that people living at great distances from one another may communicate and exchange ideas and commodities. This makes for a speeding up of trade and industry and creates more complete understanding between the parties involved. One must not overlook the fact that understanding between peoples is the greatest war deterrent that we have. On the other hand, the airplane makes war more intense and horrible when two peoples cannot come to a mutual understanding. Because of this faster transportation, peoples' knowledge of all things increases greatly. They become familiar with not only people in remote spots, but with methods of procedure in other industries. Thus, a man with knowledge is given an advantage over the man who does not acquire knowledge available to human beings.

Aeronautical engineering opens up an entirely new industry which will provide occupations for hundreds of thousands of people.

Question: What are the duties of an aeronautical engineer?

Answer: His duties are very much diversified. Primarily, he designs or supervises the design and construction of airplanes. If he is an authority on all things pertaining to aeronautics, he may act as a consultant to engineers, transport companies and other branches of the industry.

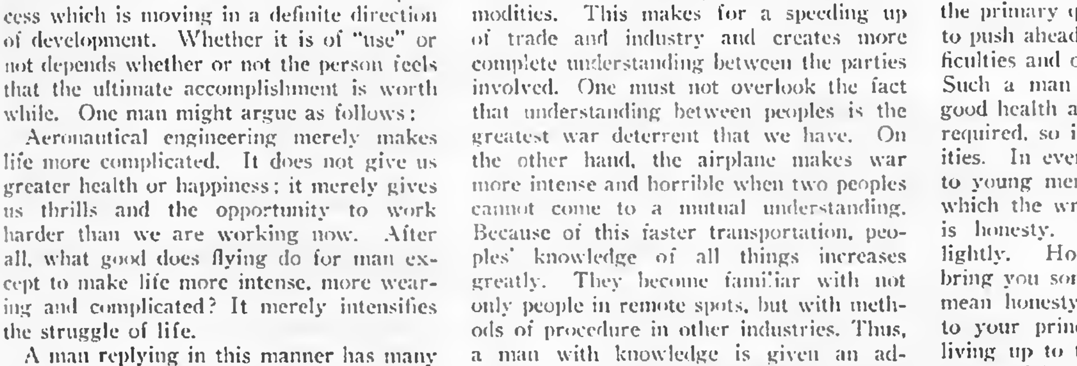
Question: What education and special training is necessary?

Answer: A primary training that may be obtained in grammar and high schools with engineering training which is given in the better aeronautical aviation schools. Mathematics and science are the "staffs of life" of the engineer. Therefore, the student should specialize in these fields.

Question: What other things are needed for success?

Answer: This question gives the one who answers it a very large order. One of the primary qualities is tenacity, the ability to push ahead and struggle through all difficulties and obstacles without being beaten. Such a man will always win. However, good health and great physical stamina are required, so it is well to foster these qualities. In every article dealing with advice to young men there is always one quality which the writer lists as necessary. That is honesty. This advice is often taken lightly. However, honesty will surely bring you some success. By "honesty" we mean honesty with yourself and living up to your principles and ideals, not merely living up to the "letter of the law," so to speak. Those who feel that they will be successful by "cutting the corners" and saying, "Well, no one will know about this," are merely fooling themselves. They may succeed, but most often will not. If they do succeed, they will not be able to hold their success, for success depends upon the qualities built up in a person by constant struggle. If success comes quickly, look out, for you will not know its value. A man must "feel" the cost of a thing or he will not know its value.

(Continued on page 47)



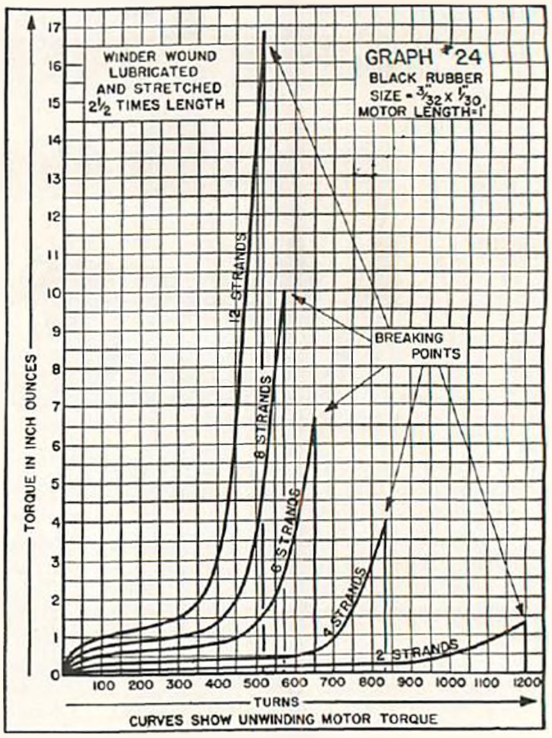
Here is the Navy's newest utility plane, the Grumman Amphibian JF-1. It is a single-bay staggered biplane of equal span. The fuselage and hull are of metal structure. The undercarriage is of the two-wheel retractable type, mechanically operated. Power is furnished by a Pratt and Whitney Twin Wasp direct drive engine, or a Wright Cyclone, under NACA cowling. The fuel tanks are carried in the hull.

The Aerodynamic Design of the Model Plane

Characteristics of Stretched Lubricated Black Rubber Motors of Vital Importance to the Model Designer

By CHARLES HAMPSON GRANT

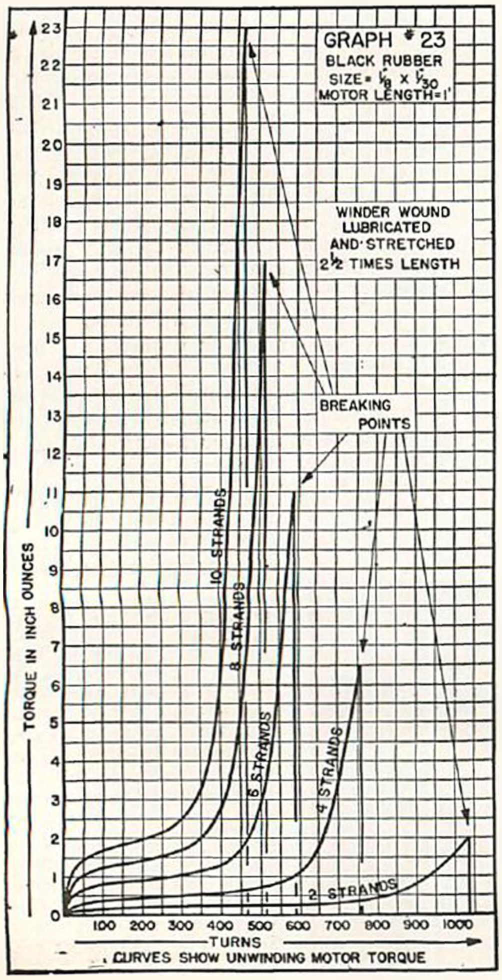
Article No. 37 Chapter No. 4



AMONG model builders, one of the most important questions that arises is "What quality rubber gives the best results, so-called brown rubber or black rubber?" This may be answered very simply. Each grade has its particular use. Brown is best for one type of performance and black is better for another. Then again, whether brown or black rubber should be used depends upon the number and size of the strands your model requires.

This question has been discussed as far as unstretched motors are concerned. However, most model builders stretch their motors when winding them if they want long flights or when they are flying in competitions. More work can be stored in them by doing this and consequently greater duration results.

Therefore, we present herewith graphs showing the torque, number of turns and the amount of work that can be stored in motors of black rubber of various numbers of strands and sizes of strands, when they are lubricated, wound and stretched to two and one-half times their original length. These may be compared with graphs Nos. 19, 20, 21 and 22 for brown rubber, given in article No. 36, February issue.



All these tests have been made under exactly the same conditions regarding scale used, lubricant used, sizes of rubber strands, the amount the motors were stretched, as well as the speed and manner in which they were wound. Therefore, we feel that they give an accurate comparison of the qualities of motors composed of black and brown rubber.

Let us see how they compare with one another and in order that you can follow our comparison of the two types, we suggest that you pull out the February issue of UNIVERSAL MODEL AIRPLANE NEWS from your files and turn to pages 22 and 23. Here you will see the graphs for brown rubber.

Graph No. 23 below, shows the torque curves for ⅛x1/30 black rubber motors. Graph No. 19 is for brown rubber motors of the same strand size.

We will first consider the maximum torque of the various motors. Examination will show that the black rubber motors develop the greatest torque in every case of motors composed of various numbers of strands. Black rubber motors of ten strands developed 20% greater maximum torque. It was 15% greater for eight strands, 23% for six, 30% for four and 25% for two strands.

Comparing graph No. 20 with No. 24 for 3/16x1/30 rubber, we see that the maximum torque for black rubber is greater in all cases except for motors of eight strands where it is practically the same.

In graphs No. 25 and No. 26, the maximum torque developed by black rubber is greater in motors of many strands but very much less in motors of few strands, especially in graphs No. 26 and No. 22 for 1/32x1/30 rubber. It appears that the smaller the size of the strands composing the motors, the *less* is the maximum torque of black rubber compared to brown.

From this, it may be concluded that black rubber should be used when many strands and large size strands are to compose the motor and a high maximum torque is desired. High maximum or initial torque of course means that the power is strong at the beginning of the flight. Thus, such conditions would be suitable to R.O.G. models or where a steep initial climb would be desired. It appears without question, that brown rubber is best when 1/32x1/30 (fine) strands are required.

Though black rubber has higher maximum torque than brown rubber in most cases, its torque is not well sustained during the complete unwinding of the motor. Inspection of the corresponding graphs for brown and black rubber will show that black rubber gives from 5% to 40% less torque for any given number of turns after the first impulse of the rubber has been dissipated. In most cases the decrease is from 25% to 40%.

The fewer the number of strands in the motor, the less is the value of the decrease. In other words, it seems that the *decrease* in the torque is less for black rubber when the motor is composed of *fewer* strands. The same condition exists when small-sized strands are used. You will notice that in the case of two strands of 1/32x1/30 rubber, black rubber gives as much torque as brown.

Thus, in cases where sustained power is desired throughout the flight, initial power being unimportant, brown rubber is best. Even the greater weight of the brown rubber will not eliminate its advantage. It will still have 10% to 20% greater torque than black rubber, weight for weight of rubber. This of course applies to cases only in which the rubber is lubricated and stretched when being wound. What has been said here can be verified easily by comparison of the two sets of graphs, in this issue and in the February issue.

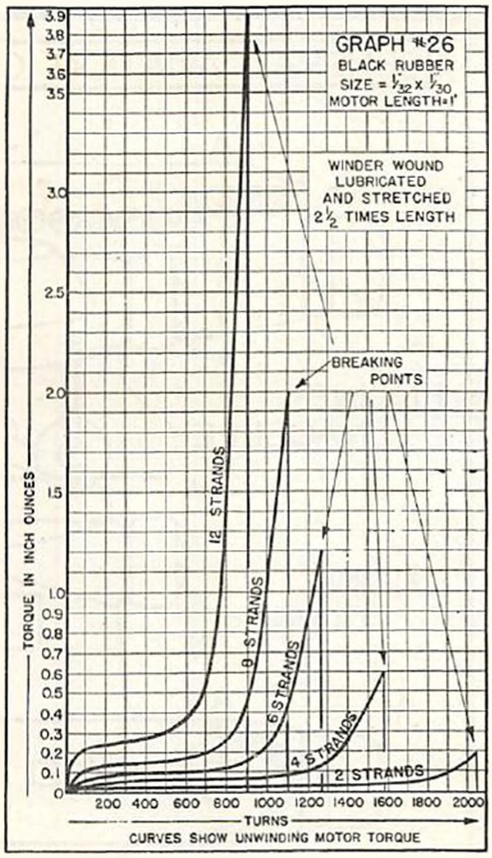
The next factor of importance to consider is the number of turns that can be stored in motors of the two different kinds of rubber. There seems to be very little difference in the number of turns that the two kinds of rubber will absorb. In most cases, black rubber will take about 4% more turns than brown. The only graphs that show fewer number of turns for black rubber are those of motors of two strands, and for motors of 3/32x1/30 rubber.

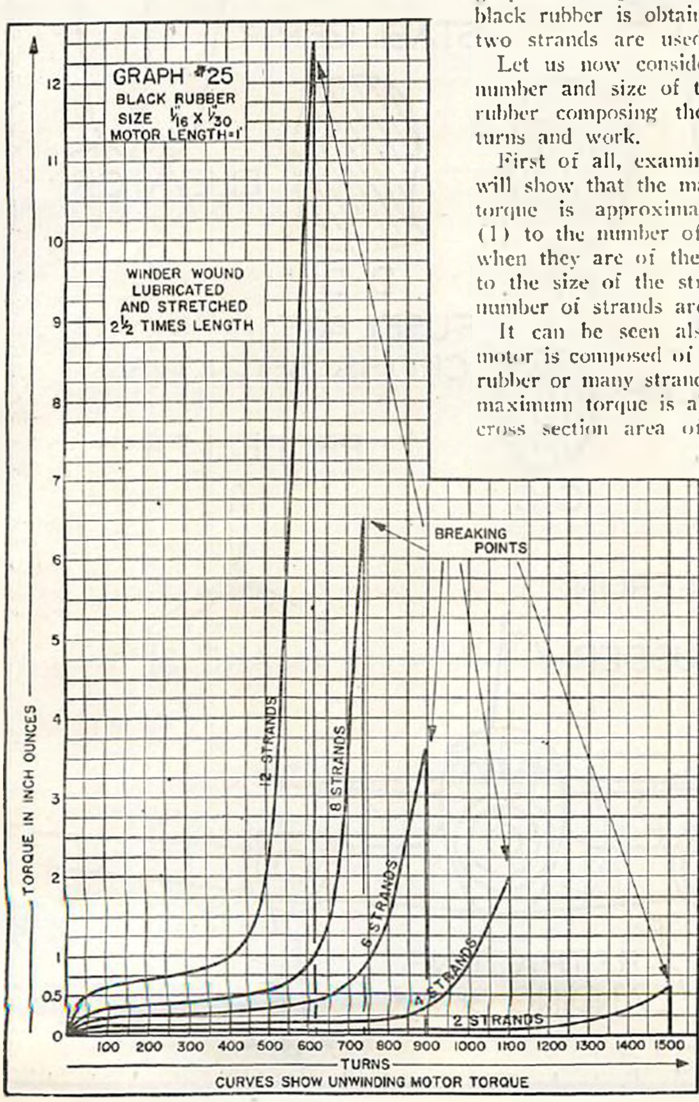
It seems that where the torque of the black rubber is *greater* in proportion to brown, the number of turns that can be put into the black rubber is *less* in proportion to the brown.

The most important quality of rubber for good performance is its capacity to absorb and store work when wound. Therefore, it is well to note the significance of the graphs in this respect. Comparing graph No. 19 with No. 23, by counting the number of squares under the two curves for motors of ten strands, it is found that brown rubber absorbs about 15% more work than black. However, when making comparisons of the corresponding graphs for eight, six, four and two strand motors, it can be seen that the fewer the strands, the *less* advantage brown rubber has over black. In fact, the advantage appears to decrease with the number of strands in the motor considered, until we reach the graph for two strand motors, which shows that black rubber has the capacity to store 20% more work than brown.

This condition seems to exist in all the graphs for motors of various sizes except for 3/32x1/30 rubber. The gain for black rubber seems to be much less in this case. It is quite possible that the quality of this size rubber when tested was not as fine as the rubber of other sizes.

As a general rule, it may be stated that *strand for strand*, more work can be stored in brown rubber than in black when a large number of strands are used in the motor; six or more. On the other hand, when two or four strands are used, more work can be stored in black rubber. However, brown rubber is about 18% heavier than black rubber. Therefore, as brown rubber cannot absorb more than 18% more work than black, weight for weight, black rubber is superior according to these graphs. The greatest advantage for black rubber is obtained when only two strands are used in a motor.





Let us now consider the effect of the number and size of the strands of black rubber composing the motor, on torque, turns and work.

First of all, examination of the graphs will show that the maximum and average torque is approximately proportional:—(1) to the number of strands in a motor when they are of the same size and (2), to the size of the strand when the same number of strands are used.

It can be seen also that whether the motor is composed of few strands of large rubber or many strands of fine rubber, the maximum torque is about the same if the cross section area of the rubber in the motor is the same. For example, if we compare the breaking points (maximum torque) of a four strand motor of 1/8x1/30 rubber with an eight strand motor of 1/16x1/30 rubber, we see from the graph that they are both the same exactly.

As another interesting example, consider the maximum torque of motors composed of eight strands of 1/32x1/30 rubber, four strands of 1/16x1/30 rubber and two strands of 1/8x1/30 rubber. It is exactly the same in all cases; a value of two inch ounces. This seems most uncanny but proves beyond a doubt the accuracy of this rule and of the graphs in respect to comparative values.

If the average torque of the two motors is considered, it will be seen that there is a slight advantage in favor of motors composed of few strands of large rubber. A comparison of the graphs will show an increase of about 15% in the average torque when the strands are doubled in size and half the number is used.

