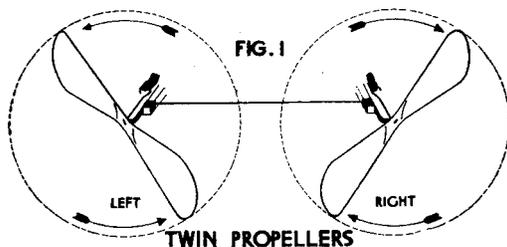


Fundamentals of Model Airplane Building

A Complete Course for Beginners Who Wish to Become Expert. How to Build an All Balsa Twin-Propeller Pusher Model –

Part No. 8

By Edwin T. Hamilton (and Charles M. Grant)



AS OUR eighth airplane model of this series, Mr. Grant has designed the first twin-propeller pusher to appear in this course. As will be noted, we have kept solely to all-balsa models to date and so the one shown here continues that type of plane. This is done as part of a set program, to fully acquaint the beginner with all types of flying models of solid construction before taking him into the more difficult field of built-up construction.

One of the most outstanding features of this model is its exceptional soaring ability which permits it to continue in flight long after normal propulsion by motor has ceased. On test flights, it has

remained in the air over two minutes and flown a distance of two thousand feet.

With these unusual flying qualities, it nevertheless is of such simple construction that the amateur can easily build it. The use of solid balsa wings eliminates the tedious operations of built-up framework, which necessitates a large number of ribs, intricate assembly and the covering of the structure with tissue.

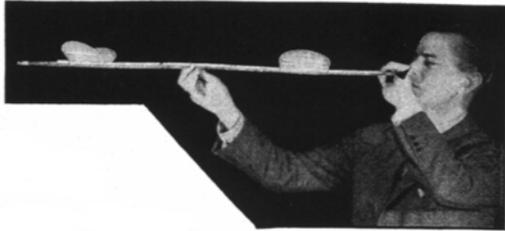
It represents the logical step toward contest models of like type and the beginner should find it a stimulating and interesting building problem without the usual expert workmanship being required. Flying the model will bring its builder experience which will prove not only valuable but absolutely necessary when tackling the launching, flying and handling of contest planes.

It must be kept in mind that the whole worth of this course is to develop the rank amateur into a well grounded, well informed expert. The entire course has been laid out by your editor, Mr. Grant and the writer on this basis. Don't shirk... don't "skip," and you'll find that we have lived up to the usual standards of UNIVERSAL MODEL AIRPLANE NEWS in giving its readers only the best.

A-Frame

In a twin-propeller model of this type, the fuselage is known as the "A-Frame." This is because it is built to the general lines of a capital "A." Such models are often referred to as "twin-stick pushers." They are

essentially outdoor models and have set up some of the finest flight records known in the model airplane field.



This is the best way to launch the twin pusher

Two balsa sticks, measuring 1/4" square and 36" long, form the framework of the fuselage. These are joined together at the front end and spread apart at the rear or trailing end, by wire. Cut two sticks to this size, sandpaper each carefully and test to see that both are exact duplicates.

A miter joint is cut at one end of the sticks, so that when they fit together, the trailing or opposite ends will be exactly 10" apart when measured from outside to outside of the sticks. This can be seen on the plans under "Top View." Lay both sticks in proper position and then cement their front ends together. Before applying the cement, squeeze the front beveled ends together and then measure the distance the rear ends are apart. If they are 10" from outside to outside, or 9 1/2" from inside to inside, the beveled ends may be cemented together. Hold them in place with a model pin or a rubber band until the cement dries.

Four piano wire braces are used to hold the frame in proper form. The two cross braces and the combination cans and center brace are all bent from 1/32" diameter wire,

which is approximately a No. 13 piano wire. The trailing end brace, because of added stress, should be bent from 3/64" wire. This is about a No.21 gauge. If you cannot purchase wire of this diameter, do not use any of less diameter than a No. 16, which is .037".

Bend the two cross braces, as shown in the plan under "Cross Braces." This plan is given full-size except for its length which had to be cut down. It is 7 1/2 " long from bend to bend, as shown. The third bracing wire which is bent to form a "can" on each end, is shown under "Cans" in the plans. This is full-size. Cans are used to keep the rubber in place against the sticks and Mr. Grant has designed this combination brace and can to cut down operations and weight.

