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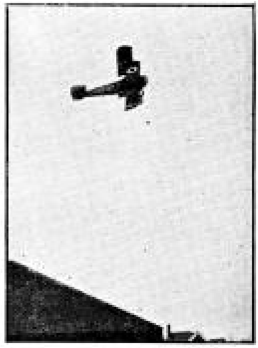
THE SOPWITH DOLPHIN AT THE FRONT. Plane Page No. 10

# Build a War-Time Sopwith Dolphin

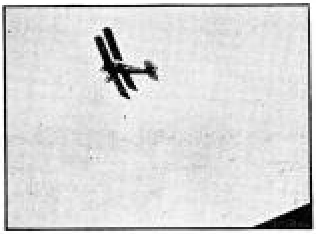
## Complete Instructions and Plans to Build a Carefully Designed Flying Scale Model of One of the Finest Pursuit Ships of the World War

**By Robert Vail Smith**



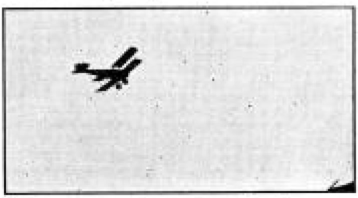
The Model Dolphin immediately after taking off

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



Gaining a little altitude for safety

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



The Model going places in a hurry

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

Coming in after about fifty seconds

### Fuselage

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

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

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

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

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

### Landing Gear

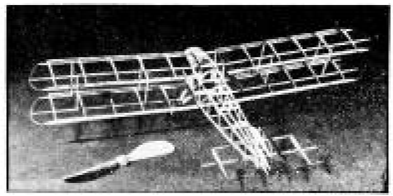
The landing gear is very simple to construct. A right and left set of "V" struts are necessary and are made of ⅛ inch hard balsa, see Plate 9 for details.

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

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

The finished framework ready for the covering
Picture No. 1

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



## Tail and Rudder

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

The Model partially covered. Pict. No. 2

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

This double surfaced empennage is both light and strong.

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

## Propellers

The flying propeller is the most important to make if one desires a flying model. A block which measures ⅝ x 1⅜ x 7¾ inches is first procured and marked as in Plate 2. This block should be of a soft variety. The propeller is carved in the usual manner by cutting out the block as shown by the heavy lines. The blades are then carved. The hub or boss is left on only for looks, and maybe weight if the model needs it.

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

## Wings

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

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

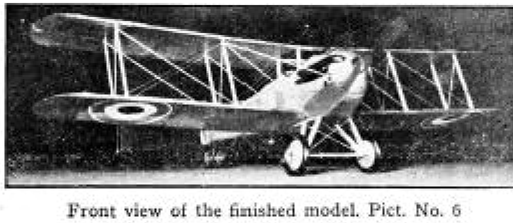
The wing struts are now made, the large inter-plane struts are of 1/16 x 3/16 inch medium balsa while the short cabane struts are of 1/16 x 1/4 inch stock. All of the struts are carefully streamlined so as to lessen the resistance.

## Covering and Final Assembly

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

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

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



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

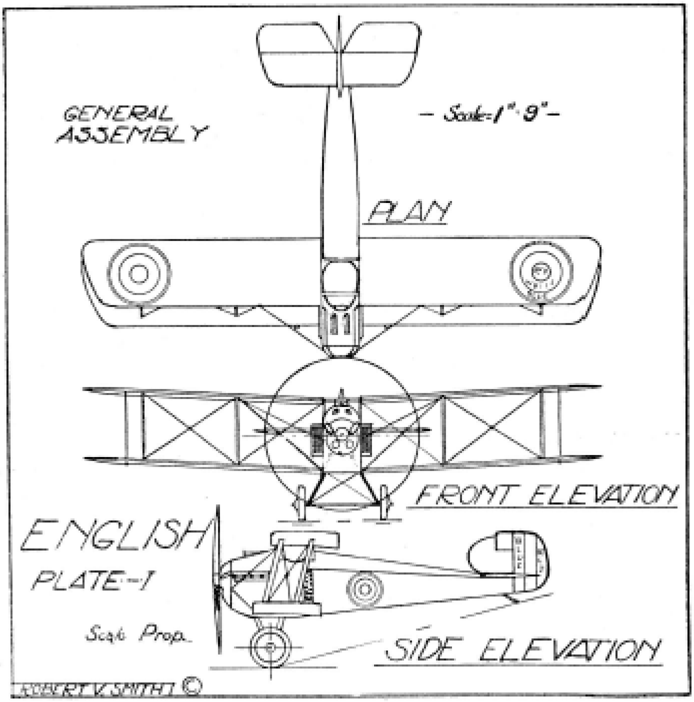
tom is covered and a place is left open for the tail skid arrangement which is seen on Plate 4. There are a number of ways in which to build the tail skid; the most desirable way is described on Plate 4.