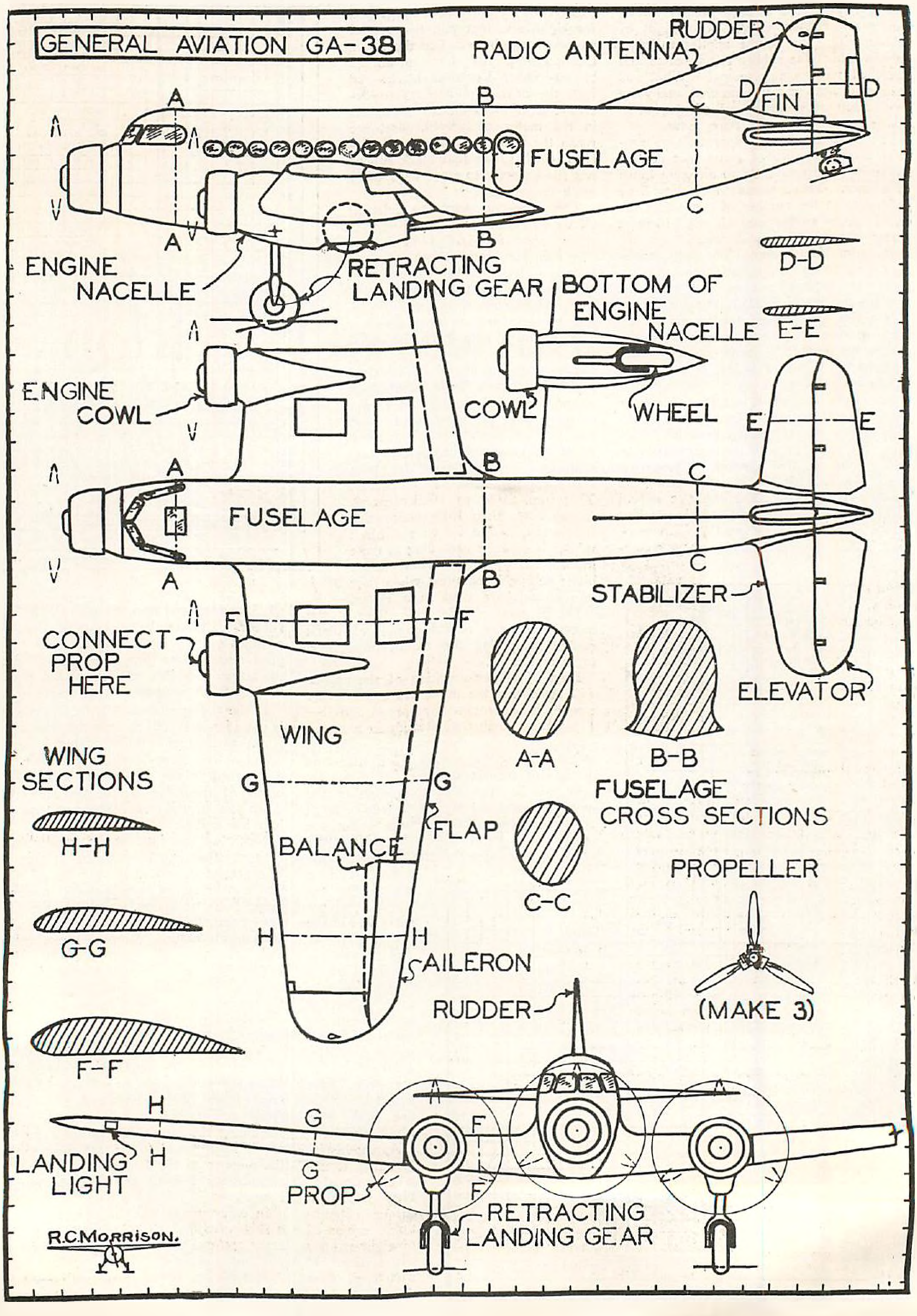
Next, we are interested in the number of turns that can be put into any motor. The graphs show that the number of turns that can be stored in a motor is inversely proportional to the square root of the number of strands, provided they are the same size in all cases. Expressed mathematically, the turns (T) are proportional to $\sqrt{1/S}$ in which (S) is the number of strands. This same relationship holds true for variations in the *size* of the strands provided the same *number* is used in every case.

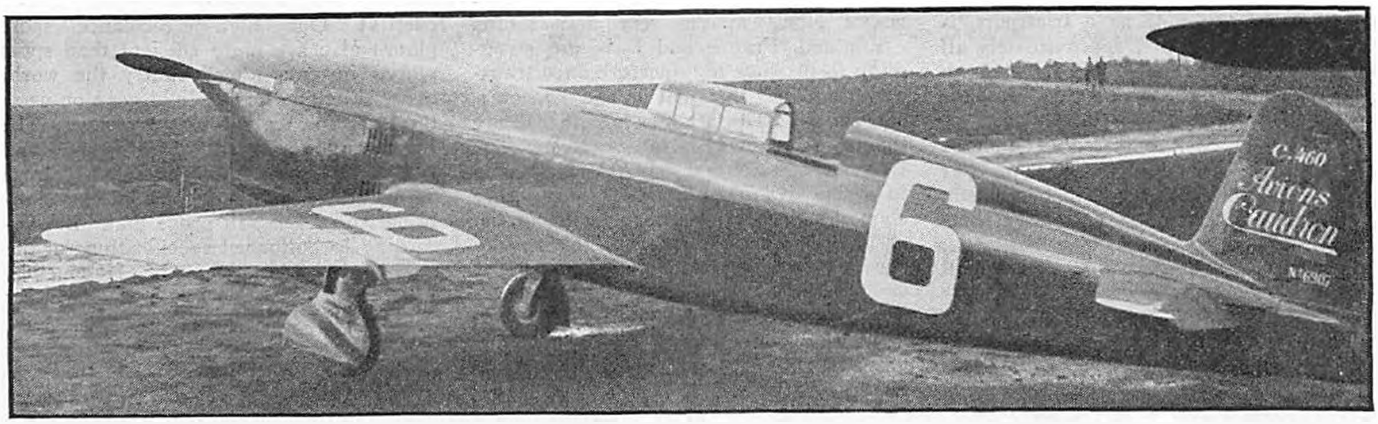
Our next interesting consideration is, how the possible number of turns vary when the size of the strands used are increased and their number decreased, the cross section area of rubber in the motor remaining the same. The graphs show an approximate average of 5% decrease in the number of turns when the size of the strands are doubled and half the number is used.

In other words, the finer the strands on a lubricated and stretched motor of given cross section, the greater number of turns you can store in it.

Though 5% fewer turns can be put into

(Continued on page 48)


GENERAL AVIATION GA-38
RUDDER
RADIO ANTENNA
FIN
FUSELAGE
ENGINE NACELLE
RETRACTING LANDING GEAR
BOTTOM OF ENGINE NACELLE
D-D
E-E
ENGINE COWL
COWL
WHEEL
FUSELAGE
STABILIZER
CONNECT PROP HERE
ELEVATOR
WING
WING SECTIONS
A-A
B-B
FUSELAGE CROSS SECTIONS
H-H
FLAP
BALANCE
PROPELLER
C-C
G-G
AILERON
RUDDER
(MAKE 3)
F-F
LANDING LIGHT
PROP
RETRACTING LANDING GEAR
R.C.MORRISON.

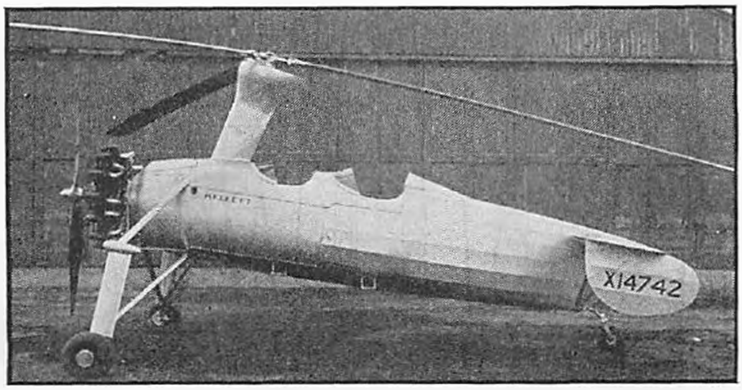


The Caudron No. 6 which recently captured the landplane speed record for France by flying at the rate of 314 m.p.h. (International Photo)

On the Frontiers of Aviation

Latest Developments in American Commercial Planes—The Paris Airplane Show —How You Can Build Scale Models of the GA-38 Transport and the New Boeing XF7B-1 Navy Fighter

By ROBERT C. MORRISON



The new Kellett wingless autogiro KD-1. It is controlled entirely by movement of the vanes which is operated by the control stick

ONE of the busiest aircraft factories at the present time is that of the Sikorsky Aviation Corporation. Their new four-engined S-42 flying boat that was completed last year is partially responsible for Sikorsky's present activity. Its performance satisfied Pan American Airways, its purchaser, so much that they have ordered four more of the giant planes beside the original three!

The new planes will have numerous improvements over the S-42 and will be designated the S-42B. Though the new Sikorskys will be the same size as the S-42s, they will carry 3,000 pounds more load and will travel ten miles faster when cruising. A cruising range of 3,000 miles is expected with twelve passengers and over a ton of cargo. It is said that wing flaps are to cover the entire span of the wing. More powerful engines will be used, which mainly accounts for the increased performance.

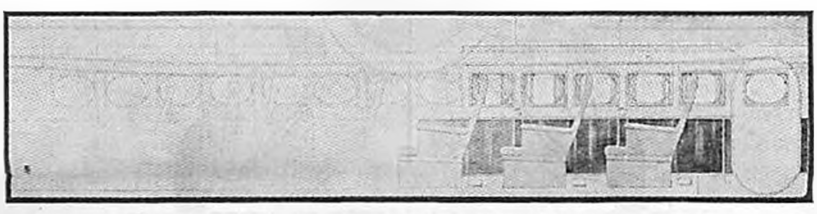
The total amount of the order exceeds $1,000,000. With the completion of these planes P.A.A. will have thirteen "Clipper Ships" as they are called, in operation, three of them being Sikorsky S-40s, three S-42s, three Martin flying boats, and the four S-42Bs.

Sikorsky is also working on some other planes that will be completed in the near future. One is the S-43, a twin-engined amphibian that will take the place of the slower and antiquated Sikorsky S-38s and S-41s. The plane will cruise at 165 m.p.h. carrying a load of from 14 to 25 persons. The ship has a wingspread of 84 feet and 17,541 pounds gross load. Two Pratt & Whitney Hornets will be the power plant. A pyramid turret structure will hold the wing to the boat as on the S-42, but there will be no long wing struts. There will be only two sets of N struts going from engine nacelles to the top of the float. The nose of the boat is much cleaner in design than the S-42 and the wings have more taper to them. However, in general, the S-43 closely resembles the S-42. The landing gear retracts into the sides of the float. On completion, the S-43 will be the fastest amphibian in the world with the probable exception of the Seversky.

At the present time only one S-43 is under construction. The plane has been ordered by P.A.A. and will undergo rigorous testing before others of like design are constructed. The S-42s were built solely for P.A.A., and they have the sole purchasing option on them, but the S-43s can be made available to any purchaser.

The Sikorsky company also has plans for an S-44 to take the place of the present S-39 single-engined ship. This will also be on the lines of the S-42s and S-43s. The S-44 was entered in a design competition of P.A.A. for three small single-engined amphibians, but the Fairchild Company was low bidder and received the contract. The S-44 will be built nevertheless.

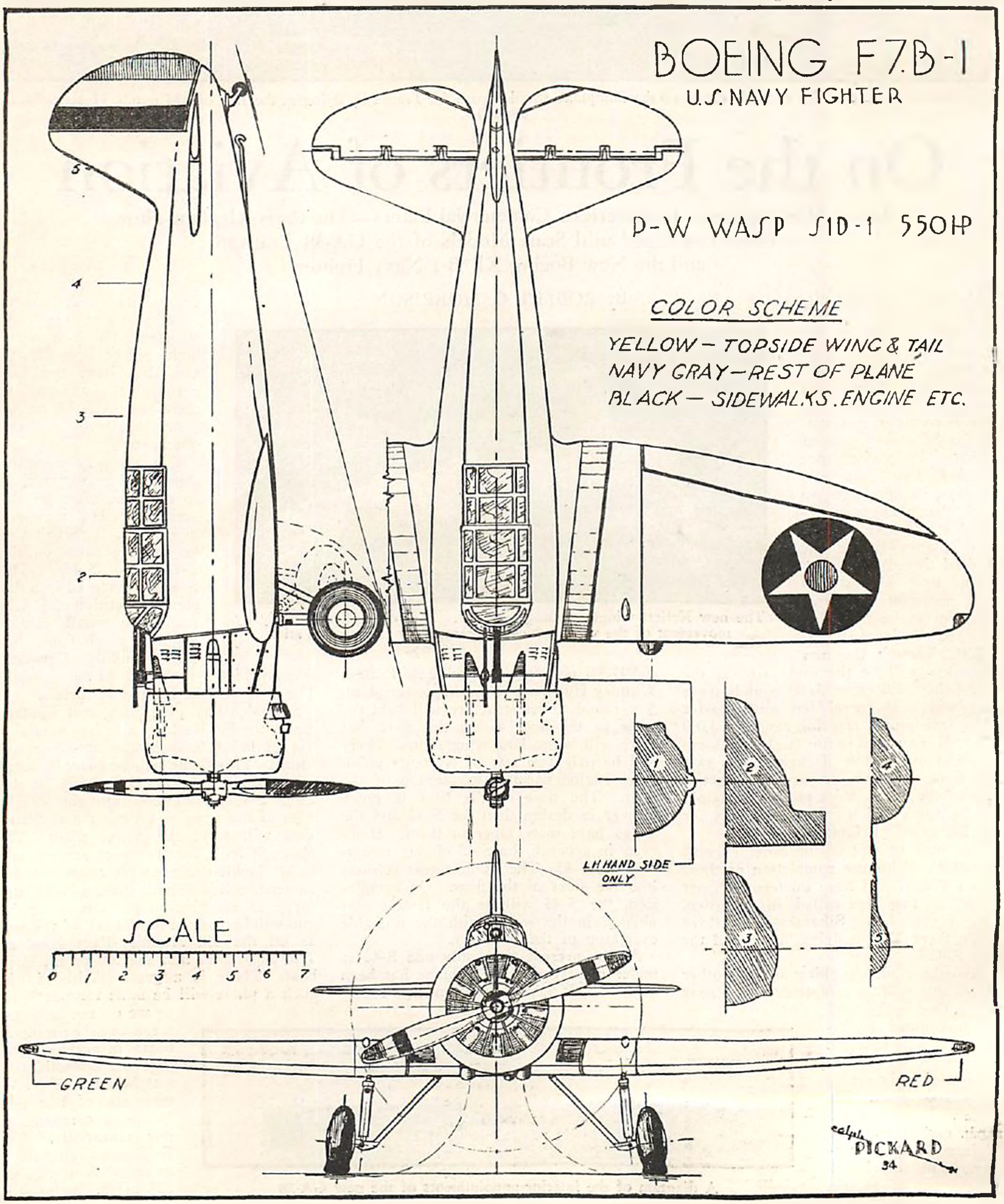
Sikorsky has plans for still another plane, the S-45, which also has possibilities of being built in the not-so-distant future. This plane will be twice as large as anything Sikorsky has built heretofore. Six engines fitted into the leading edge of the wing as on other new Sikorskys will form the power plant. The plane, if built for transport service, will be a double-decker with room for 100 passengers and if built for the Navy, will carry 13 machine-guns! One machine-gun will be located on the tail of the boat as on the old Handley-Page bombers. The wing fairs into the top of the large boat. There is a great likelihood that such a plane will be built for our Navy as we do not have any large modern flying boats in service other than the Consolidateds and Martins, and even they are of low performance compared to our transports. The S-45 with full load is expected to do at least 225 m.p.h. Included in

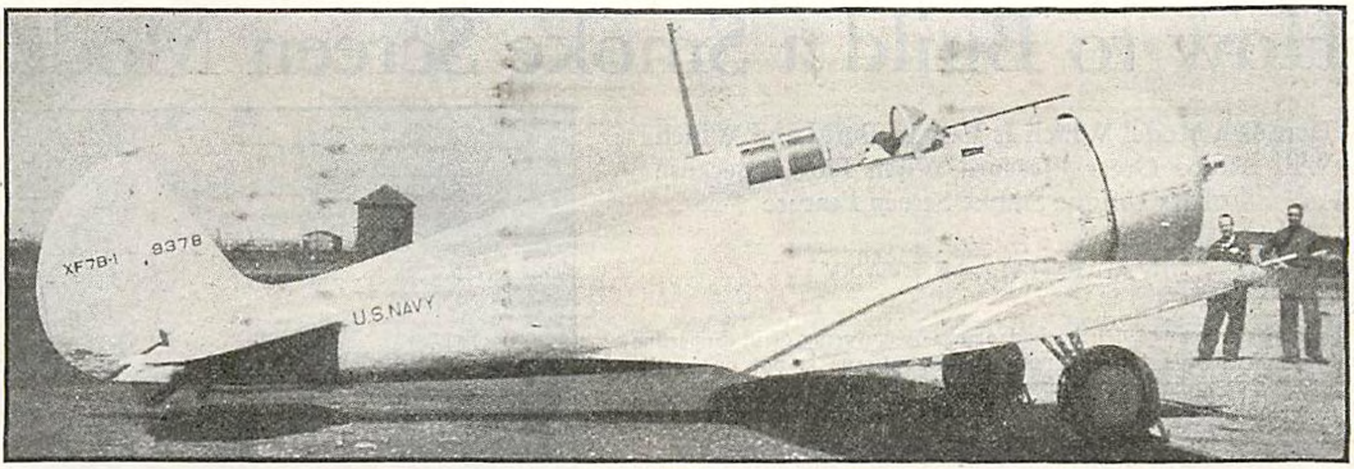


A diagram of the interior appointments of the new GA-38 the plans of the S-45 as a transport, is a complete kitchen and approximately all the luxuries of a small ocean liner. Such a plane would have no trouble in spanning either the Atlantic or Pacific.

The second S-42 has been completed and will be used for training purposes across the Pacific Ocean. The new Glenn L. Martin flying boat has also been completed and is now undergoing tests. Plans and a full description of it will be published in UNIVERSAL MODEL AIRPLANE NEWS in the very near future.

England, France and Italy are struggling to produce high-performance transoceanic planes that will be equal to ours, but we fear they are too late to capture the most valued ocean routes. The United States is now further advanced in flying boat construction over other countries than we are in the construction of landplane transports, even taking into consideration the famous Short flying boats and the newest Italian Savoia-Marchettis! Our high-performance sport planes also are more efficient than sport planes in any other country the world over. England has a slight edge on us in the light sport plane class however. The wonderful flight of MacGregor and Walker flying a Miles Hawk and Melrose flying a DeHavilland Moth in the MacRobertson Race will prove that. But according to published specifications of the new Fairchilds, Spartans, Hammonds, Curtiss-Wright Sparrows, Privateer



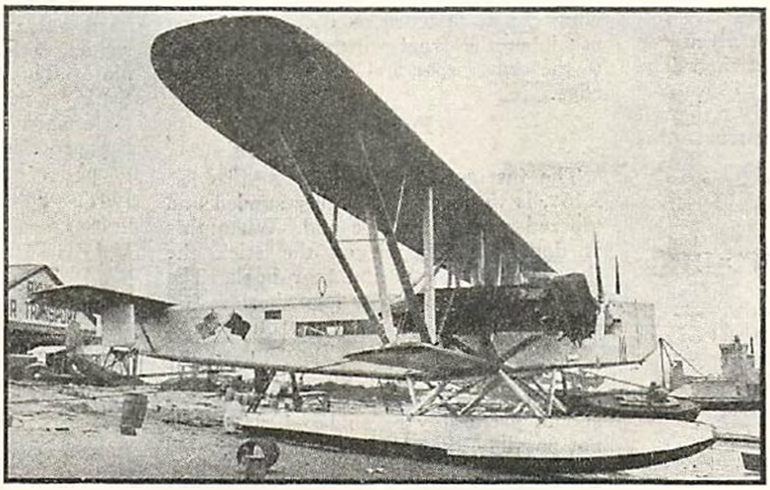


Here she is! The new Boeing fighter XF7B-1. It has a high speed of 265 m.p.h. or more. (Courtesy Fred Hughes)

Aeromobiles and Cunningham Halls, England will have to do some very fast thinking and hard work to hold their lead. Incidentally the new Cunningham-Hall GA-21 is ready for flight tests.