The last brace is located at the trailing ends of the sticks. It is bent from a 10" long piece of 3/64" diameter wire. Both of its ends are bent for a distance of 3/8" which leaves 9 1/2" of its length straight. This is shown in the magnifying-glass view in the plans under "Top View."

When all these wires have been bent to shape, they are assembled on the A-frame. The trailing brace should be attached first. As a thread binding is used around its bent ends and the propeller bearings of the model, the latter should be attached at the same time.

Obtain two propeller bearings of good size. These are cemented to the outer sides of the sticks, while the bent ends of the brace are cemented to the inner sides. When

all are in place, bind the bearings and the ends together with thread and apply a thin coat of the cement over the thread for added strength. Note this assembly in the magnified view of the plan under "Top View."

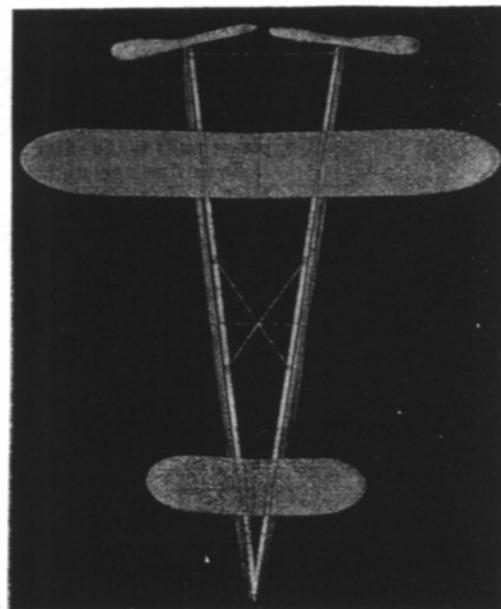
The two cross braces are now cemented in place. Note that their bent trailing ends are lashed to the inner side of the sticks 14 1/2" from the trailing end of the A-frame. Cement and lash the four bent ends of these two braces in place. The brace having the cans on its ends, is located 18" from the trailing end of the assembly and crosses the two cross braces at the point where they cross each other. Mark a point 18" from the trailing end on each stick, pass the bent notch on each end of the brace over the sticks, cement and then bind with thread. Cement is applied over all thread bindings for added strength. Complete the brace assembly by binding all three of these center braces together at the point where they pass each other in the center of the frame.

A nose hook, which is shown in the plans full-size under "Nose Hook," is bent from No. 13 piano wire. This holds the "S" hooks of the motor and at the same time strengthens the nose joint formed by the two sticks. After bending to proper shape, slip it over the joint of the two sticks and cement firmly in place. It is then bound with thread, which is given a thin coat of cement over its top to add strength.

Up to this point we have not spoken of the top or bottom of the stick. As the curved bends in the cans are to hold the rubber strands of the motor, the opened side of

these calls must be the upper side of the frame. The frame is completed by cementing two small blocks on the side of each stick.

These blocks are shown in the plans under "Top View" in the upper left-hand corner. Cut two blocks measuring 1/8" thick, 1/4" wide and 2 1/2" long. Cut two additional blocks 1/16" thick, 1/4" wide and 1" long. The long blocks are cemented on top of the sticks 4" from their leading, or "nose" end, The smaller blocks are then cemented on top of these long ones, with the leading ends of both flush with each other. This completes the A-frame.



The completed all-balsa twin pusher ready to go places

Elevator

The elevator consists of a single sheet of 1/16" balsa with four ribs of the same thickness. Square up a sheet of the balsa to measure 1/16" thick, 3 1/2" wide and 14" long. From each end, measure in 3 1/2" and

layout the curves of the tips. Cut these to proper shape. Finish smooth with sandpaper.

The elevator is now cut through its center into two halves of equal length. Cut four ribs from 1/16" sheet balsa, as shown full-size in the plans under "Elevator Rib." Note their location in the plan under "Elevator." Apply cement to the ribs, bend the elevator carefully to fit their curves and attach them in place. Hold with model pins until the cement has hardened.

The two completed halves are now cemented together with a 1 3/4" dihedral at each tip. When perfectly dry, complete the elevator by carefully sandpapering its entire surface. As rubber bands are used to hold it in place on the A-frame, no metal fittings are required.