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

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

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

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




**SOPWITH DOLPHIN**

**CHARACTERISTICS OF LARGE MACHINE**

| | |
|---|---|
| Hispano Suiza Engine | 200-300 H. P. |
| Gross weight | 1,881 pounds |
| Range (cruising speed) | 230 miles |
| Speed at 6,500 feet altitude | 131.5 M. P. H. |
| Climb to 15,000 feet | 14.7 minutes |
| Ceiling | 23,000 feet |
| Landing speed | 40 M. P. H. |

| | |
|---|---|
| Color schemes (optional) | Colored, dope |
| Yellow and Green | White and Green |
| Orange and Blue | Yellow and Blue |

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

## Miscellaneous Details

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

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

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

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

# AIR—WAYS

(*Continued from page* 41)

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

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

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

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

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

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

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

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

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

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

(*Continued on page* 45)

# Build a War Time Sopwith Dolphin

(*Continued from page* 12)

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

## Flying the "Dolphin"

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

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

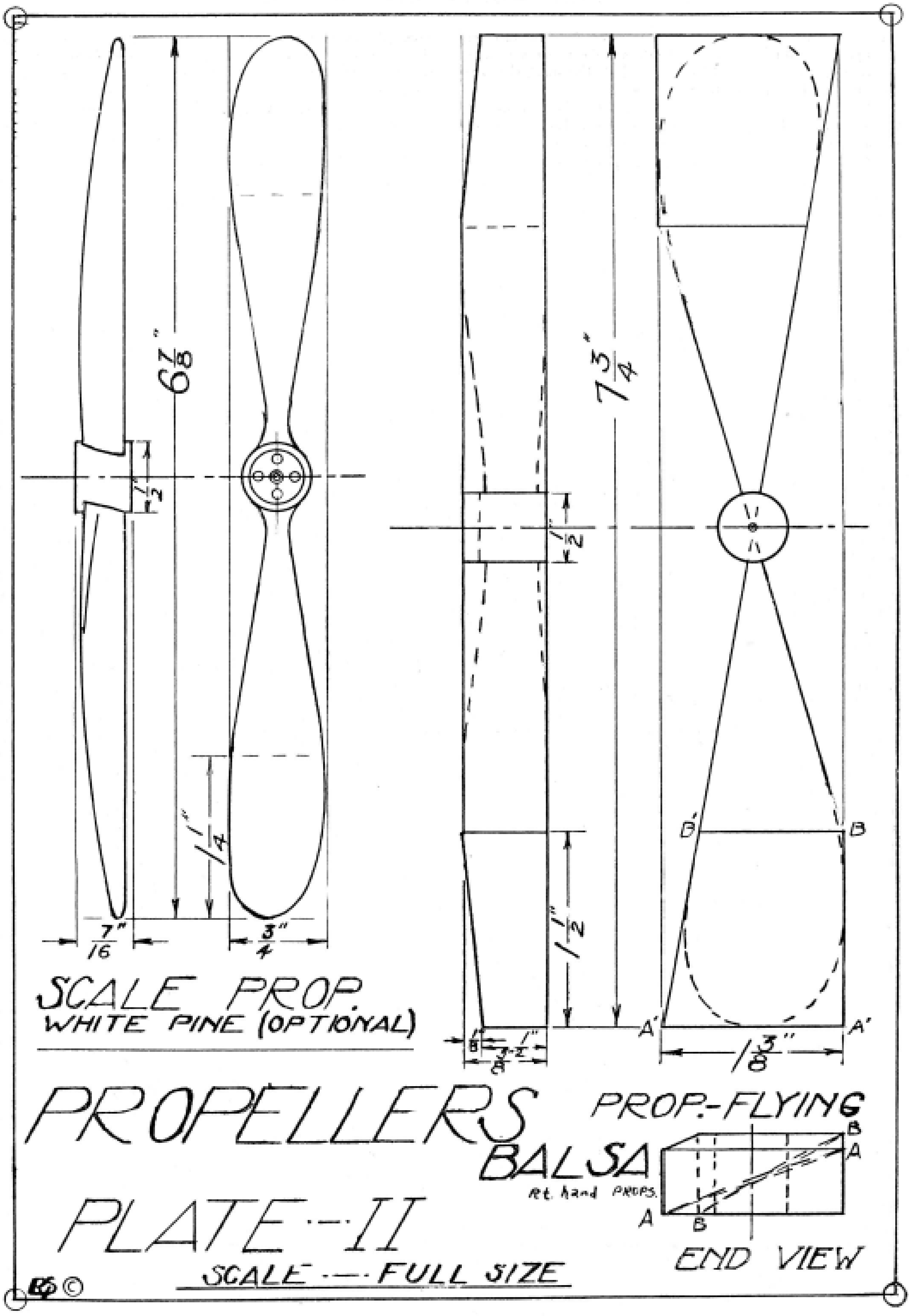
Although the tests were made in cold weather the average duration was approximately sixty seconds. With the advent of warm weather, the duration should be about 25 per cent longer. A long steady climb is characteristic of this model as is also an exceptionally long and flat glide, which are both necessary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