Several months ago England took a big step forward when she produced two new autogyros of astonishing flying ability, and France would have been well up in front also if their latest experimental autogyro had not unfortunately crashed, killing one of their best 'gyro pilots. The two new English 'gyros, as you may recall, were the Avro and Weir. Both are wingless.

In this country, work has been going on secretly for the past year on two autogyros and just recently they have been made public. One is the small cabin Pitcairn and the other is the slightly larger Kellett, with open cockpits. No ailerons, wings or elevators are employed on either ship! Rudder control is optional. The control stick is connected to a swiveling hub which holds the rotor vanes, this being the means of steering the ship. The Kellett is powered by a 225 h.p. Jacobs and the Pitcairn by an English Pobjoy engine of 75 h.p. The new 100 h.p. Kinner engine that is being developed would be excellent for use on the Pitcairn.



One of the few existing pictures of the ill-fated Sikorsky S-37 that sank at sea recently. (Courtesy David Cooke)

The rotor vanes fold back on both 'gyros to simplify parking in a small space. Recently the Pitcairn 'gyro was landed on the lawn of the White House at Washington, D. C., in order to demonstrate the ease with which it could be handled and the small amount of space it needed for landing operations.

Performance data on both ships follows:

	Kellett	*Pitcairn*
High Speed	125 m.p.h.	105 m.p.h.
Cruising speed	103 m.p.h.	90 m.p.h.
Minimum speed	16 m.p.h.	17 m.p.h.
Rate of climb	1000'/min.	———
Cruising range	316 miles	350 miles
Take-off run	60 ft.	———
Landing run	Nil	Nil

The only drawback in the autogyro is that it is not fast enough. It undoubtedly will never become as fast as the conventional airplane but it will always play a major part in aeronautics for many years to come. Faster speeds are sure to be obtained in the near future.

The autogyro may be put to many uses which are not usually comprehended at first thought. In addition to its civilian uses for sportsmen, commercial flying advertising, etc., are the following:

Agricultural work

Blind flying operations

To replace sausage balloon for military observation

Staff reconnoissance and transportation behind the lines

Control of communications

Relief of isolated personnel

Ambulance service for evacuation of wounded

For control of mobile units

Bombing

For use on submarines

For photographic use

For air mail use with roof-top landing platforms

Forest patrol

Police work.

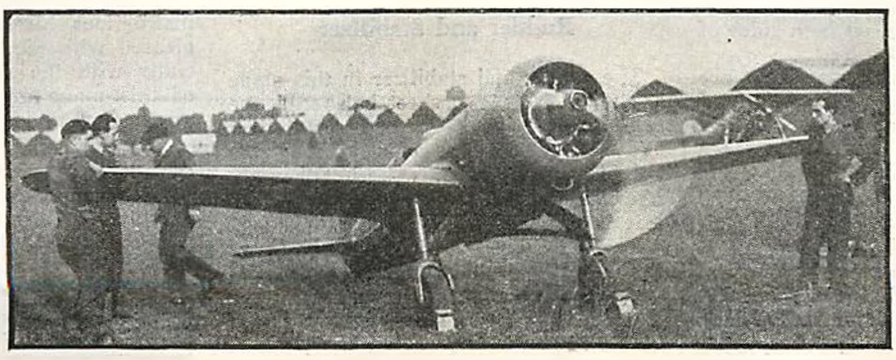
Luscombe will soon have out a new all-metal plane. It will be sold for $3,500 and is of the Phantom design.

Bellanca has a new transport out. It is a version of the twin-engined bomber built for South America. A pointed nose of the fuselage is the only radical change in design.

A few of the new Grumman amphibians built for the U.S. Coast Guard have recently been completed. These planes are similar to the one designed by Sikorsky, plans of which were later sold out to the Grumman Company. The new Grummans resemble the old Loenings.

Laura Ingalls' new "mystery Orion" has a coal-black paint job. The windows of the cabin have been tightly sealed and large gas tanks have been installed in the cabin, indicating that the noted aviatrix intends to make a long-distance flight sometime this year.

Now that the 10-20 passenger transport has been engineered to perfection, larger transports will be constructed to carry 30 or 40 *(Continued on p. 36)*

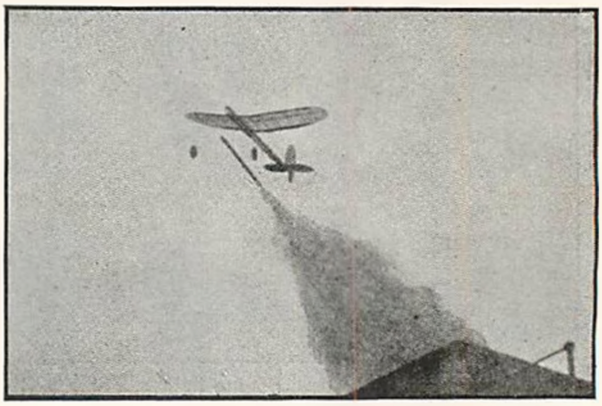


A Potez cantilever low-wing racer with retractable landing gear. This type of racer has become very popular in France lately. (International)

How to Build a Smoke Screen Model

Here Is a Model Which Is Easy to Build and Which Will Afford Great Pleasure When Flown Because of Its Unique Smoke Screen Feature

By MARSHALL MULVANY



The model in full flight, laying its smoke screen. It will prove to be an interesting experiment

MUCH amusement can be had experimenting with this type of novel plane, whether it is to be flown with or without the smoke screen tube. The simplicity of the design combined with unusual performances, make it a plane well worth the time spent building it. It is a high-speed model that can be flown in almost any kind of weather because of its unusual, sturdy construction. With the smoke screen working, it makes a very imposing sight as it climbs for altitude, the average flight being over one minute with the smoke screen attached, loaded and working.

The drawing of the wing and fuselage are half size; all other drawings are full size. Dimensions that are not given can be taken directly from the drawing. The wood used throughout is a hard grade of white balsa. The following is a list of materials necessary to construct this plane.

1 motor stick, 16" x 5/16" x 1/4"
1 sheet 1/16" balsa
2 balsa wheels
1 propeller block, 8" x 3/4" x 1 1/4"
1 strip bamboo
1 strip 1/4" x 1/4" x 18" balsa
1 strip 1/8" x 1/4" x 18" balsa
1 strip 1/8" x 3/16" x 18" balsa
.020 music wire
1 sheet superfine tissue
1 oz. glue
1 oz. dope
washers
smoke screen material
7 ft. 1/8" flat rubber

Wing

Draw the wing full size on a sheet of paper. You should build your entire wing on this full-size plan so that your wing will be true to size.

The first step is to cut the eleven ribs out of 1/32" balsa. To do this accurately, it is advisable to make two rib templates of some thin sheet metal. After the ribs are cut out, the center spar and rear spar can be pinned on the full-size plans. The pins are not to be stuck through the spars, but are staggered on both sides of them.

The size of the various spars that are used can be taken from the drawings of the ribs. Then all ribs except the center rib are glued in place. The leading edge is sanded to correct shape and glued on. When this has dried, the two bamboo wing tips are bent from 1/32" x 1/16" bamboo and fastened in place. After this is done and has dried, the proper dihedral angle can be given the wing, and the center rib inserted and glued in place. This completes the wing except the covering of it. Superfine tissue is put on in the usual manner and then is sprayed lightly with water and allowed to dry, after that it is given two light coats of dope.

The two balsa ailerons can be made at this time and fastened in place with a small amount of glue at each end of the aileron. The ailerons can be moved slightly, up or down, by breathing on them. Finally the two wing clips of .020 music wire are formed to shape as illustrated on plans. The rear wing clip is fastened on the rear spar as usual but the front wing clip is fastened to the center spar and not to the leading edge.

Fuselage

The fuselage stick, which is 1/4" x 5/16" x 16", is to be very smoothly sanded and tapered slightly at one end. When this is done, then fasten on the stick the thrust bearing, can and rear hook. The thrust bearing and rear hook besides being glued are also fastened on with a few turns of light silk thread. While this is drying, make the wire landing gear from .020 music wire. The joints should preferably be soldered. If this is not possible, they should be securely tied with light silk thread and then glued. The large lower cross piece is for the front "V" of the landing gear and the small high piece is for the rear "V."

The smoke screen tube is not soldered to the supporting wires, but is held in place by tying it with thin copper wire to the supports. (This is most important because the heat will melt any solder placed on these two joints.)

To reduce the weight as much as possible, it is advisable to use aluminum for the smoke tube. The wheels are cut from 1/8" sheet balsa; a small bead or aluminum bushing should be put in each wheel before they are fastened on the landing gear.

Rudder and Stabilizer

The rudder and stabilizer in this plane are made from 1/16" sheet balsa like the full-size drawings. The balsa stabilizer and rudder are less efficient than the built-up, paper-covered ones but they are less liable to be damaged from the smoke screen attachment.

The stabilizer is placed on the top of the motor stick and set at about one degree negative angle. The rudder is then fastened in place. (Note the lower part of the rudder acts as a tail skid; this is to prevent the tube from touching the ground.)

Propeller

The propeller is cut from a block of hard balsa in the usual manner. It is shaped with the aid of the propeller template. The blades should be left rather thick to withstand the shock of a possible hard landing. When this is done the propeller shaft is inserted and the propeller balanced properly. After that, the propeller is given a light coat of dope.

Smoke Screen

The smoke tube is preferably made from thin wall aluminum tubing. The powder which is packed tightly in soda straws is made from the following formula:

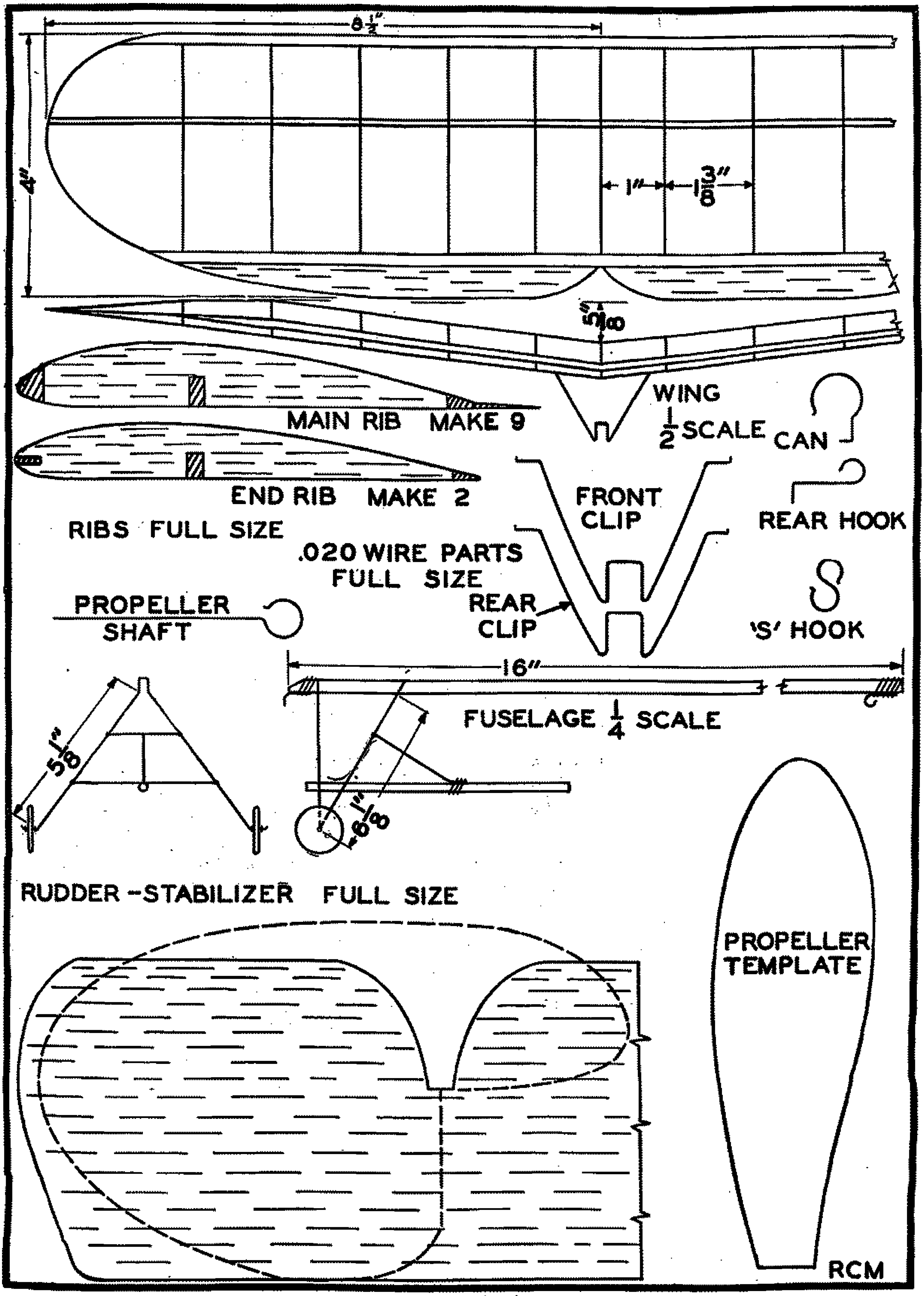
1 part charcoal
2 parts saltpeter
2 parts sulphur

The powder must be finely pulverized otherwise the tube will be filled with half-burned ashes. After the first straw tube has been inserted and burned, the remaining ashes can be cleaned out with a small stick and another straw full of powder inserted in the tube.

A few words of caution—do not mix large quantities at any one time as it only takes a very small amount to fill many straws. Remember the tube becomes quite hot due to the burning of the powder. The rear end of the straw is left projecting from the tube 1/4". This is the end to be lighted.

If you have followed the design and instructions carefully you will be quite pleased with the final results and especially with the spectacular performance of this plane in flight with the smoke screen in action.

This Is Your Magazine
Write and Tell Us
How We Can Improve It.
What Do You *Like* Best?


8 1/2"
4"
1"
1 3/8"
5/8"
MAIN RIB MAKE 9
END RIB MAKE 2
RIBS FULL SIZE
WING
1/2 SCALE
CAN
FRONT
CLIP
REAR HOOK
.020 WIRE PARTS
FULL SIZE
PROPELLER
SHAFT
REAR
CLIP
'S' HOOK
16"
FUSELAGE 1/4 SCALE
5 1/8"
6 1/8"
RUDDER-STABILIZER FULL SIZE
PROPELLER
TEMPLATE
RCM

An Open Forum for Readers, What They Think, Do and Say, Presented So That All Who Read May Enjoy and Benefit by an Exchange of Ideas

We cordially invite all our readers to make use of this department of the magazine to present their ideas, criticisms, arguments and commendations, on *all* phases of aviation. If you feel that any idea presented herein warrants commendation or criticism, write, telling what *you* think about it, so that by debate, "truth" may be determined. Address all letters to "SLIPSTREAMS."—*The Editor.*

MANY interesting ideas have been contributed to this column by our readers, for which we thank them. However, very few criticisms concerning model design and flying, or "kicks" of any kind have come to us. We urge our readers to send any remarks concerning pet ideas they may have, so they may see the "light of day" in this column. Criticisms are always welcome.

Mr. James Johnston sends an idea which he feels may be of interest to model builders. He says that model builders find it advantageous, from a construction standpoint, to build low-wing planes. However, this type of aerodynamic design brings the center of gravity above the wing, thus giving the plane an unstable tendency. He suggests that low-wings be constructed with a gull wing feature, which allows the wing to be attached to the lower part of the fuselage at the longerons, and yet brings the center of lift above the center of gravity. Figure No. 1 shows this idea graphically.

Do readers feel that it is an advantage to accept the complication of a gull wing instead of merely placing the wing through the center of the fuselage and bracing the fuselage at the point of the wing's intersection with it? It appears that in making the plane of the gull wing type that one difficulty is merely being substituted for another. What do you think?

Next we have a suggestion from an old contributor, Roger F. Parkhill. He presents what he thinks is an improvement in floats for hydroplanes He writes us as follows:

How to Improve Floats

"Last summer I built a model of Gordon Light's seaplane, but I had difficulty in making the ship 'take off' from the water. This difficulty persisted until I had altered the floats as shown in Fig. No. 2. I built into the floats a slot back of the steps, letting a stream of air over the top of the floats, through the slot and under the float. The air between the bottom of the floats and the water creates a cushion which counteracts the tendency of the floats to adhere to the water, thus facilitating faster take-offs.

"This is not my idea, having been successfully applied to light plane floats for years."

Diagram No. 2 clearly shows Mr. Parkhill's design. We note with interest that Mr. Parkhill is very modest in the fact that he does not assume that this is an original idea. He has the true scientific spirit.

Possibly many model fans have attempted to make a perfect five-pointed star without success. Evidently Felix Gutmann has had this difficulty at one time. He has solved the problem by a fairly well-known "trick" in geometry, as shown in diagram No. 3. He passes it on to readers, describing the method of procedure as follows:

Making a Five-pointed Star

"Many model airplane builders do not know how to make an exact five-pointed star insignia. If the plans are followed, Fig. No. 3, any size insignia may be exactly made. The only tools needed are pencil, ruler, compass and 90° triangle or protractor. The layout is the same as when measuring for a pentagon up to a certain step.

"First, make a circle of desired diameter. Then in the exact center, draw a perpendicular line (line 1). Now take the triangle or protractor and also in the exact center draw another line at right angles to the first, (line 2). Now take the ruler and measure half the radius (point A) on the upper half of line I. Using point A as the center, put the compass point on point A and the lead point on point B and swing an arc to point C.

"Now put the compass point on B and the lead on C and swing another shorter arc down to point D. Now the distance between points B and C or B and D is what we have been aiming towards, for this distance is exactly one-fifth around the circle. Measure this distance five times around the circle using the compass, leaving a mark at every division, till you come to the point from which you started.

"The second illustration will show how to connect these points to make a five pointed star. Do this lightly and then erase lines E and darken lines F. Next make the inner circle just large enough to touch the inner points of the star. The color scheme is a background of blue, star of white and circle G of red."

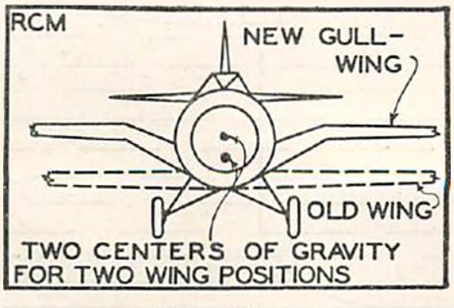


Figure No. 1.