Wing

The wing is of the same construction as the elevator. It differs very little from other all balsa wings given for other models in this course. It is made of two pieces of 1/16" sheet balsa. Square up two pieces to measure 1/16" thick, 4 1/2" wide and 16 1/2" long. Measure 4 3/4" from one end of each piece and layout the curve of the wing tip, as shown in the plans. Cut these to shape.

Cut to proper form eight wing ribs from 1/16 " sheet balsa. The rib is shown in the plan full-size under "Wing Rib." Note the location of these ribs in the plan under "Wing." Apply cement to the ribs' curves, carefully bend the sheeting around each, and hold with model pins until

dry and hard.

The two halves are now cemented together to give a 1 3/4" dihedral at each wing tip. When hard, reinforce the joint by cementing leading and trailing edge pieces to the underside of the wing. These measure 1/32" thick, 3/8" wide and 7/8" long, or the distance between the two center ribs. Bend them slightly at their centers and cement them in place between the ribs on the underside of the wing at its leading and trailing edges.

Finish the wing by carefully sandpapering its entire surface to a satin finish. As the wing also, is held by rubber bands to the A-frame, no metal fittings are required in its construction.

Propellers

In the November issue, our first pusher model called for a left-hand propeller, the use, carving and difference of which was fully explained. When two propellers are used on a model, they must be so made as to turn in opposite directions, so that the directional pull of the one will offset that of the other. For this reason, twin propeller units are always made up of one right and one left propeller. On twin propeller pushers such as the one we are building, the propellers are so mounted that each will turn up and out, as shown in Fig. 1. In this view the eye rests on the concave side of the propeller's blades.

All the models having propellers in this course have had right-hand propellers with the exception of last month's model, which was a left-

hand propeller. It will not be necessary, therefore, to repeat carving instructions for the propellers required for this model. From blocks measuring 1 " thick, 1 3/4" wide and 10" long, carve one right-hand and one left-hand propeller. Equip them with propeller shafts bent from 1/32" piano wire, (No. 13). These shafts are shown in the plan full-size under "Propeller Shaft." Complete the assembly by adding two shaft washers to the propeller shafts and then place them in position on their bearings.

Motor

Twin motors for the twin propellers are used on such models as this. Each of these consist of eight strands of 1/8" x 1/30" rubber. As considerable "play" should be allowed for added power, the original length of each motor should be at least 288" long or 24 feet. Tie the ends of each piece together to form a single loop.

From No. 13 piano wire, bend two "S" hooks to shape, as shown in the full-size pattern, in the plans under "S" Hook. Hook one end of each over the nose hook and then pass four loops of the rubber motor over the other ends. Weave the rubber strands through the cans and loop their other ends over the propeller shaft hooks, which completes the motor assembly.

Assembly

With the assembly of the motors completed, we have only to add the

wing; and elevator to our A-frame to complete the job. Both these units are held with rubber bands. Two bands are used for each. Note how this is done in Fig. 2. Locate the trailing edge of the wing 6" from the trailing ends of the sticks and fasten in place on top of the frame with the bands.

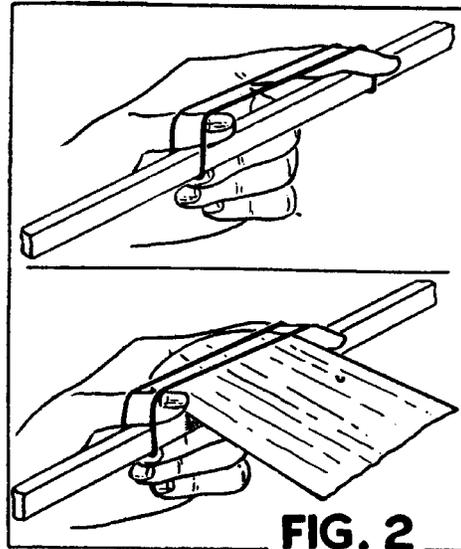


FIG. 2

The elevator has its leading edge resting on the lower of the two frame blocks. 4 1/2" back from the nose. Attach in this position with two bands as shown.

When flying the model, launch it in the manner shown in the photograph. It will be found best to hold the propellers with one hand and steady the model with the other rather than using the old method of "pushing" the model from you with both hands on the propellers,

If more elevation is required, the elevator may be thrust forward until its leading edge is on top of the second and higher elevation blocks.