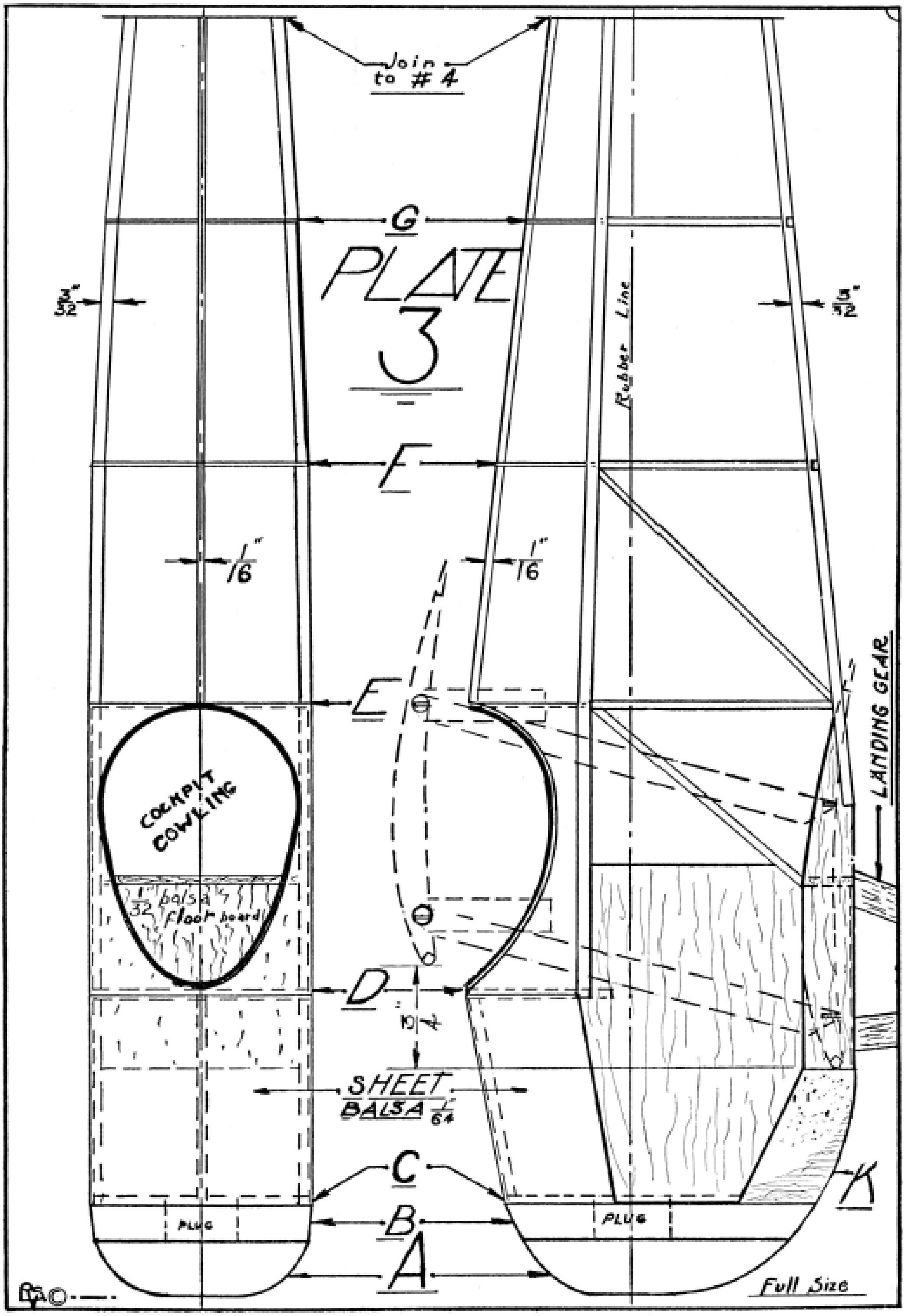
Wind'er up and let'er go—good luck!

# Belgium's Greatest Ace

(*Continued from page* 39)

conquest and he wished it to be a certain one. At about 9,000 feet smoke started


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


Join to #4
G
PLATE 3
3/32"
3/32"
Rubber Line
F
1/16"
1/16"
LANDING GEAR
E
COCKPIT COWLING
1/32" balsa floor board
D
10
SHEET BALSA 1/64
C
K
PLUG
PLUG
B
A
Full Size