Mr. A. Pouliot has been intrigued with the solution of lateral stability by automatic means, like many other model builders. Old readers will remember that Mr. Hing Lee offered a suggestion of this nature some time ago. However, we feel that it had several faults. What do our readers think of this one? Mr. Pouliot describes his system as follows. Diagram No. 4 will help to make his exact meaning clear.

Automatic Stabilizing Device

"When a model plane is flying in windy weather, it often inclines and losing its lateral stability, falls and crashes. Here is my idea to prevent this crashing.

"A pendulum lightly weighted is attached to a small hook to swing free laterally. To this pendulum is attached on two sides a light and soft wire, non-metallic and passing through a hook fastened on the top of the wing. The thread is attached to the ailerons, held back with a very thin rubber strand.

"When the plane inclines, the pendulum stays vertical, drawing the thread that lifts up the aileron. By this fact the plane returns *to stability.* While one aileron is raised up, the other is drawn down by the rubber strand."

Apparently this system will operate successfully, at least it will theoretically.

However, we will tell you secretly that there is a "jinx" in this method of operation. We are going to let you figure it out. Can anyone tell us what it is? As a hint we will say that it is necessary to analyze the complete flight of an airplane, considering various maneuvers that it might make in order to determine it.

Edward Hathaway offers a suggestion which will improve the looks of your models. He says:

A Plastic Filler

"Here is an idea which may help some builders who make digs inadvertently in their balsa wood. Apply a pasty form of one-half balsa sawdust and one-half cement to the dig after the filler has been thoroughly mixed. Allow the filler to dry for two hours, then sandpaper it down until the surface is smooth."

We would like to ask Mr. Hathaway whether or not this method will not leave a hollow or indentation after the cement has thoroughly dried? Why not use plastic wood? The extra weight of the plastic wood required for small digs would be negligent.

Next Mr. John Mackenzie presents a question and remarks concerning it which have been in the minds of many model builders. He says:

Why Not "Speed Models?"

"Why not have a speed event in our next National contest?

"In reading your magazine I have gained the impression that you do not have much regard for the speed model airplane. I cannot blame you for such an attitude, if you really do feel that way, because one ordinarily sees very poor flights delivered by this type of ship. However, should not the very fact that the speed model is poorly developed call forth the best we have in us to raise it to a higher level? Here is a field of endeavor wide open to the ambitious model designer.

"The problems of speed model design call for real thinking and the application of aerodynamic principles to a greater extent than the design of endurance ships. The theory that seems to prevail today will have to be changed or rather, further developed. As it stands now it is; high wing loading gives high speed. You can't make a speed ship by merely adding weight however; the basic principle of all high speed airplanes, real ships or models, is high wing loading plus low power loading. The latter point is as important as the former. Streamlining, careful selection of airfoils, propeller design and application of motor power all play an important part in the makeup of this type of model. Well designed speed models are few and far between but when you have one you have something that is really worthy of the name 'airplane.'

"The only way the speed model will ever really be developed is by the National Aeronautic Association getting behind it by sponsoring a contest. Our big National meet has events for every type of endurance ship but nary a one for the forsaken speed model. I am sure that such a contest would arouse a great deal of interest and bring out some keen competition.

"Furthermore, I believe there would be developed models surpassing in efficiency anything ever before built. Perhaps I am wrong in asking for such a contest but why not find out what the other fellows think?"

We feel Mr. Mackenzie is absolutely right in his contention that the building of speed models will contribute much knowledge and pleasure to the builders. However, the chief drawback to speed model contests has been the lack of an accurate method of determining the speed. One must realize that if speed contests are to be held on two different days, they are bound to encounter varying wind velocities. It is hardly fair to consider the speed of a model which has flown in a thirty mile wind, with or against it, with a model flown on a day when there is no wind at all. Even though the model's flight is cross wind, there will be a radical difference in the speed registered with any given model.

It is always desirous that speed records be established under conditions which are similar in all cases. This is obviously necessary in order that these records have any meaning at all. Of course, this is assuming that speed contests are held outdoors. It is perfectly possible to hold speed contests indoors—provided that communities are fortunate enough to have armories or similar places with large floor space and that the model builders are persuasive enough to gain the use of such a place.

Another difficulty presents itself in the fact that due to the high speeds of models they invariably crash against some enclosing wall before they come to rest at the end of the flight. In order to prevent this, it is now necessary to establish the length of the speed course at such a ridiculously short length that accurate timing is difficult and the aerodynamic efficiency of the model itself does not usually act to true advantage. It is merely the case of how much rubber can be put on a machine. In order to derive the efficiency from true aerodynamic design, we feel it is necessary

(Continued on page 47)

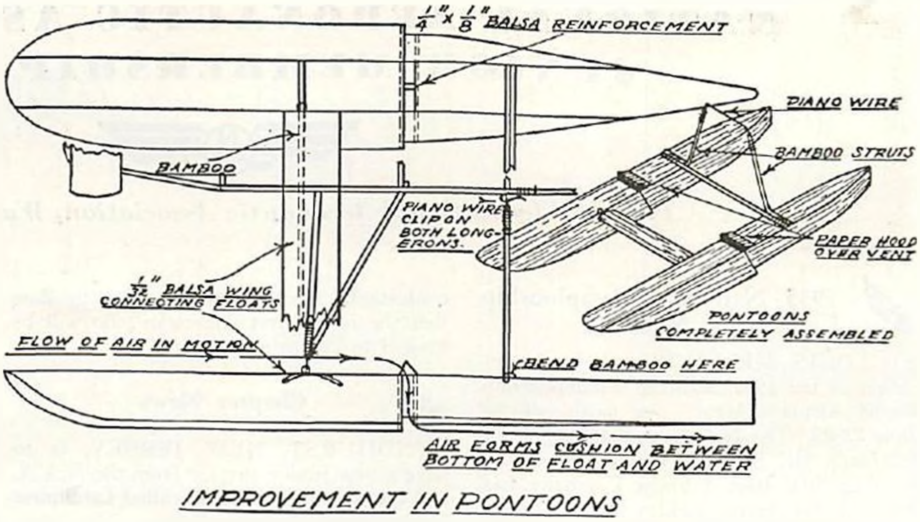


Figure No. 2.

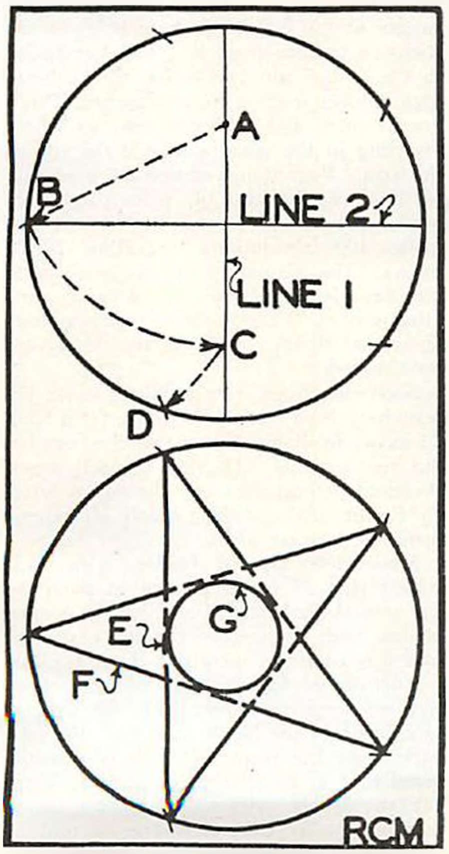


Figure No. 3.

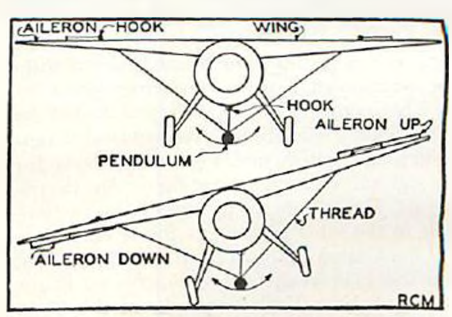


Figure No. 4.

NATIONAL AERONAUTIC ASSOCIATION
JUNIOR MEMBERSHIP NEWS

Prepared by National Aeronautic Association, Washington, D. C.

1935 National Championship Meet

ST. LOUIS, MISSOURI, will be the location of the 1935 National Championship Model Airplane Meet. The dates will be June 27-29. The N.A.A. junior chapter of St. Louis, the Boys' Aviation Club, sponsored by Stix, Baer & Fuller Company, has accepted the responsibility for this most important event on the model airplane calendar.

This meet is to be under the personal direction of Mr. Claude E. Carmichael, the club's director. Mr. Carmichael reports that all air-minded organizations in St. Louis join in welcoming the meet to that city. A great deal has been contributed to aviation by St. Louis and it is certain that the 1935 National Championship Model Plane Meet will measure up to the very highest standards of such an event.

The International Contest for the Rear Admiral William A. Moffett Memorial Trophy will be a part of this meet. Entries from Great Britain and Canada have already been assured. Efforts are being made to bring entries from France, Australia, Italy, and other countries. Only six members are permitted to represent one country in the Moffett Contest.

Stix, Baer & Fuller Company are to be congratulated on their decision to hold the 1935 meet. Full particulars will be available in following issues of this section. Please do not write to the sponsors or to the Association to ask for further information as that will be published as soon as it is ready.

The Meet will be made up of the same typical events as at the 1934 Meet held in Akron, Ohio. Provisions are scheduled for all age classes and the facilities in St. Louis together with the strong sponsorship insure one of the best National Meets ever to be held.

Wakefield International Competition

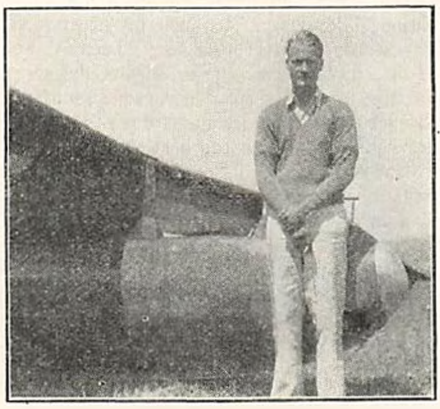
THE WAKEFIELD Competition for the Lord Wakefield Cup is scheduled to be held in England some time in the early summer of 1935, probably in June. It is hoped that complete details will be available for publication in the next issue. The United States has been invited to send over a team of six members, just as in former years.

This competition is to be conducted by the Society of Model Aeronautical Engineers, the British sports governing body for model aeronautics, operating under license of the Federation Aeronautique Internationale in the same manner as the N.A.A. does in the United States. It will be recalled that in the 1934 Wakefield Competition, Frank Zaic of New York City, placed third, the highest position attained by any American contestant. On the showing made by Zaic then, he is the first American who will be invited to compete this year.

Chapter News

LYNDHURST, NEW JERSEY, is to have a new junior charter from the N.A.A. and the club in that city is called Lyndhurst High School Aviation Corps. The membership numbers almost fifty. Francis J. Tlush is club president and lives at 755 Sixth Street, Lyndhurst.

The club has scheduled an aviation exhibit in the High School for February 22



Richard du Pont with his glider in which he established his world record distance soaring flight. Du Pont is an N.A.A. licensed pilot.

and 23. This exhibit is open to anyone who wishes to submit anything pertaining to aviation. It will also include a display of motors, engine starters, parts of planes, etc. This should be well worth attending and deserves full cooperation of all N.A.A. junior members.

Another event that is being planned by the club is an outdoor meet to be held at Teterboro Airport April 27. Gasoline-powered models are to be permitted. Write to the club president, whose address appears above, for complete details.

CHARTERED Junior N.A.A. Clubs that were represented at the Eastern States Meet, conducted by UNIVERSAL MODEL AIRPLANE NEWS in New York City on Dec. 28, include Springfield Model Airplane Club, Jordan Marsh-Boston Traveler Junior Aviation League, Bamberger Aero Club of Newark, N.J., and Philadelphia Model Aeroplane Association. The story of the meet appears elsewhere in these columns so it will not be repeated.

Technical Discussion

THE following article on propellers is the promised discussion by Mr. Ernest A. Walen of Springfield, Mass. He is a member of the N.A.A. Model Plane Committee as well as the adviser of the Springfield Model Airplane Club. Mr. Walen has conducted some extensive propeller tests in a very careful manner and passes on his findings to all model airplane enthusiasts.

Mr. Walen's discussion follows:

Indoor Propellers

All model builders are familiar with the word "slip" as used in referring to propeller efficiency. Slip means the difference between the distance actually traveled by a propeller in use and the distance it ought theoretically to cover.

Most of us have always felt that propellers were less than 100 percent efficient, but now by actual test props can be made that will work up to 110 percent efficiency, or better. This sounds as if we could get something for nothing, which is rather against the general rules of model building as well as other walks of life. There is, however, a definite prop design which will give these results. But before the data, a brief description of the test apparatus.

The testing device has been named a Dynamic Thrustometer. A light counterbalanced arm is mounted on a vertical shaft. The horizontal circle described by this arm is 329.08 inches in circumference. A wire hanger at the end of the arm holds motor sticks of various lengths. Special attention to the design and lubrication of the bearings reduces friction to a minimum. Props are mounted and rubber wound up before inserting in the wire hanger at the end of the arm. Two stop watches are used, one for total time and the other for single revolutions. In a majority of the tests the arm made 100 revolutions, traveling 32,908 inches. The simplicity of this machine in no way detracts from its accuracy and effectiveness. Free flight comparison tests show that flying conditions are closely approximated.

Sixty-one props were used and so far 173 tests have been made. Props are from 12 to 20 inches in diameter, most of the tests being run with 14-, 15-, and 16-inch props. Average temperature of the room used, 76°F; air, still and dry; nearly all experimenting done at night.

Moderately tapered blades, with their widest part 25 to 30 percent in from the tip, proved the best shape. Sharply pointed blades, with the center cut-out extending half way or more, were not at all efficient.

Two design features showed their effectiveness very definitely: (1), the amount of camber in the blade; and (2), the cutback from the front. It will be remembered that in an article appearing in UNIVERSAL MODEL AIRPLANE NEWS some months ago, by Carl Goldberg, he told of the type of propeller used by Wilbur Tyler and John Bartol of Boston, in the 1933 Nationals, where the front edge was cut back in a wide, shallow V with the deepest part at the hub, to reduce altitude. At that time ⅛ of an inch at the hub was recommended as a cut-back. In the tests which are being described various amounts of cut-back were tried, from ⅛ of an inch to cutting all the way back from the front, as we call it. It was found that ¼ inch cut-back on the average 14-, 15- or 16-inch blade was about the ideal amount, and it was with propellers cut back this much that the plus slip showed.

To be most effective this cut-back should begin about 45 percent of the blade length from the hub. It should be put in when the blades are shaped and form a rather wide, shallow V, having a depth of ¼ of an inch at the hub.

For greatest effectiveness this amount of cut-back should be combined with a deep camber. By a deep camber, ⅛ of an inch, or slightly more in wide-bladed props, is recommended. This ⅛ of an inch depth should be determined by a small depth gauge and not the eye. And this depth should not be simply at the tip but should run in through the widest part of the blade, meaning that you actually give the tip more than ⅛ of an inch camber. Then, of course, it gradually tapers back toward the hub. The importance of this deep camber in conjunction with the cut-back cannot be over emphasized. Not only does it strengthen the propeller materially but it also contributes greatly toward efficiency.

To prove the effectiveness of the camber and cut-back beyond question several pairs of propellers were carved the same diameter and blade angle. One was done in the conventional way, having approximately 1/16 of an inch camber and little or no cut-back. The others were given the ¼-inch cut-back plus the deep camber. In every instance the deep camber, cut-back blade showed between 10 and 12 percent greater efficiency than the more conventional type.

Now what really happens to make these propellers efficient is that under the full power of the rubber the blade fans out slightly, increasing the pitch at the start when the power is greatest to care for it. This means slower revolutions and less liability of wash out on light wings. Then as the power falls off, the blade gradually springs back to its normal pitch, enabling the lowered power to still keep the model flying.

In sanding down a prop of the design just described it proves desirable to leave the leading edge slightly heavier than is usually done. It is also advisable not to thin the trailing edge down to paper thinness, as it is very apt to warp or crinkle. The best fanning results are obtained when the leading edge bends back slightly all along rather than having the whole propeller tip bend and allow considerable spill there.

Another point in propeller design which was emphasized was the amount of blade angle. It seems that blade angle for the best in efficiency should be somewhat less than has been used in the past. When the blade angle goes above 30 degrees, efficiency falls off rapidly. For instance, a 14-inch propeller having a blade angle of 28½ degrees showed a slip of only 0.71 percent, or 71/100 of 1 percent. A similar propeller having a blade angle of 31½ degrees showed a slip of 7.03 percent, and another similar blade having a blade angle of 34 degrees showed a slip of 11.53 percent. It was rather surprising that such small increases in the blade angle should show such a marked falling off in efficiency. Should blade angles of 35 to 40 degrees be used, the slip runs up to 25 percent or more. Increase in blade angle does not affect large diameter props as much as the smaller sizes.

A speed of between 43 and 46 inches per second seems to be necessary to maintain the average duration tractor in flight. Naturally the initial speed when the model is launched is considerably greater than this and accounts for the climb. It was interesting to see how the power of our rubber motors falls off as they run down. For instance, an 18-inch loop of 3/32 brown rubber was wound 2,000 turns, using a 15-inch prop with a blade angle of 31½ degrees, or a pitch of 28¾ inches. The initial speed was 62.85 inches per second. After 1 minute the propeller was moving 48.89 inches per second; at the end of 2 minutes, 43.14; and at the end of 5 minutes, 36 inches per second. At 10 minutes the speed had dropped to 30.99 inches per second.

The effect of long loops of rubber was also tried. The speeds just given were with an 18-inch loop of 3/32 on a 16-inch motor stick. Using the same propeller and motor stick, but a 20-inch loop of 3/32 wound 2,000 turns, the initial speed was 55 inches per second. At 1 minute it had dropped to 46.08; at 2 minutes to 41.5; and at 5 minutes to 34.92; at 10 minutes to 30.01. It was of further interest to note that on practically all tests the power held very steady from the fourth through the sixth minute.

Several microfilm props were tested and showed up very well, indeed; in fact more consistently than the all-balsa blade. It should also be added that these microfilm props which were tested were single surfaced only. Several ways of making microfilm props have been brought forward. The most practical from the standpoint of these tests has been to carve the propeller in the regular way except to leave the blade flat on both sides, reduce the thickness to about 3/64 of an inch, then shape the blade, put in the ¼-inch cut-back, cut out the center; in fact, in every way prepare the propeller in the regular way. Then mark and cut out the centers of both blades, leaving a rim of about 3/32 in width. Carefully sand this rim smooth and balance the propeller. Then put in the ribs, spacing them about ¾ of an inch to an inch apart. Once more balance the blade and then cover with microfilm. This method of making microfilm propellers is quick and easy, as you do no sanding for the camber. Several of the microfilm props tested showed a plus slip; in other words, over 100 percent efficiency. None of them showed over 5 percent slip. The blade angles used were under 30 degrees.

Both black and brown rubber was used in these tests. It will take at least twice the present number of tests to form any very definite conclusion as to the virtues of these two grades of motive power for indoor models. The brown rubber seems to stand repeated windings better than the black; that is, to maintain its power with less loss. This is not conclusive.

For the making of these tests, three Thrustometers were built and a fourth has just been completed which it is hoped will prove even better than the first three.

It is regretted that the tests have not reached the point where it will be possible to develop tables and charts. It is expected to run these off during the winter months as rapidly as the time can be spared for the work.

Flight Record Certificates

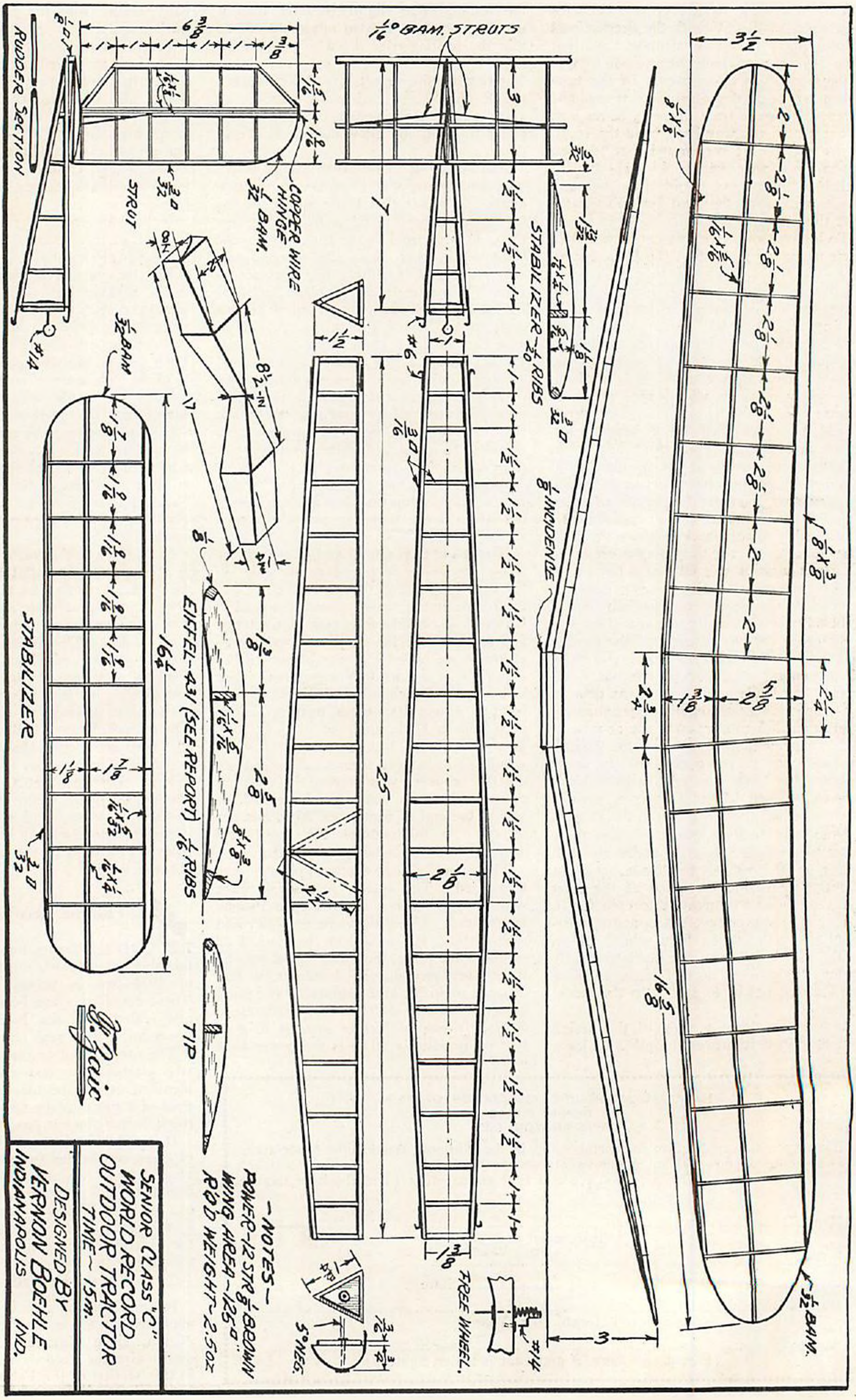
RECORD certificates for all those who established new records during the latter half of 1934 are in process of preparation. These certificates are beautifully engraved and sealed with the National Aeronautic Association gold seal imprint.

The racing pilot or the altitude balloonist who establishes a new record receives the identical certificate for his efforts as the flyer of a model plane does for doing something better than it has been done before.

It is a distinct honor to hold one or more of these certificates from the N.A.A. Obviously it is something that everyone has the chance of possessing, but not everyone can qualify. The Association's policy is to issue certificates twice yearly, this being the second issue of record certificates in the past year.

Records

Inasmuch as no new records have been approved by the contest committee of the N.A.A. since Nov. 20, 1934, all official model airplane records stand as published in this section of the February issue.


N.A.A. CLASS "C" OUTDOOR STICK MODEL, HAND LAUNCHED.
MULVIHILL TROPHY WINNER IN 1934 NATIONAL MEET
SENIOR CLASS "C"
WORLD RECORD
OUTDOOR TRACTOR
TIME ~ 15m.
DESIGNED BY
VERNON BOEHLE
INDIANAPOLIS IND.
-NOTES-
POWER-12 STR. 1/8 BROWN
WING AREA-125 □"
RUB'D WEIGHT-2.5 OZ.
STABILIZER
EIFFEL-431 (SEE REPORT) 1/16 RIBS
TIP
STABILIZER-1/20 RIBS
1/8 INCIDENCE
1/16 BAM. STRUTS
COPPER WIRE HINGE
1/32 BAM.
STRUT
RUDDER SECTION
FREE WHEEL.
5° NEG.
#14
#6
25
17
16 1/4
16 5/8

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MADISON FLYING SCALE MODELS

DeWOITINE D-33

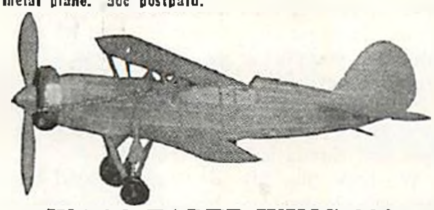
A perfect model of a famous French bomber. Wingspread 20". 50c postpaid.

FOKKER D-8

15" flying scale model of a famous fighting ship. 50c postpaid.

JUNKERS D-1

15" model, an outstanding type of German commercial all metal plane. 50c postpaid.

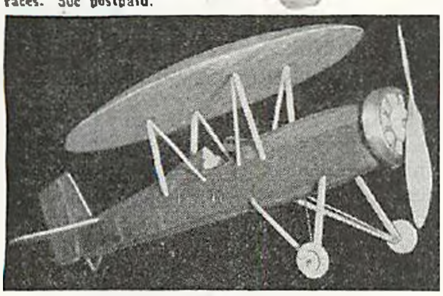


WACO TAPER WING 220

15" cabin type plane. Made for private ownership. 50c postpaid.

WEDELL WILLIAMS

15" model of the racing plane that made new records at the air races. 50c postpaid.



MADISON UMBRELLA TYPE

New successful umbrella type plane. Wing circumference, 28 in. 50c postpaid.

VOUGHT CORSAIR O3U-4

15" model of the shipboard type Navy planes used on Aircraft carriers. 50c postpaid.

BOEING P 12 B

15" model of one of the fastest army pursuit planes. Complete 50c postpaid.

HELL DIVER

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No question about it! Madison kits have the call today,—whether you buy them direct or at your dealer. If you have not as yet had the thrill of building and flying a Madison model, there is a great treat in store for you. Take our word for it. They're great models! Prove it to yourself. Send your order today.

50c EACH POST PAID

REMIT CASH OR MONEY ORDER
Canada: add 15c postage each kit.

Just See What Each Kit Contains:

1—Finished Hand-Carved Hard Wood Propeller
1—2" Aluminum Drag Ring where required
2—Front and Rear Hooks—finished
2—1" Hard Wood wheels—finished
2—Sheets of colored Japanese tissue
1—Bottle of Alco Cement Ribs and Bulkheads printed on Balsa Wood
1—Strand of 3/16" Rubber
1—Piece of Celluloid
1—Full size plan
1—1 foot length .028 wire
All necessary wood for Stringers and Landing Gear

Each new Madison Kit contains a 5½-inch Paulownia Wood Propeller. Each propeller is accurately made and beautifully finished by hand, guaranteed true and evenly balanced—an assurance of efficiency in flying models—of beauty and realism in solid and exhibition models. This feature is exclusive with our kits.

MADISON LEADS IN HIGH QUALITY MODEL SUPPLIES

Highest Quality BALSA

Lightest and best had. Clear straight-grained stock, cut to convenient sizes.

18" Strips
1/16x1/16 .... 20 for .05
1/16x1/8 .... 16 for .05
1/16x1/4 .... 12 for .05
1/8x1/8 .... 10 for .05
1/8x3/16 .... 8 for .05
1/8x1/4 .... 6 for .05
1/8x3/8 .... 4 for .05
3/16x3/16 .... 6 for .10
3/16x1/4 .... 6 for .11
1/4x1/4 .... 6 for .12
1/4x3/8 .... 6 for .13
1/4x1/2 .... 6 for .14
3/8x3/8 .... 6 for .15
3/8x1/2 .... 6 for .16
1/2x1/2 .... 6 for .17
1/2x1 .... 6 for .20
1x1 .... 2 for .12

18" SHEET BALSA
1/32x2 .... 2 for .03½
1/16x2 .... 2 for .04½
1/8x2 .... 2 for .06
3/16x2 .... 2 for .08
1/4x2 .... 2 for .10
1/2x2 .... 2 for .18
36" lengths may be had if desired at above prices but for half quantity.

40" Lengths
1/8x3/8 .... .05
1/8x1/2 .... .06
3/16x3/8 .... .07
3/16x1/2 .... .08

PLANK BALSA
1x3x36 .... .30
1x6x36 .... .45
2x3x36 .... .45
2x6x36 .... .85
2x5x40 .... .85

PROP BLOCKS
1/2x3/4x5 .... 5 for .05
1/2x3/4x6 .... 4 for .05
5/8x1x7 .... 3 for .06
5/8x1x8 .... 3 for .07
3/4x1 1/8x8 .... 3 for .08
3/4x1 1/4x10 .... 2 for .09
3/4x1 1/4x11 .... 2 for .11
7/8x1 1/2x8 .... 2 for .11
7/8x1 1/2x11 .... 2 for .12
3/4x1 1/4x12 .... 2 for .13
7/8x1 1/2x12 .... 2 for .15
7/8x1 1/2x14 .... 2 for .17

COLORED DOPE
Pigmented aircraft dope. Red, Blue, Black, Yellow, Orange, Olive Drab, Silver, Star color.
2 oz. can .... .15
4 oz. can .... .28
Pint .... .90

ALUMINUM DRAG RINGS
Used on real ships for cutting down wind resistance. A beautiful addition to any radial motored model.
1" diam. .... .10
1½" diam. .... .19
2" diam. .... .21
2¼" diam. .... .26
3" diam. .... .29

12" SHEET ALUMINUM
.005 per ft. .... .12
.010 per ft. .... .19
.003 per ft. .... .12

THRUST BEARINGS
Strong and light, large size. .035 hole .... .02
Per doz. .... .20
Small 0.25 hole .... .02
Per doz. .... .20

COLORLESS CEMENT
Strongest, lightest and fastest drying.
1 oz. tube .... .13
2 oz. can .... .17
4 oz. can .... .32
Pint 1.00

WOOD WHEELS
1" diam. hardwood unbreakable, pair 5c

INSIGNIAS
U. S. Army and Navy. 4 Stars and 3 Stripes (red, white and blue). 1" sheet 3c; 1½", 4c; 2", 5c; 2½", 6c.

CELLULOID WHEELS
¾" diam. .... pair .06
1" diam. .... pair .08
1¼" diam. .... pair .11
1½" diam. .... pair .17
3" diam. .... pair .30
Bushings .... 4 for .02

DUMMY RADIAL ENGINES
Celluloid, 9 cylinders, 3" diam.
Each .... .35
1½" diam. .... .20
2" diam. .... .30

ALUMINUM LEAF COVERING MATERIAL
Pure sheet aluminum .0003 inch thick, only 1/10 thickness of writing paper. Light; strong; 3½" wide, 5 for .... .05

ALUM. 3-BLADE PROP
Each blade 1¼" long .15

JAPANESE TISSUE
Strong, light tissue.
20x24 .... 3 for .08
Doz. .... .27

N.A.C.A. COWLINGS
No dummy motor needed with this cowling.
1½" diam. .... .19
2" diam. .... .21
2¼" diam. .... .27
3" diam. .... .30

CELLULOID COMB DRAG RING AND DUMMY MOTOR
1½" dia. 25c; 3", 45c.

CLEAR DOPE
Nitrate dope thinned down for model airplane use.
2 oz. can .... .13
4 oz. can .... .25
Pint .... .90

EXTRA THIN TISSUE
Lightest covering material known. For covering endurance models.
Sheet 20x15 .... .05
Doz. .... .50

COLORED JAP TISSUE
Red, Blue, Green, Orange, Brown, Yellow and Black.
Sheet, .05; Doz. .... .50
Wood veneer paper
Sheet 20x30 .... .15
Sheet 20x24 .... 3 for .08
Doz. .... .27

DOWELS
Straight-grained genuine birch dowels:
1/8x18" .... 6 for .05
3/16x36" .... 3 for .05
1/4x36" .... 2 for .05

BAMBOO
Tonkin straight-grained, no-knot bamboo.
1/16x1/4x11 .... .01
Per doz. .... .08
1/16x1/16x9 doz. .... .08
1/16 Round x 36 .... .05

RUBBER
.045 sq. 25 ft. .... .08
3/32 flat 25 ft. .... .10
1/8 flat 25 ft. .... .12
3/16 flat 25 ft. .... .15

ACETONE
2 oz. can .... .11
4 oz. can .... .18
Pint 70

ALUM. TUBING
1/16 outside dia. ft. .... .07
1/8 outside dia. ft. .... .07
3/16 outside dia. ft. .... .11
1/4 outside dia. ft. .... .13

NEWEST TYPE GUNS
Rotary Barrel
¾", 8c; 1⅛", 12c; 1¾", 15c

MUSIC WIRE
Strong, light and stiff. Sizes: .014, .020, .028, .034.
4 ft. packages. 1 ft. lengths .... .02
Annld. Wire, 5 ft. .... .02

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1. Orders under 25c not accepted. 2. Add 15c for packing and postage on orders up to $1.50; on orders for $1.51 and over add 10% for packing and postage. 3. Add 10c extra to above charges on Balsa plank orders less than $1.50 west of the Mississippi and Canada. 4. Stamps, Canadian or Foreign coin not accepted. 5. Remit by check, postal or express money order. Make payment to MADISON MODEL AIRPLANES, Inc. 6. Add 5c for insurance against breakage in transit.

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Ask for Madison Kits and Supplies. On Sale at Leading Department Stores Everywhere.

Air Ways Here and There

(Continued from page 13)

from Philadelphia; Mr. Otto F. Condermann and William Winters, both contributors to UNIVERSAL MODEL AIRPLANE NEWS; Captain Claude M. DeVitalis, former war ace; Mr. James W. Aldred of the staff of UNIVERSAL MODEL AIRPLANE NEWS; Mr. David Cooper, writer of the articles, "How The Aeroplane Was Created," published in UNIVERSAL MODEL AIRPLANE NEWS; Mr. Avrum Zier of "Flying Aces"; Mr. William Bouldin, 3rd, a member of the "Early Birds," who was active in flying before 1914; Mr. Aaron D. England, Director of the Westchester County, New York, Model Airplane Clubs; Mr. Harry S. Pack, Jr. and Mr. John Siegel, heads of the Model Aircraft Engineering Company. Mr. Charles H. Grant directed the contest.

We wish to extend our sincere appreciation to these gentlemen and others who assisted in the successful operation of the contest. The success of any contest depends largely upon how leaders handle their groups. These men we feel are outstanding in their attitude of promoting model airplane activities for the education of young men; in most cases at their own inconvenience and expense.

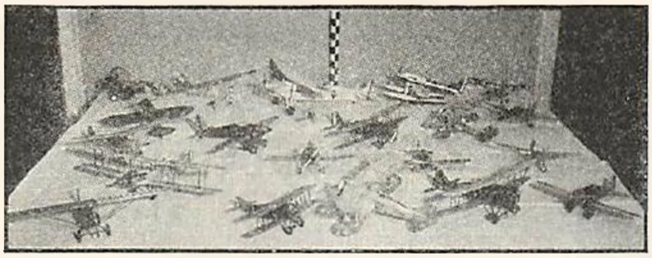
One of the biggest factors which helped to make this a success was the generosity of the donors of the prizes. We wish these concerns and personalities to know that both UNIVERSAL MODEL AIRPLANE NEWS and the contestants appreciate their cooperation in every sense. They are one of the important links in the chain of factors which make these contests possible. Following, are the concerns and personalities who have been generous enough to donate trophies and prizes: THE WHITFIELD PAPER COMPANY of New York, trophy for the R.O.W. event; MEGOW'S MODEL AIRPLANE SHOP of Philadelphia, trophy for first place Fuselage event; EDWARD R. MITTON, vice-president of the Jordan Marsh Company, trophy for high-point winner; UNIVERSAL MODEL AIRPLANE NEWS trophy for first place Hand-Launched Duration; L. BAMBERGER AND COMPANY, Newark, N.J., second place trophy, Hand-Launched Duration; BERKELEY MODEL SUPPLIES of Brooklyn, second place trophy for high-point winner and four beautifully produced kits; SCIENTIFIC MODEL AIRPLANE COMPANY of Newark, six fine kits. Nine medals were donated by UNIVERSAL MODEL AIRPLANE NEWS. The NATIONAL AERONAUTIC ASSOCIATION donated three trophies to the winners in the Open Event through the courtesy of Mr. E. A. Walen of Springfield, Mass. Following is a table of results of the Contest:

High-Point Winners

1. Hyman Oslick, 1200 points.
2. Kenneth Ackerman, 600 points plus.
3. Mayhew Webster, 600 points.

Hand-Launched Duration

Mayhew Webster	12 min., 2 sec.
Joe Kovel	11 min., 19 3/5 sec.
Jim Throckmorton	10 min., 58 sec.
Isador Manulkin	10 min., 48 sec.
Mathew Kania	10 min., 40 sec.
Kenneth Ackerman	10 min., 37 4/5 sec.
Henry Struck	10 min., 5 2/5 sec.