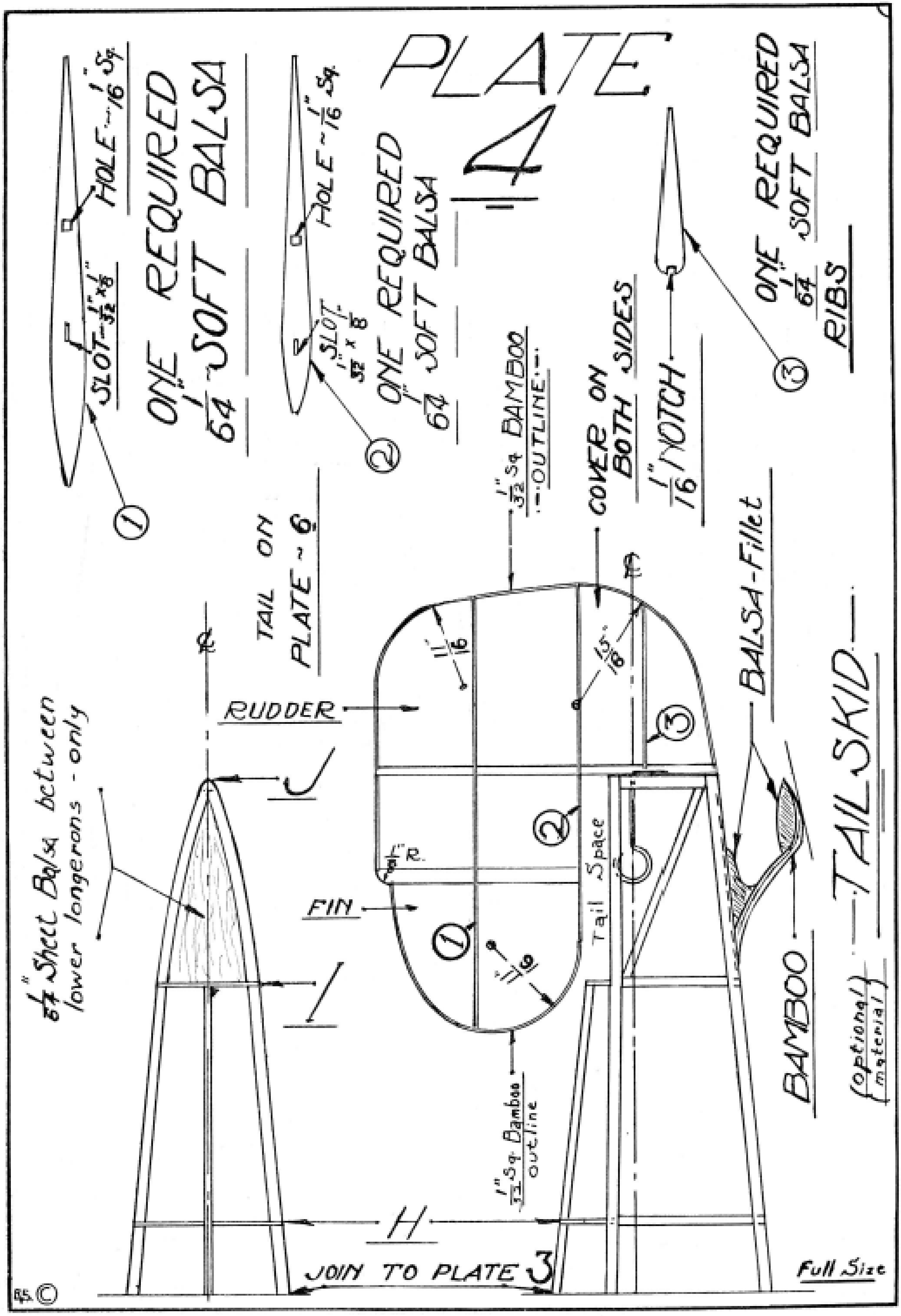
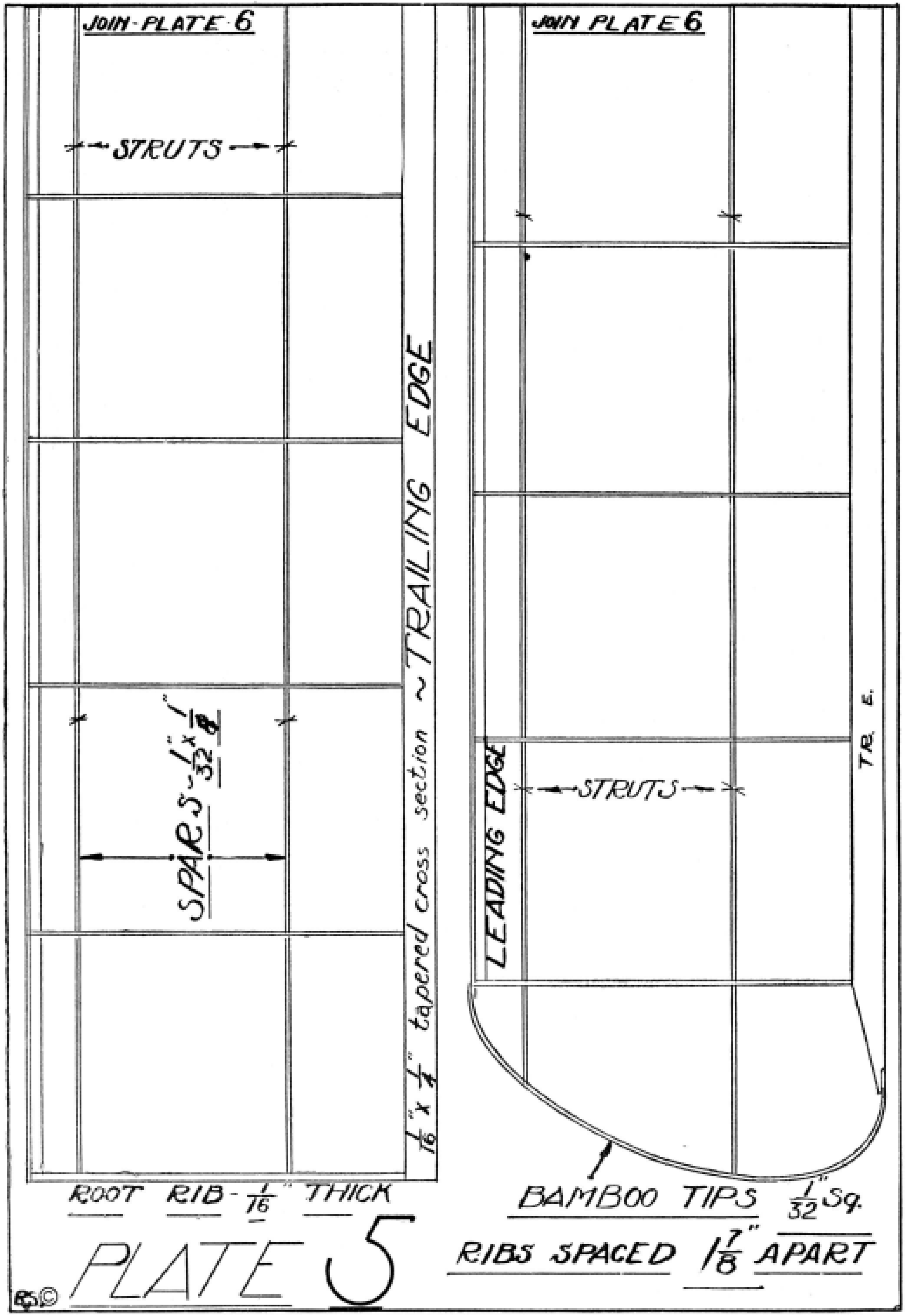