Pict. No. 16. Some of the scale models built for the "Legion" contest held at the Y.M.C.A., Wheeling, West Virginia

Open Class

Jesse Bieberman	9 min., 35 sec.
Louis Garami	8 min., 31 sec.
E. A. Walen	7 min., 41 sec.

Fuselage Duration

Hyman Oslick	11 min., 4 sec.
John Haw	7 min., 55 sec.
Herbert Greenberg	6 min., 47 sec.
Hewitt Phillips	7 min., 15 1/5 sec.
Kenneth Ackerman	6 min., 26 sec.
John Ginnetti	6 min., 27 3/5 sec.

Open Class

William Latour	6 min., 10 sec.
E. A. Walen	3 min., 24 1/5 sec.
Jesse Bieberman	2 min., 30 sec.

R.O.W. Duration

Hyman Oslick	10 min., 59 sec.
Bruno Marchi	8 min., 8 sec.
Stanley Jonik	8 min., 7 sec.
Kenneth Ackerman	7 min., 22 1/5 sec.
George Waite	7 min., 9 1/5 sec.
Robert Jacobson	6 min., 23 sec.

There were no Open Event entries.

The finest picture this month must be credited to Irwin G. Ohlsson of 1439½ Bellevue Avenue, Los Angeles, Cal. It is picture No. 5, showing Ohlsson with his 8-foot gas job. As can be seen from the picture, the workmanship is remarkable and flights of over 1½ hours have proven the quality of his ship. Mr. Ohlsson is the foremost gas-model builder on the West Coast. Unquestionably his ship will produce some interesting results in the coming 1935 National Competition to be held at St. Louis, Mo.

Picture No. 6 shows Mr. W. Effinger's exact scale gasoline model Buhl "Bullpup." Mr. Effinger lives at 53 Berkeley Place, Brooklyn, N.Y. The model is complete in all details and has a span of six feet, two inches. This model has placed in the Bamberger and Kresge Gas Model Contests. It is a remarkable little ship and flies very well. Mr. Effinger is head of the Berkeley Model Supplies.

One of the most unique devices that has ever been developed in model aviation must be credited to Mr. Robert Becker of 919 Olive Way, Seattle, Wash. Mr. Becker has developed a means of control of a model plane while it is in flight. His plane is shown in picture No. 7. The control is accomplished by having a slow flying model and elongating the control stick and rudder bar sticks placed on the top of the fuselage cowl at the rear of the cockpit. By means of these elongated controls, he is able to follow the model and govern its flight by moving the control sticks. This at first might seem to be impossible. However, we will quote what Mr. Becker has to say:

"When I was building the first model I hardly believed it would be possible to do any more than influence the general course of the model. I scarcely dared to hope it would be possible to pilot the model with real accuracy. The results were beyond my wildest expectations.

"The controls are hooked up to all control surfaces as on a large plane. The rudder and flippers have light tension springs. These springs, having very light tension, return the controls to normal when they are released. The plane is usually launched at about shoulder height. Being lightly and carefully built, it flies at an easy walking speed. With it in flight, it is easy to pilot it with one hand. Naturally it takes some practice, and of course, one must learn to pilot a model the same as a large plane. It is best to fly the smaller ships indoors.

"I have had so much greater pleasure and so many more experiences with this type of model, that ordinary models seem tame. It is possible to make accurate spot landings, stunts, etc., with real ease. It is certainly very instructive.

"I will be very happy if my contribution to model flying will give others the pleasures and thrills it has given me."

We hope that Mr. Becker will send in a clearer picture of his model, showing greater detail.

Picture No. 8 shows a gas job built by Harold Mitchel of 6 Baldwin Terrace, Everett, Mass. It weighs 3 pounds, 13 ounces. When flown, it was found to have an approximate rate of climb of 1200 feet per minute. This was determined by the use of a little trigonometry, Mr. Mitchel says. It is of all-balsa construction, covered with paper and powered with a Hurleman Aristocrat.

Picture No. 9 shows a scale Douglas Transport built by Arnold Smith of 2887 Beechwood Blvd., Pittsburgh, Pa. This model was entered in the recent T.W.A. Scale Model Contest and won tenth place. This is excellent, considering that there were 2500 contestants competing for prizes. All details have been carried out.

MODEL NEWS FROM OTHER COUNTRIES

Germany

An unusual pastime has taken root among older people in Germany. It is airplane kite flying. One of the large airplane kites is shown *in picture No. 10, with* its builder holding it down to "Mother Earth." This is not merely a "stunt." These kites rise aloft for several thousand feet, as other pictures which we have seen, indicate. They also carry aloft a man in

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Building the Famous Udet Flamingo

(Continued from page 15)

The proper lengths are shown in detail on the plan. Bevel the ends to fit flush with fuselage and wing. Pins are used to hold in place while drying.

Wings-Upper

The spars of 1/16" x ⅛" are pinned in place with the narrow side down. The ribs are cut from 1/16" sheet and pinned together. Sand them even and trim ends. Cut notches and remove pins. Cement ribs in designated positions. The leading edge of 3/32" sq. is rounded on one side and cemented in notches at front of ribs. Be careful that edge is not wavy as seen from above. Trailing edge is of 1/16" x ⅛", shaped as shown in plan. Tips are bent by heat from 1/16" bamboo. Notch end of trailing edge to receive tips. Both trailing edge and tips are held in place by pins while cement is drying. When dry, remove pins and crack spars and edges at first rib on either side of center. This is to obtain the proper dihedral. Pin center section to bench at the first rib on either side of center rib. Elevate by placing 1" blocks under each tip (keep center section flat on bench) and cement cracked spars. A short piece of 3/32" square is for the top outer sections, one for the section in the center and one for the underside. Dope a few ribs at a time, or if you wish, dope only the edges and last two ribs and apply paper. If the last method is used the surface is doped, which, of course, causes the paper to adhere to the ribs. In either case, trim all loose edges and dope down frayed ends.

Wings-Lower

The lower wings are built the same way as the upper but in two sections, each of which is cemented to fuselage when completed and covered. Care should be taken that the first rib is tilted to permit the correct amount of dihedral. It is now advisable to pin the upper wing to the center section struts and to line it up with care. When everything is true, cement struts to wing.

I Struts

These interplane struts are cut from a piece of ⅛" x 1¾". Cut them to proper profile and then streamline and sand. A detailed drawing is provided for this purpose. when completed, cement between wings at ribs shown on plan.

Propeller and Motor

The prop is cut from an 8" x 1" x 1¾" block. The block is first cut to the outline shown. The top surface of each blade is then cut, slanting the blade toward your right side. It is slightly rounded as is the upper surface of a low lift rib. The back surface of the propeller is cut in the same manner with the surface cambered slightly inward. A cross section of the blade would be similar to a wing rib. Drill a hole large enough to receive the shaft, and placing a pen through this hole, balance the propeller. Whichever side descends should be cut a little more. The prop is then sanded and re-balanced. Bend the shaft and glue in place. A ¼" washer is fastened to the rear of the hub. An ⅛" washer is placed loose on the shaft to take up friction.

The nose plug is cut and sanded to shape shown on detail drawing. Drill hole for shaft and cement ¼" washer to front end to act as bearing. Plug is placed on shaft before hook is bent. Motive power is six strands of ⅛" flat rubber.

Flying

The model should be first tested in deep grass with a few turns. If it noses up, the tail should be slightly bent down along the elevator line. If, for some reason, your model should be an extreme case, a little weight may be added to the nose. As this is a flying scale model with the wings in real plane position, a nosing down is not probable. When balanced and fully wound this little ship is stable and climbs rapidly to about 20 feet, levels off and then commences a long, gradual ascent in circles, due to torque.

We have flown this model, winder-wound and hand-launched, about a distance of 400 to 450 feet.

Required Materials

6 pieces ⅛" sq. x 36" for longerons and cross pieces.
2 pieces 3/32" sq. x 36" for leading edges and rudder spar.
4 pieces 1/16" x ⅛" x 36" wing and stabilizer spars.
1 piece ⅛" x ¼" x 36" landing gear, center section struts and spreader bar.
1 piece 7/18" x 2 1/16" x 1½" (soft) nose block.
1 piece 1¾" x ⅛" x 7" for I struts (interplane).
1 piece 1/16" sq. x 36" for stringers.
1 piece 1/16" x 2" x 18" for wing rib and fuselage formers.
1 piece 1/32" x 2" x 12" for stabilizer, rudder ribs, and cockpits.
1 piece ⅞" x ¼" sq. for T section.
1 piece ⅜" x 1⅛" x 1" for nose plug.
1 block 8" x 1" x 1¾" for prop.
1 foot .028 music wire for hooks and axes.
1 scrap celluloid for windshields.
½ ounce clear cement.
1½ ounces clear dope.
2 pieces Jap. tissue, choose colors to suit.
1 pair 1⅞" wheels, (black celluloid).
2 washers ¼" for prop hub and nose plug.
1 washer ⅛" for friction.

On The Frontiers of Aviation

(Continued from page 25)

passengers in order to meet the increased traffic on our air lines. From present rumors there are indications that Boeing is building such a plane, a double-decker.

The Paris Show this year exhibited many new planes made public for the first time. Unfortunately no American planes were shown, but the Pratt & Whitney Company had a booth where they exhibited their new engine. There were many pathetic looking designs of aircraft in various parts of the show building, and also one or two planes of real interest.

The Bréguet Company had a fine transport at the show which is said to do 240 m.p.h. It is a low-wing twin-engined 12-passenger monoplane somewhat similar to our Douglas.

A marked improvement has been shown in the new Farmans. Their new F.430 is now on a par with our Curtiss Kingbirds of 1928 heritage.

Dewoitine has developed a wonderful low-wing fighter, but it has too much wing to be able to keep up with our newest Boeing pursuit.

France exhibited several giant bombers that had some very good qualities. They had very sharp lines and were much larger than anything in this country. As usual, those foreign aeronautical engineers slapped on some ugly and inefficient tail, etc., that marred the whole design of what would have been a noteworthy airplane. This year the French bomber had the tendency to carry boxlike sun porches in various parts of the plane. In other words, they carried spacious glass-enclosed compartments for gunners and bombardiers. Fortune help them if they ever should come in contact with a Northrop fighter! They looked like excellent places for the crew to bask in the sun while going about their "egg-laying" business.

The wonderful little Caudron Simoun limousine was one of the outstanding exhibits.

A Levasseur seaplane was present that closely resembled a special Dornier design. Its tail was connected to the tail of its two floats instead of the fuselage, thus facilitating a short fuselage containing engine and pilot.

Potez had a transport almost an exact duplicate of the English Airspeed Envoy.

Summing up, the French as a whole seemed to have advanced considerably in the past year which is rather contrary to rumors about the inferior quality of French planes that have been circulating about recently.

Czechoslovakia surprised visitors at the show with a wonderful Avia fighter that looked quite promising.

A few of the popular English planes were displayed and also a metal monocoque fuselage of a Bristol transport. Its gigantic windshield looked like it might stand up in a heavy fog.

Germany showed a tri-engined low-wing Junkers on floats, the largest at the show. The floats had two steps running lengthwise as well as one running crosswise. The longitudinal steps were for the purpose of lessening the shock when the heavy plane hit the water.

Italy had their Macchi-Castoldi world speed record holder on display, and Poland and Russia were other exhibitors.

The Fairchild concern's new cargo transport will do over 160 m.p.h., which is quite a performance for such a large single-engined plane. The ship is a high-wing monoplane with a 75-foot wingspread and it will be used for transport work in the Army. A retractable landing gear is employed.

Roscoe Turner's new racer is now well under construction. It was designed by Professor Barlow.

Byron Armstrong, famous racing pilot, has a new high-wing racer that he will fly in next year's National Air Races. A Menasco is the power plant.

Blackburn of England is building a new low-wing plane that without a doubt will be one of the finest planes of its type yet built. The side elevation of the fuselage is in the shape of a wing section. The plane will carry 12 passengers and will have a very fast speed. We will have further news of it next month.

Russia is now in the process of building a 13-passenger glider! Well—it just can't be helped. Thirteen parachutes would be a necessary asset on such a ship.

Northrop is now busy building 110 new attack planes for the U.S. Army. Vance Breese, noted test pilot, put one of the ships in a 16,000 foot power-dive and snapped it out at the end of the dive. No part of the plane was weakened by the strenuous dive.

Build a Solid-Wood Scale Model of the General Aviation GA-38 and the Latest Boeing Pursuit.

The models should be made from a good grade of balsa wood that may be obtained in any model airplane shop or popular department store. Get dimensions from plans for stock. The cost in constructing the models is very low, and the novice should have no trouble in constructing either model.

Only a few tools are needed; a sharp chisel, razor blade, saw, paint brushes, ruler and fine and coarse sandpaper are essential. Dope and a tube of ambroid are also needed.

If you wish to square off the plans, connect up the corresponding dots on the border of the plans with light straight lines. Each square on the plans of the *transport* will equal 2 feet actual size.

Draw the outline of the side elevation of the fuselage first. The tail units will be made separately. Saw around this outline, leaving a slight margin. Cut down to the outline with your chisel and then draw the top elevation of fuselage on stock. Cut around this in like manner. Go over the four surfaces with coarse sandpaper. Then begin to round out the fuselage with your chisel as shown in cross-sections. The wing fillets may be puttied on later.

Next draw the outline of wing and cut and then taper down as shown in front view, using your chisel. Shape the airfoil section in wing as shown. The engine nacelles may be made separately or as one piece with the wing, on the General transport. Go over both the fuselage and two wing sections with first coarse and then fine sandpaper.

Make the tail units next. Cut around the outline of these with your razor blade. Then finish off the three pieces as shown in cross-sections.

Shape out the prop or props and put hole through center of hub for straight pin which will act as shaft.

It is preferable to purchase the wheels. The landing gear struts many be made from balsa strips and a piece of a small straight pin used as an axle. The landing gear may be made retractable as shown. Carve the tail wheel from some scrap wood.

Begin the assembly next. Ambroid the wing parts to fuselage as shown with blocks under the wing tips to hold them in place. Then join the tail units in place, applying plenty of ambroid. Lay the model on its back and connect the landing gear and then put on the props. Put wing fillets on with putty.

You are now ready to paint the model. Several coats will be needed before a fine smooth, finish is obtained. It is preferable to use dope. The General Transport should be painted silver and the Boeing as specified on plans. After five or six coats have been applied, the model or models will then be completed.

The Development of The Fokker Fighters

(Continued from page 11)

was similar in design and construction to that of the V.20. Longerons and cross struts were of seamless circular steel tubing, welded at the joints and cross-braced by steel piano wires run through quadrants at the corners of the welded joints and tightened by a turnbuckle arrangement. The diameter of these longeron tubes was 22 mms. from the front of the body to the splice at the rear. After this splice, the diameter was reduced to 18 mms. All tubing was of 24 gauge stock. Engine bearers of heavy gauge steel tube were welded to the fore end of the fuselage.

Beside the engine and radiator supports found in the front of the body, the method of attaching the lower wing calls for some comment. In order to allow simplicity in assembly, the lower wing was made in one piece, and by removing two tubes on the underside of the body, access to a recess in the floor of the fuselage was gained, in which to set the wing. This cut-out was closed by bolting into place these tube supports and replacing the cover plate.

The entire front end was cowled in aluminum on all four sides. The cowl was extended on the top to the cockpit, and underneath to a point beyond the rear spar. From the center of the cockpit to the fin, the top of the body was covered with a three-ply shell which did not quite reach to the longerons. Wood strip formers held the shell in position and fabric placed over the top held it down tight.

Tail surfaces of the D.VII were of somewhat different design than those employed on previous Fokker models. The vertical fin was triangular in shape and the rudder rounded and balanced. The horizontal stabilizer was also triangular in shape, with a divided elevator, balanced and of one-piece construction. The fin of the D.VII was set with its leading point about two inches to the port side of the airplane to counteract propeller torque and to keep the machine from turning to the left in flight.

Construction of the tail assembly was entirely of steel tubing, including the trailing edge of the elevator. The cross-section of the tail assemblies suggested a symmetrical camber. The stabilizer was set at an angle of incidence of 3 degrees positive and was held in place by three bolts passing through the longerons and fastened to projecting tubes to secure them in position. Two streamlined steel struts stayed the stabilizer while the fin was braced by a steel cable on either side.

The undercarriage assembly of the D.VII was typical Fokker style in construction. The angle between the front and rear struts on either side was 55 degrees. The struts were streamlined in cross-section and were 34 mms. and 65 mms. on their minor and major axes respectively, while these members were made of 20 gauge metal. Upper attachments of the undercarriage were of the ball and socket type, the sockets welded to the longerons of the lower portion of the fuselage. Bracewires extended from the upper extremities of the two forward struts to their lower ends where the wires were attached to lugs welded to the struts. The small wing fairing on the axle was retained in the landing gear. Only one spar, an aluminum box riveted on the top side, ran the whole length of the wing while the covering was cloth-covered plywood. Rubber shock absorbers used on earlier types were replaced by coil spring absorbers later in 1918 because of the scarcity of rubber in Germany. Two wheels 760x100 were fitted.

Only one fuel and one oil tank was built into the D.VII. These reservoirs were made of sheet brass slung on felt-lined saddles from the cross braces of the fuselage just in front of the ammunition magazines, immediately in front of the pilot. The two-section petrol tank held 61 liters (approximately 13½ gallons) while the reserve portion provided for 33 liters (approximately 7¼ gallons). The oil tank capacity was 5 gallons. All fuel switches, cocks and air gauges were located within pilot's reach on the dashboard.