PLATE 4
SLOT - 1/32" x 1/8"
HOLE - 1/16" Sq
ONE REQUIRED 1/64" SOFT BALSA
1
SLOT 1/32" x 1/8"
HOLE - 1/16" Sq
ONE REQUIRED 1/64" SOFT BALSA
2
ONE REQUIRED 1/64" SOFT BALSA RIBS
3
1/32" Sq BAMBOO OUTLINE
COVER ON BOTH SIDES
1/16" NOTCH
TAIL ON PLATE - 6
RUDDER
FIN
11/16"
15/16"
1/8" R.
1/16"
Tail Space
BALSA-Fillet
TAILSKID
BAMBOO
(optional material)
1/32" Sq Bamboo outline
1/64" Sheet Balsa between lower longerons - only
H
JOIN TO PLATE 3
Full Size
B.S. ©


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

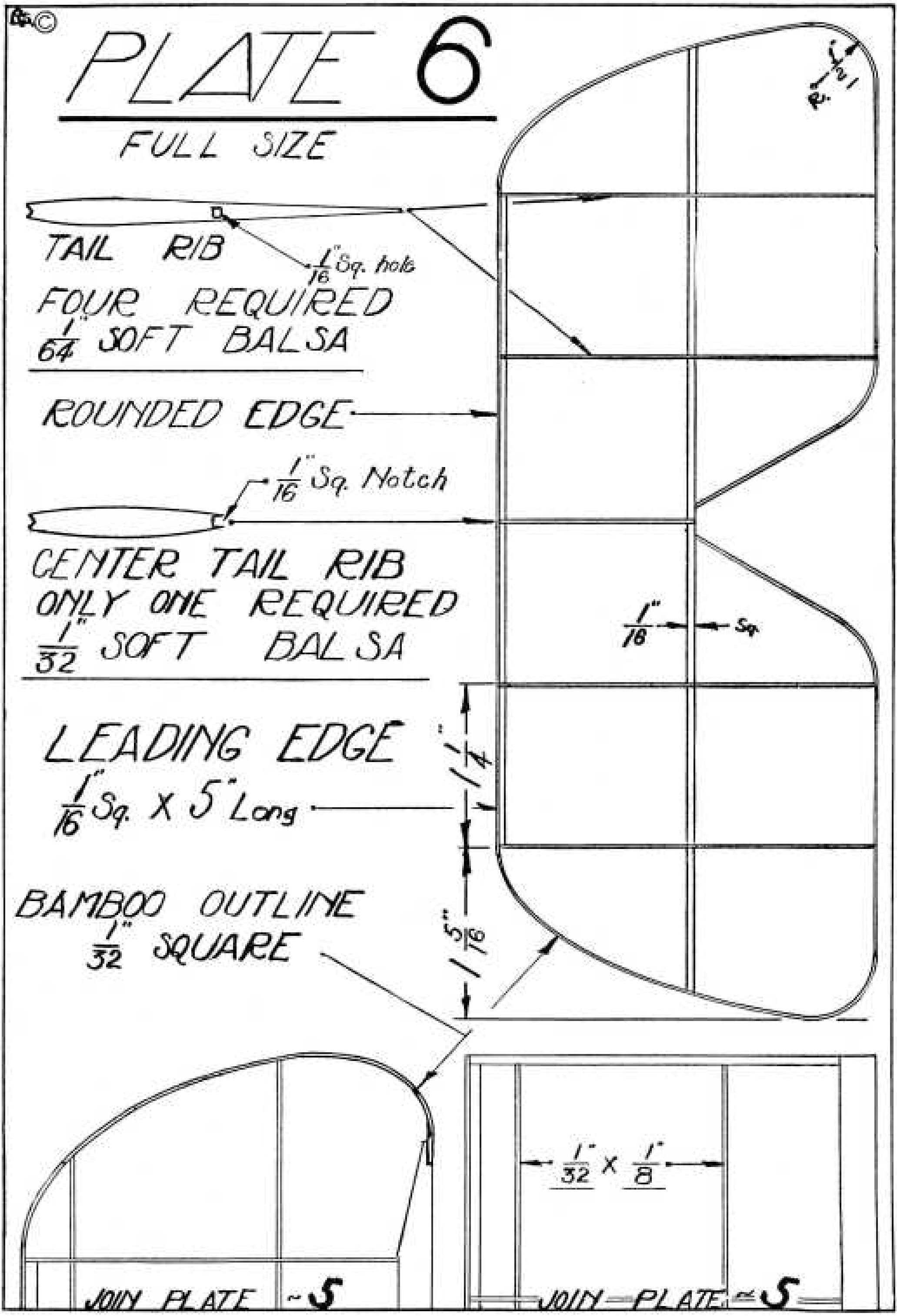
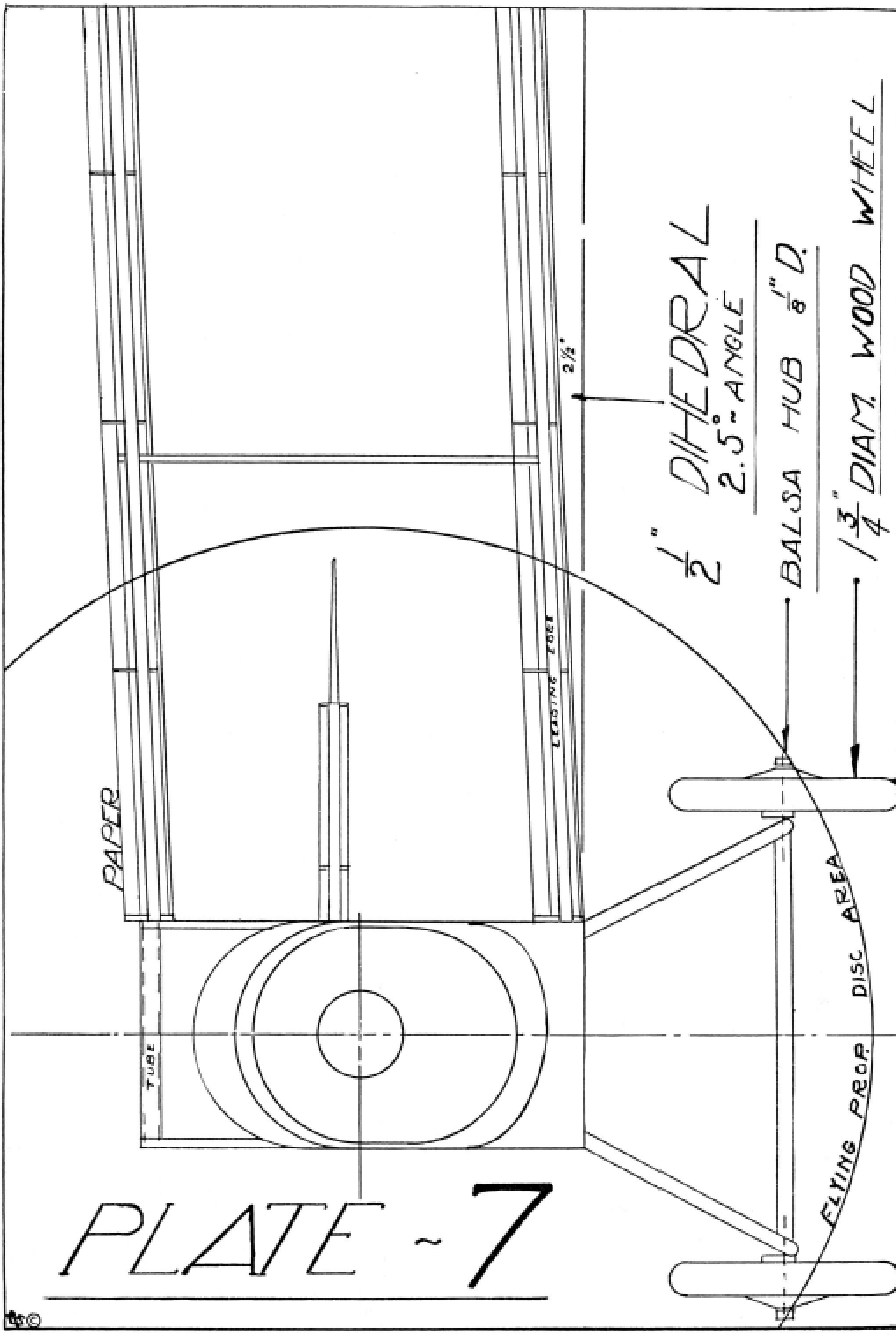
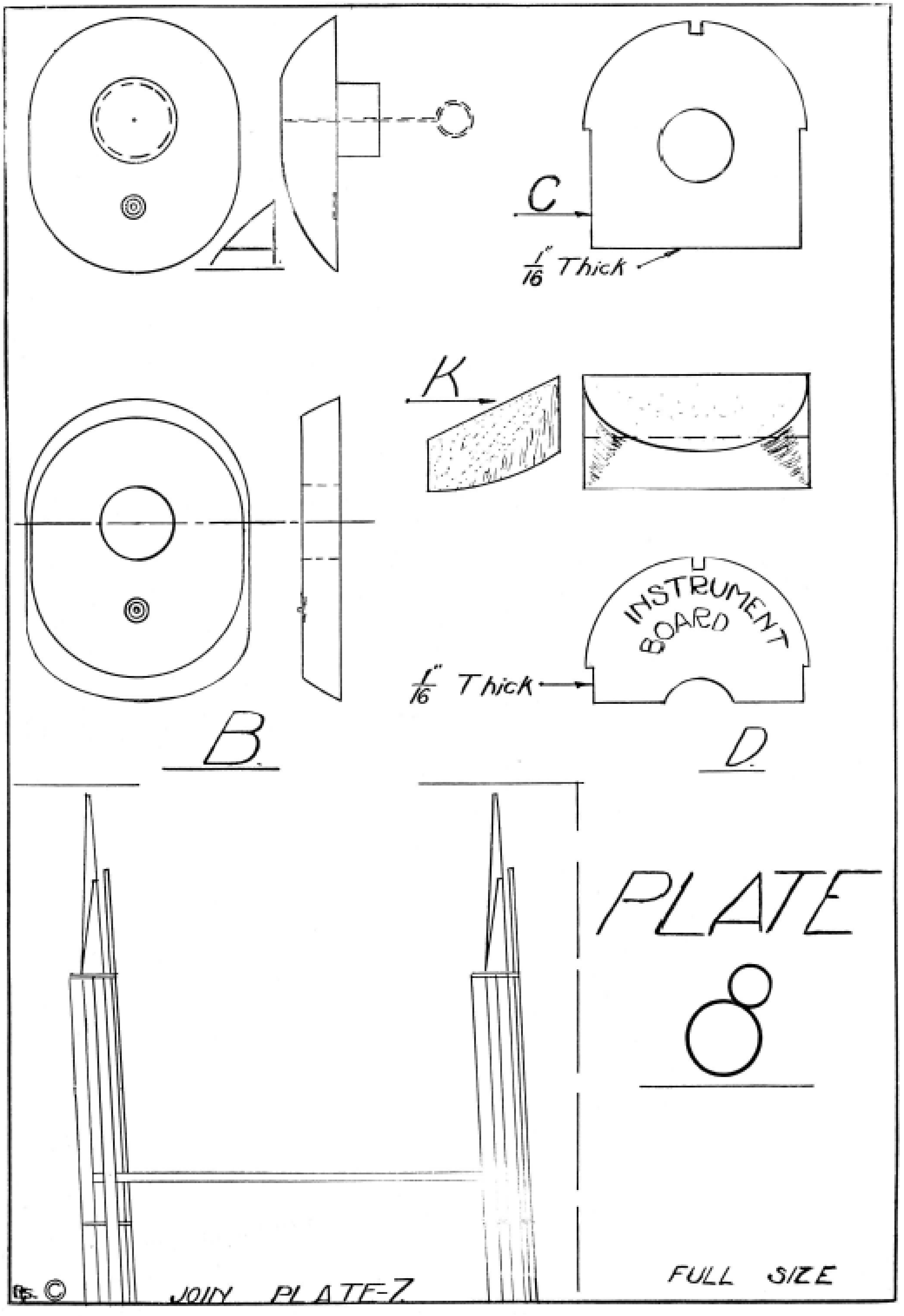
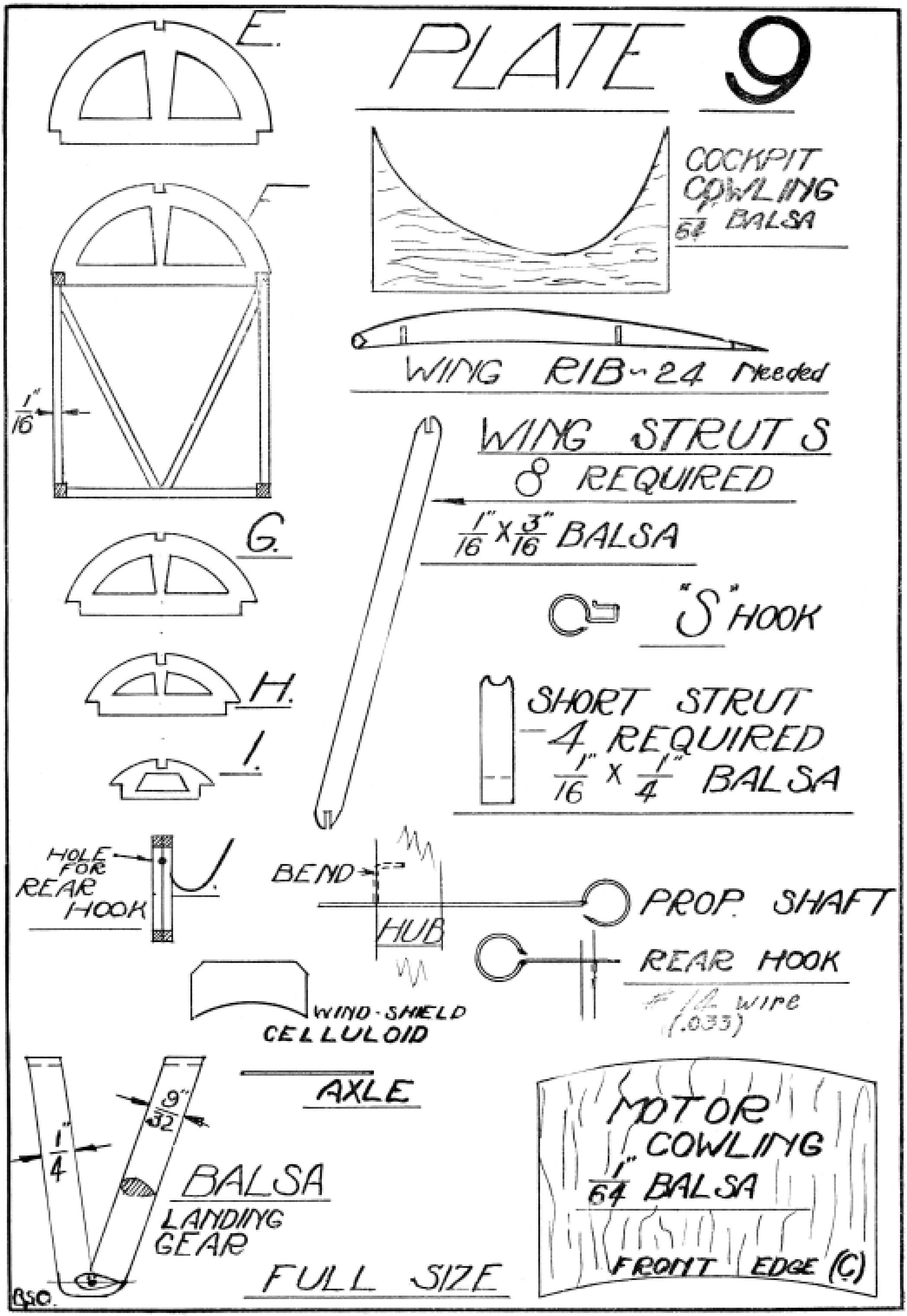


PLATE 6
FULL SIZE
TAIL RIB
1/16" Sq. hole
FOUR REQUIRED
1/64" SOFT BALSA
ROUNDED EDGE
1/16" Sq. Notch
CENTER TAIL RIB
ONLY ONE REQUIRED
1/32" SOFT BALSA
LEADING EDGE
1/16" Sq. X 5" Long
BAMBOO OUTLINE
1/32" SQUARE
R. 1/2"
1/16" Sq.
1 1/4"
1 5/16"
1/32" X 1/8"
JOIN PLATE ~5
JOIN PLATE ~5



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


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


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