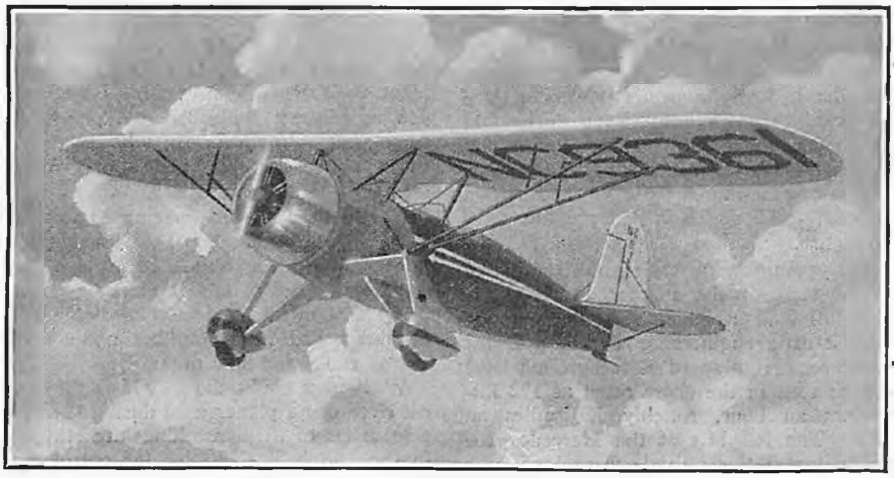
Cockpit appointments included a full set of instruments, crash pads and a locking device for the controls. The left hand of the pilot was free to work the auxiliary as well as main throttle control and the right hand was free to work the guns and controls.

In the D.VII, the famous Fokker "thick wing" made its first appearance at the Front. Since that time the strength and efficiency of this type of construction has been accepted and imitated in all parts of the world.

Both wings of the Fokker D.VII were made in one piece. Giving the problem broad consideration, Fokker decided to prevent loss of construction time by having to make special fittings for his wooden wings. His final decision was on an all-wood wing without metal parts except those necessary interplane fittings. The two main spars were separated by 30 ribs in the upper wing and 11 ribs in each of the two lower wing bays. Inter-spar compression members were merely special strength ribs. All ribs were made of three-ply and were not lightened except for holes passing the control and internal bracing wires. Two-piece flanges strengthened each rib; one-half of each flange was tacked and glued to each side of the rib.

Upper and lower wing spars were of box type, constructed of fairly narrow top and bottom flanges, to which side walls of plywood were tacked. The flanges were two-ply pine and the side webs were two outer layers of birch and an inner layer of ash. Only the best casein glue was used in Fokker wing construction, which was sufficiently good that parts so joined successfully withstood four hours immersion in boiling water. The trailing edge of both wings was wire with a tape lattice running about ten inches in from the trailing edge. All wood work was varnished, and fabric was bound and glued around the flanged members.

As in the Fokker D.VI, ailerons were fitted to the upper wing only and were of the balanced type. A false spar behind the main spar carried these members. Control was carried through a welded horn, while the control cables were led into the wing through leather re-enforced slots in the



wing covering. Ailerons were constructed of steel tubing, including the trailing edge (some models, however, were fitted with wire trailing edges), and all framework was well lacquered.

All interplane and center section struts were of steel tubing of streamlined section. Center section struts, three in number, were attached and shaped similarly to those on the D.VI, while interplane struts were of a type similar to those used on the Fokker V.11. No wire bracing was used externally in the wing structure, since the internal construction had been made sufficiently strong to withstand any stresses of load or drift encountered in flight.

Power was supplied by a Mercedes six cylinder motor of 160 rated horse-power. Two carburetors and two Bosch Z.H-6 type magnetos furnished the fuel and spark.

Specifications of the Fokker are given below:

Fokker D.VII-Mercedes

Wing Span—upper	27' 5½"
lower	22' 11¼"
Wing chord—upper	5' 3"
lower	3' 11¼"
Wing area including ailerons	236 sq. feet
Wing area of landing gear plane	11 sq. feet
Length overall	23'
Height overall	9' 3"
Incidence in upper plane	None
lower plane	1° to 1½°
Weights: Empty	1540 lbs.
Gross	1936 lbs.
Power loading	12.1 lbs. per h.p.
Wing loading	8.33 lbs. per sq. ft.

It has been a popular supposition by those interested in aviation during the World War that the Fokker D.VII was a demon for speed, that it could dive at a tremendous rate of speed and escape its enemy, and that it possessed super powers of maneuverability and climb. Such misleading statements are usually made by fiction writers who have been misinformed of the truth, or who wanted to make their Allied hero fight odds which in real wartime were not actually as bad as painted.

The accompanying table gives the actual official tests of the Fokker D.VII made with full load at Aldershof, Germany, by the German engineering department for reference. High speed at the ground level will be seen in the chart rated at 192 kilometers an hour, roughly 120 miles an hour. The R.P.M.s of the Mercedes 160 h.p. motor at this altitude were 1565. As the altitude increased, the speed naturally fell off because the revolutions of the motor fell off. At 3,000 meters altitude the speed of the D.VII has dropped to 177 kilometers, roughly 110 miles an hour. This conclusively proves the D.VII was not a "demon for speed." Any of the metric equivalents in the table can be multiplied by ⅝ for speed factors, and by 3 for altitude readings to get the approximate speeds and altitudes in feet and fractions. During the last three months of the War, the D.VII was slightly improved and fitted with a B.M.W. motor of 185 rated horsepower. On a synthetic fuel then in use by the German Air Force, the power was boosted to 243 h.p. The fuel used in this case was a mixture of half gasoline and half benzol.

This B.M.W. machine reached a top speed near the ground of 124 miles per hour (197 kilometers an hour). The ceiling of this later model was 7,000 meters instead of 6,000 meters of the Mercedes model.

In regard to the diving ability expressed by some historians, the fact is that the terminal velocity of the Fokker D.VII was only a few miles more than 200 m.p.h. The ability of a D.VII to recover from a dive and regain altitude was the factor which worried Allied pilots. While the Spads and Nieuports could dive perhaps 50 miles an hour faster than the D.VII, the Fokker could recover from its slower dive and be on its way back up to the sun while the Allied types shot past the German ship and recovered several seconds later.

Maneuverability of the Fokker D.VII was remarkable at low speeds, where most machines became decidedly mushy. The author has seen two D.VIIs cavorting about at about 75 miles per hour, hopping over one another like two small dogs. Instead of nosing up into the air suddenly when the pilots began to climb, even at this low speed, the D.VIIs would rise as though they were on lifts, before the fuselage actually began to incline. A favorite trick of German pilots flying a D.VII was to bring the ship into a stall position and hang on the propeller. In this attitude the pilot could leisurely pepper the enemy and still travel along at 30 miles an hour.

At high speeds, the D.VII became stiff as any machine will and it took a good haul on the stick to get it around, but the D.VII shone at low speeds, where it could dance around the loggy Spads and Nieuports.

That the D.VII turned the tide of Allied superiority in the Summer of 1918 is shown by the aerial records of Germany at that time. With the Fokker as standard equipment, the German victories for June totaled 468 in contrast with 217 in April of the same year. July saw 518 allied planes go down under the new planes and August claimed 565 planes.

The answer to this amazing comeback is simply that the Fokker D.VII made good pilots out of fair ones. It made experts out of good pilots and it must be remembered that in the final months of the War, Germany had turned to her non-commissioned ranks for new pilots.

Without a doubt the D.VII is the longest lived of all planes used during the War. Squadrons of these machines are still used in the Dutch East Indies for patrol duty. Several are in South America, flying supplies over the Andes. Along with the old DeHavillands, Avros and Jennys, all relics of the War which can still be found today, the D.VII is perhaps the *only ship* of its time still in active service.

A final tribute to the genius of Anthony Fokker and to the D.VII was made in the Treaty of Versailles, which specified that all Fokker D.VIIs were to be surrendered. The D.VII was the only plane identified by name or number. And some historians still insist that the Allies had the Fokker D.VII licked by French and British types!

Third in the early 1918 group of Fokker machines was the V.23 monoplane shown here. Similar in nearly every respect to the V.20 type described before, this machine left the Fokker shops in February or March of 1918. Several points of interest differentiates the V.23 from the V.20.

In the V.23 the Mercedes engine had been completely covered in with the exception of the exposed rocker arms. Exhaust gasses were led under the wing through a streamlined tube instead of over the pilot as in the V.20. Instead of the comma-shaped rudder fitted on the V.20, the V.23 was equipped with a curious balanced type rudder, the balance of which fitted flush with the top of the stabilizer. Its appearance leads one to believe that it had lost a supporting fin.

As the Fokker D.VII production got under way in the various contracting factories, Fokker was asked to design and build a two-seater fighter of the "C" class, which was to make use of component parts of the D.VII. This machine, designed and built, did not reach the Front, but its story will be told in Part 14 of this series.

New Developements In Blind Flying

(Continued from page 5)

same dial with "right" and "left" indicators which enables the pilot to fly to the landing transmitters guides him to the broadcasting station. So accurate is the system, that toy balloons attached to cords have been sent up over a transmitter. A pilot flying entirely blind, following his radio compass, is led to the transmitter with such perfect precision that he will break the cord holding the balloon on every test.

Just at the time when the Air Corps system of blind flying has been adopted as standard, word comes from the Massachusetts Institute of Technology of another means of making landings on a fog-bound airport that promises to be of considerable value.

Perhaps when you want to land an airplane during foggy weather in the future, you will just radio down for the airport attendants to wipe the fog off the runway like wiping moisture from a window pane. At least that was the way it was done during these recent tests at M.I.T. and the progress of the apparatus is being watched with keen interest by flying men everywhere.

A professor of electrical engineering, puttering around his laboratory, got an idea that may have a vast effect upon future air navigation. Dr. Henry G. Houghton, Jr., had been making a study of fogs and bringing to light many interesting facts about their nature and habits. He was taking microscopic photographs of them and doing other unheard-of things with the cool, damp mists that blow in along the New England coast. Houghton found that fog was composed of very minute droplets of moisture condensed on impurities, such as dust, floating in the air. The smallest of the droplets are so infinitesimal that 25,000 of them could be placed end to end within the space of one inch.

If this fog could be made to precipitate into a fine rain, Houghton reasoned, a clear space in the atmosphere would be formed. The problem was something like the old darky story of tying a rock to each drop of rain, but Houghton worked out a formula that he believed would do the trick.

Then one day not long ago, a fog closed in like a death shroud over the Round Hill Airport, Massachusetts. The fog bank, driven by a southwesterly wind at 13 miles an hour, drifted in from Buzzards Bay. The visibility was less than 500 feet. Here was the opportunity Houghton was waiting for.

As soon as the fog had completely enveloped the airport, the equipment was put into operation and a fine spray of chemical began falling from a long pipe suspended in the air. Within a few seconds, the fog drifting through the chemical curtain began to precipitate, falling to the ground in the form of water drops. The curtain was in effect straining the fog, for immediately a path of visibility approximately 100 feet wide and 30 feet high began to open across the airport in a northwesterly direction. On either side were walls of turbulent white vapor, but in the cleared area the ground was entirely free of fog. The lane continued to open as though a huge invisible plough were moving through the fog. Within a few minutes objects on the opposite side of the airport, a distance of more than 2000 feet, were clearly revealed. The path was clear as long as the chemical curtain was operated, and it was several minutes after the pumps had been stopped before the fog began to close in again.

The chemical used in the process has the ability to collect or condense the water vapor in the air. In applying the method for its first tests in natural fog, a pipe 100 feet long and fitted with small nozzles of special design at frequent intervals along its entire length, was suspended horizontally 30 feet above the ground. A chemical solution is sprayed from the pipe in the form of a curtain of tiny drops or particles which in falling through the drifting fog, condense the water vapor and carry it to the ground by force of gravity.

In using a system of this kind on an airport, it would be necessary to use a localized radio beam to guide aviators to the region of the cleared area where they would then be able to see the ground and land safely. Successful development of this method in the future may lead to its application to aircraft, thus making it possible for pilots to fly over an airport and by spraying a curtain of chemical particles from apparatus carried in the plane, clear a path of visibility to the landing field.

The success of these blind landing systems is of great significance and it seems that the last real barrier to the complete mastery of the science of air navigation has finally been conquered.

Fundamentals Of Model Airplane Building

(Continued from page 8)

with it weighted at the center. Adjust the books so that each wing tip is raised 1½". Allow this to dry thoroughly. It might be well to perform this operation and allow the wing to dry overnight.

When the dihedral has been created to the proper degree, put the ribs in place as shown. Six are required. While the cement is drying, slit the upper wing at the center, beveling it carefully so that a tight joint is formed when the proper dihedral is given to each half wing. Each wing tip should be raised 1 13/16". Apply cement to the joints and allow the wing to dry with the tips raised the proper amount.

By this time the ribs of the lower wing will be dry. You may then cement the flat balsa sheet in place, which is shown at the center of the wing in the plan view. This is 1¼" wide and 2½" long. Before cementing it in place, curve it by wetting it and allowing it to dry thoroughly, then apply cement to the under surface and press it tightly in place on the lower wing. When in the correct position, use pins to hold down firmly. Keep the tips of the lower wing raised to the proper amount while this joint is drying. A weight may be placed at the center of the wing if necessary.

Struts

While waiting for the cement to dry, cut out the struts as indicated by the graph pattern. These are built from two sheets of 1/32" balsa cemented tightly together. For the two struts, four pieces will be necessary. While the cement is drying, place a weight on each strut in order to be sure of a tight joint. The flat balsa strip at the center of the lower wing will now probably be dry. Cement in place ⅛" half round dowel to the undersurface of the wing. Be sure that they are of equal distance from the center line. Pin them in place while the cement dries.

Meanwhile form the center section struts of the wings. These are shown full size on the drawing. Be sure that they have been bent accurately before cementing them in place to the upper wing, as indicated on the drawing. They are made from .026 steel wire or .032 steel wire. This wire is approximately 1/30" to 1/32" in diameter.

Make the "S" hook, which is shown in the side view and which is used to hold the front struts to the body. Probably the balsa struts are now dry. Sandpaper the edges round and smooth them carefully. Bevel the upper ends slightly so that they fit snugly against the inner side of the outer rib, as shown in the front view. You will notice that the strut slants slightly inward at the bottom, thus requiring this bevel. Cement the strut in place at the top to the outer rib and at the bottom to the lower wing, directly over the outer rib. When cementing the struts in place, be sure that the two wing chords are parallel. This may be determined by pinning the strut firmly in place and checking by passing a ruler under each wing, making sure that the edges of the wing are parallel. Adjust the struts until satisfactory.

You may now cement the rear turtleback of the fuselage. Draw the two sides together after thoroughly wetting the sides at the line of curvature from the stabilizer slot to the cockpit. Bend gradually and wet frequently until the edges come together. Bevel the edges with sandpaper, then apply cement, and use pins to hold them together. Rubber bands may be wrapped around the body in several places to insure a tight joint. Be sure the rear points of the turtleback are fastened tightly to the fin and stabilizer.

Landing Gear

Bend the landing gear to the proper shape, using 1/32" steel wire. When each part is thoroughly shaped to satisfaction, join them together with thread as shown at K in the side view. This type of landing gear was used in the last article and those who have been following the series will find little difficulty in performing the operations. We might caution you not to bend the wire too sharply, as this causes breakage. When bending the wire allow a small radius of bend at the angles.

When the landing gear is completed, put the wheels on the ends of the axles, holding them in place with washers to which cement is applied and allowed to dry.

The wheels may be of the aluminum disk rubber-tired type or of solid hard wood, 1½" in diameter. They should be fairly heavy to give plane correct balance.

Propeller

While this is drying, carve your propeller from a block of hard balsa 8" long, 1¾" wide, ¾" thick. The propeller is cut by the usual method, along diagonals drawn from the corners of the block. A graphic illustration of how the propeller is cut is shown on page 8. When both blades are finished roughly to approximately the same thickness and weight, use the propeller blade pattern shown on the graph, to form their outline. Place the pattern on the blades and draw around it, cutting the corners of the propeller away and sanding lightly so that the blade is accurate in shape.

Now sandpaper the sides of each blade. It is best in making a propeller to finish the concave faces to your satisfaction first. Then sandpaper the convex or back sides of the blades so that both are equal in thickness. Force a pin through the hub at the exact center in such a way that it is true and perpendicular to the plane of rotation of the propeller. Balance the propeller, suspending it by the two ends and sanding the heavy end of the blade away until it remains motionless when placed in any position.

When this is completed you may put the wing center section struts in place. Cement them to the underside of the upper wing, using plenty of cement and allowing it to dry thoroughly before disturbing again. The front strut should contact the upper wing 3/16" from the leading edge; the rear struts at 1/4" from the trailing edge.

Next fit the landing gear to the body in the position shown in the drawing so that it remains in place firmly without cement. Then apply plenty of cement around the wire on the sides and across the body. Allow it to dry thoroughly.

The chassis may be held in place firmly by rubber bands put over the top of the body and through the loops of the chassis while it is drying.

You may now put the flat sheet of balsa over the rear lower side of the fuselage as indicated at P. This is cut from 1/32" balsa sheet. Cement it firmly in place, trimming and sanding the edges. Cut out the tail skid, sand it to the proper shape and then cement it in the position shown, to the undersurface of plate P.

The nose block, R, may now be cut to the proper shape, 15/16" wide and 1 7/8" thick. It is made from a piece of hard balsa 1/4" thick. Cut the contour as shown in the side-view drawing. Round all edges carefully.

Next cut out the propeller bearing, which fits into the front of the nose block, as indicated in the side view. This bearing is exactly the same as the one shown in last month's drawing. It may be made from a piece of ordinary tin can. Note there are four sharp prongs. However, before fitting it into the nose block, make the propeller shaft from 1/32" diameter steel wire to the shape shown. Do not bend over the end of the shaft but place the shaft through the hole in the center of the pronged bearing so that the prongs extend toward the hook of the shaft and then slip the washer on next to the bearing. Finally pass the straight end of the propeller shaft through the hole in the propeller hub.

When this is done bend over the end of the shaft into a "U" and pull back into the propeller hub, as shown in the side-view drawing. Cement this firmly in place, smearing cement between the washer and the propeller and over the end of the shaft.

A cone may be made, as shown, 7/8" long and 5/8" wide at the base. Make this in two halves from a piece of balsa 5/16" thick. Slot the two halves so that they fit snugly round the propeller hub. This was explained in last month's article. Cement them firmly in place, holding them with pins.

While this is drying, cement the nose block, R, to the front end of the fuselage. Use pins to keep it in place until dry.

In the meantime cut out the cowl bulkheads, 1, 2 and 3. Number 3 consists of two bulkheads, one which is to be cemented to the rear end of the front cowl sheet, shown at M, and the second one which is to be cemented to the front end of the rear cowl sheet, N. No bulkheads are to be put in place, however, until the outer side of the front cowl sheet is soaked in water. Leave the inside dry. While it is wet, smear the inner side of the cowl sheet with cement and allow it to dry. This will help to curve it to the proper shape.

Now cement two strips to the rear of the cowl sheet from its front to a point from the front face of bulkhead No. 2 when it is in place. These pieces are made of balsa 1/16"x1/8"x3 3/4". When this is done, wet the outside of the sheet again and cement bulkheads 1, 2 and 3 in place, holding them with pins. Between bulkheads 2 and 3 cement a short strip, as shown in the inside view of removable cowl. This is to straighten this part.

Now make the rear cowl by cementing the second half of bulkhead 3 to its front end. Then, after applying cement to the bottom of the bulkhead and the edges of the cowl, fasten it to the fuselage with pins, making sure that plenty of cement fills the joints. The front of this bulkhead should be located 7 1/2" from the rear face of the nose block, R.

While the cowl is drying, cut the holes through the nose block, R, and the front bulkhead through which the propeller shaft is to pass. This may be drilled through, burned through with a hot iron, or cut out with your penknife.

Next fit the propeller unit on to the nose block by cutting small slots with the end of your penknife for the prongs of the bearings. Then push the prongs into the slot and the bearing back tight against the nose block. A little cement placed over the face of the nose block, back of the bearing, will help to hold it in place.

The next step is to fasten the plane unit in place. This is done by looping your rubber band through the right U of the front center section struts, fastening the two loops of the rubber band into the eye of the S hook. Now slip the body through between the two wings, propeller end first, squeezing the chassis together so as to provide clearance.

When the wings are in position so that the lower wing is up tight against the bottom of the fuselage, draw the S hook down and around under the body and fasten it through the left U of the front wing struts, as in the drawing.

Next loop a rubber band over the front end of each dowel strip on the lower wing; through the other end of each bend up and back through the Us of the rear center section struts and looping each of these ends over the rear ends of the dowel

(Continued on page 48)

Air Ways—Here and There

(Continued from page 34)

some cases. This might be an interesting pastime for bored model builders.

France

From our friend, Pierre Legros, Secretary-General of the model airplane club, Escadre De La Rose Des Vents, comes picture No. 11 of the Salon de l'Aviation. He says that during this winter the members of his club have relented a little in their attack upon model problems. However, from the picture of this exhibition, we would say that considerable activity is taking place, nevertheless. Forty models of the club were entered, which was a great success. The club has enrolled 230 members since it was organized 10 months ago.

We are waititng to hear the results of the Grand International Competition of models organized by this club. We are not certain as to the date on which this event takes place. Therefore, we cannot advise American contestants who may wish to compete. However, they may write to Pierre Legros, 47, rue des Tournellos, Paris-3, France.

England

L. S. Wigdor of 2, Windsor Road, N. 3, London, England, with a group of his models is shown in picture No. 12. He mentioned several things of interest in his letter. He says that eight of the models are built from Cleveland kits, one from a Peerless kit and another from an Ideal kit. In the picture he is holding an uncovered Lockheed Vega. The other planes are an A.8 attack, a Supermarine S.6.B, Curtiss Goshawk, Lincoln Sportster, Macon Fighter, Howard Ike, Curtiss Helldiver and two Gee Bees. All the models are built to a scale of ¼ inch to the foot. Wigdor certainly is a remarkable builder. He says that he is only 15 years of age.

At the school which he attends they have two full-size airplanes and aero engines, which are used to instruct the boys in aviation. We call special attention to this fact to the educational department of schools throughout the United States. They can be less backward in the great art of child training if they will do more teaching through the medium of model building. In certain schools this method has been used with great success.

Australia

On Nov. 25 the Model Flying Club of Australia held a gigantic model competition under the direction of Mr. Ivor Freshman. Contestants assembled from all over the Australian continent to celebrate the fourth anniversary of the club. The following events were held: Angus-Coote Cup Race for all types and sizes of model planes; Angus-Coote Cup Flying Scale Trophy Event for true scale models only; the famous Wakefield Trophy Event.

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official Australian records are as follows:

Stick Tractor, 28 min. 27 4/5 sec., by Gordon Ratcliffe of Concord

Fuselage Tractor, R.O.G., 54 min., by Jack Brown of Albury

Indoor Stick Tractor, 7 min., 45 sec., by J. Jago of Malabar

Indoor Fuselage R.O.G., 4 min., 35 sec., by E. G. Leighton of Long Bay

This club applies for certification of records through the National Aeronautic Association, Washington, D.C.

Picture No. 13 shows the uncovered framework of one of the typical fuselage models popular in Australia and built by Donald Pardee. At the contest some of the unusual events were exhibitions of bomb dropping and stunting, smoke screen work, parachute releases, inverted flight, glider towing, etc. We would say that this was not only a competition, but an exhibition which should have been extremely interesting.

Picture No. 14 shows a fuselage model built by A. H. Reynolds of 79 Balmoral Road, Mt. Eden, Auckland, New Zealand. This model is an exceptionally fine-looking ship and is typical of the ones being built by the boys in New Zealand. Mr. Reynolds says that many of the boys are at a great handicap in their indoor flying. The best hall they have available is only 50 feet high and 100 feet wide. Mr. Reynolds is also a very prominent scale-model builder. He won first place in a recent winter exhibition at Auckland.

CLUB NEWS

Westfield Model Airplane Club

One of the most progressive model clubs in this section of the country is the Westfield, Mass., Model Airplane Club. There is some kind of activity constantly going on among its members in respect to model building. One of the outstanding model enthusiasts in this club is Miss Barbara Maschin. Though of the so-called "weaker sex," her capabilities in the model field are equal, if not greater in many respects, to her young men clubmates. She has been a habitual contender in local and national meets.

She has been kind enough to send us picture No. 15, which shows a group of Springfield and Westfield model club members taken during the second annual Western Massachusetts Outdoor Championship Contest. Miss Maschin is at the extreme left of the picture. Mr. Ernest Walen, leader of the club, is in front of her, kneeling. Other members of the club are Harold Maschin, John Whitehouse, Alfred Bogush and Danny Clini.

Junior Aviation League

The members of the Jordan Marsh, Boston Traveler Junior Aviation League have been practicing indoors in an armory with a comparatively low ceiling. This has been done more or less deliberately in order to make themselves proficient as flyers in this type of building. At many contests these young men have felt it advisable to be able to make flights of long duration at a low altitude. The club news is disseminated through their model airplane weekly, *Wing Overs*. Those interested concerning its contests might write to the Editor, Albert Lewis, c/o Junior Aviation League, Jordan Marsh Company, Boston, Mass.

CORRESPONDENTS

The following readers would like to hear from other model builders: Rafael Figueras, 82 Fernandez, Juncos Avenue, Santurce, Puerto Rico; Ronald E. Sands, "Cotowold," Rylstone, N.S.W., Australia; Jack Olsen, 88-51 247 St., Bellerose, N.Y.; LeRoy Stierlin, 314-9th St., Rock Island, Ill.; John P. Folmer, Jr., 229 East 8th St., Alton, Ill.; Marvin J. Border, 55 French St., Buffalo, N.Y.; Miss Judy McFarland, Valley City, N.D.

Aviation Advisory Board

(Continued from page 19)

Question: What are the wages of an aeronautical engineer?

Answer: His wages depend entirely upon the work he has to do and his employer's estimate of his value.

Question: What are the chances for promotion?

Answer: "The sky is the limit." However, when any man gets to the top, there are few people to promote him, he must do his own promoting. In such a case he must expect to give a lot more than he receives.

Question: What are the conditions concerning hours of work, health and safety?

Answer: The hours of work for an aeronautical engineer start at 8 a. m. and end at 8 a. m. the following day. Through these hours, he must glean as much sleep as possible from his constant and intense activity. In other words, do not get into this occupation unless you are really "born" to the work and work because you like it. This profession is a great strain upon one's health and he must take constant steps to keep it. This profession is probably as safe as any other.

We hope that these few words of wisdom, or otherwise, will prove of help not only to Fred Smith, but to all other readers who contemplate taking up aeronautical engineering as a life's work. We know that questions such as these are in the minds of many readers. If you like what we have said, will you not write us?

Now we have some questions of a more definite character. John A. Hamman of 370 Amory Street, Jamaica Plain, Mass., wants to know the following:

Question: Why is it necessary to have negative or positive rake and sweepback?

Answer: Rake adds efficiency to the wing and therefore is obviously advantageous. This means that greater lift and less resistance will result from it. Due to tip and eddy currents, the wing tip gives considerable resistance when it is not so designed by raking it that the air flow around is smooth or as nearly so as possible. Sweepback is advantageous because it gives greater stability, and, in the case of airplanes when it is used on the upper wing, gives a more unobstructed view to the pilot. A complete description of rake and sweepback is given in the article entitled, "The Aerodynamic Design of the Model Plane," March and April issues, 1932. We will not duplicate here what we have said in these articles.

Question: Why do some ailerons increase in width at the outer ends?

Answer: The pressure on the aileron is greater toward the inner end. Therefore, in order to have the pressure equal over the entire surface, it is necessary to widen the aileron at the outer end to give it more area at this point.

Slipstreams

(Continued from page 29)

to have the model fly at least 300 feet. Then it is not merely the case of how much rubber can be put on the machine, but how efficient the model can be built in regard to streamlining and design, in order that it will attain speed with comparatively small power, the small power being necessary in order that the motor will absorb enough turns to have the model fly the required 300 feet. Such models can be built without difficulty, for this fact has been practically demonstrated many times.

Let us give you a hint regarding twin pushers as speed models. Many builders complain that the model will not fly a straight course but will climb and fall off the climb into a turn. There is just one reason for this and that is, that the elevator or front plane is made without dihedral. If the builders will make their ships with a straight rear wing without dihedral and give the front wing a dihedral of approximately twenty to thirty degrees, on each half wing, they will find that the plane will fly a perfectly straight course. This little "trick" was used as long ago as 1913, with excellent results. At that time your editor had a model which would fly 1200 feet in a perfectly straight course without twenty-five feet deviation either way, provided that there was no wind. Try this some time and see for yourself.

Possibly, readers will have other suggestions regarding the design of speed ships or to the holding of speed contests. If you feel that you have any ideas which might be helpful to other readers, will you not send them for publication to this column?

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The Aerodynamic Design Of The Model Plane

(Continued from page 21)

a motor when the size of the strands used are doubled, a 15% increase in the average torque results. How does this effect the work that can be stored in such a motor? It is increased by 10%; the difference between the percentage decrease in turns and percentage increase in the torque.

We may say therefore, that the larger the strands used in a motor of given cross section area, the more work can be stored in it.

In our next instalment, we will give you some valuable formulas derived from the facts established by the graphs.

Fundamentals Of Model Airplane Building

(Continued from page 41)

strip. Adjust the wings so that the whole machine balances 1" from the leading edge of the lower wing.

Motor

The motor is composed of six strands of 1/8"x1/30" lubricated black or brown rubber. The length of the motor is 13 3/8". This may be made from one strip of rubber 21 inches long with the ends tied together. To put the motor in place, drop the front end of the motor down through the fuselage through the rear opening. A wire may be used to thread it through the fuselage. Loop the three front loops over the front motor hook and the three rear ones over the rear hook.

You may now put the front cowl in place against the underside of the fuselage. When it fits perfectly, force a pin backward through the nose block, R, and into the front bulkhead, 1, of the cowl, as shown in the drawing. Push another pin through the right side of the body into the second bulkhead. It should be long enough to pass through and come out on the other side. Next loop a rubber band around the rear end of one dowel strip, pull it down under the cowl and loop it over the rear end of the other dowel. This pin should be 3/4" long.

After the model is fully assembled, smooth off all surfaces with fine sandpaper. It may be decorated with lacquer. However, it is wise to fill the wood first by applying a coat of dope to all surfaces you wish to paint.

Flying

The model is now ready to test, provided the wings are in the proper place, as mentioned before. Glide it two or three times before winding it up in order to be assured that it has the proper balance and flying angle. You may now wind the rubber motor 425 turns, if it is lubricated and not using a winder. If you use a winder with an S hook at the rear end of the motor, it may be wound 600 turns. This is when the motor is first wound; after several windings fifty more turns may be added safely in each case.

We hope you will follow our advice not to fly this model with more than a very few turns unless it is a wide open space, for it "goes places." It may be hand-launched or started from the ground, as decided. We hope this little ship will afford you a great amount of pleasure.

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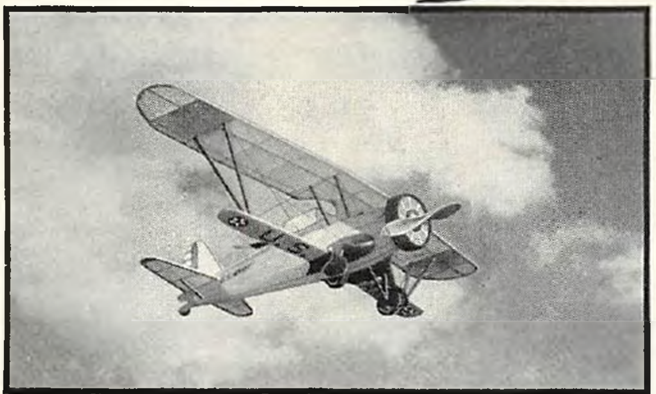

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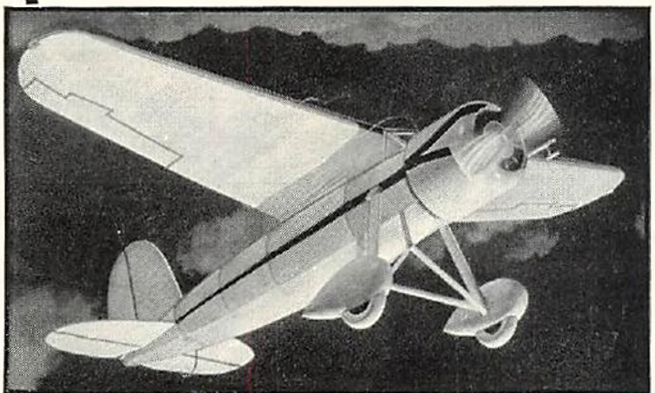

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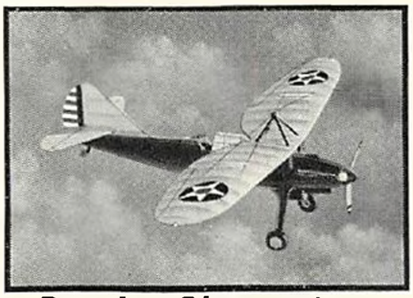

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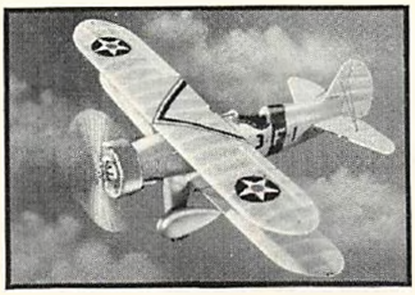

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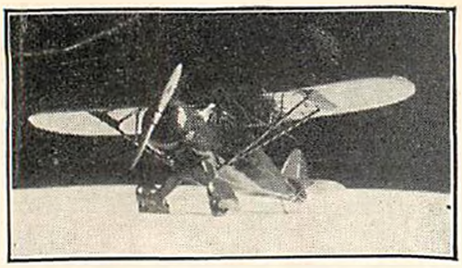

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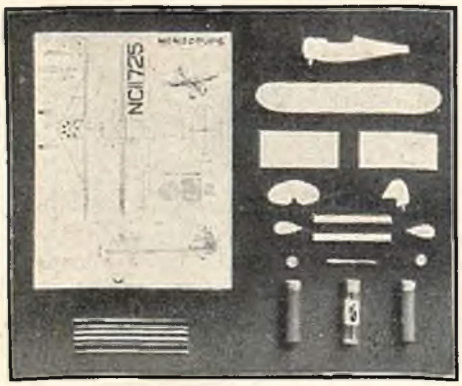

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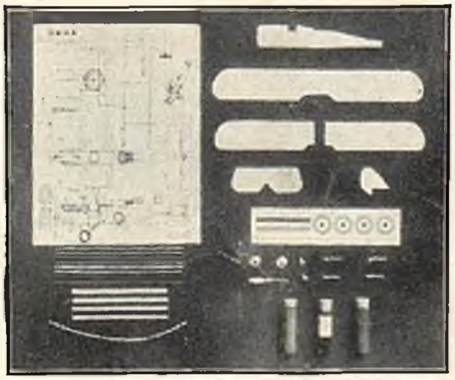

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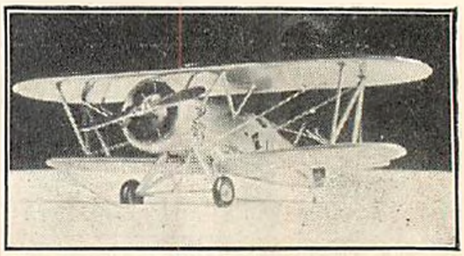

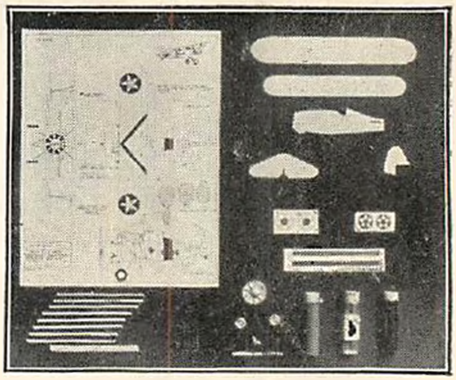

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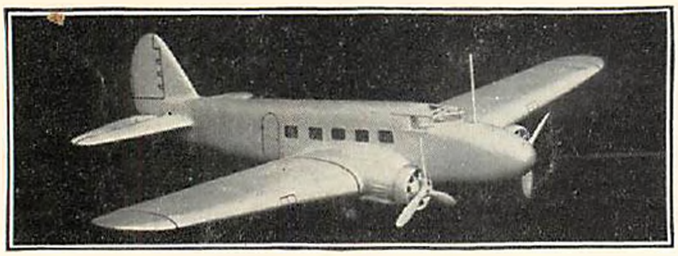

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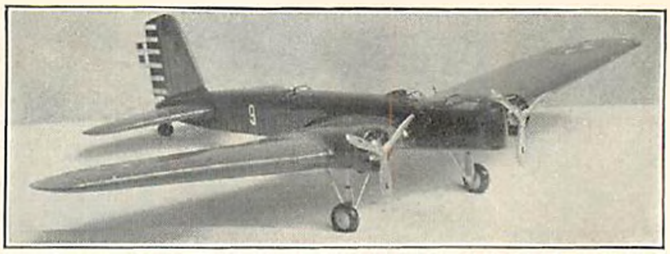

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