

FUGITIVE

Jim Brittain's aerobatic machine utilizes a jig-built plywood fuselage and foam wing.

How about trying something different in building techniques and save money at the same time? The Fugitive will do just that. A .60 powered aerobatic design, the Fugitive features a wrapped plywood fuselage. This is a simple and quick jig type construction, insuring accuracy and building ease. This construction is lightweight, extremely strong and very economical. A good aerobatic airframe must excel in many areas. They must be easy to fly, groove without pitch or roll corrections, and perform well in all types of weather and winds. They must be responsive to controls without being sensitive, and land slowly without any tip stall characteristics. The Fugitive does all of these second to none.

Many competition designs weigh from 9 to 10 pounds, thus requiring extremely high powered engines and exotic fuels to pull them through the power maneuvers in the Class "D" pattern. The Fugitive weighs in at 7¼ to 7¾ pounds.

In October 1968, RCM published an article (Cunningham on R/C) using 1/32" plywood for fabricating a fuselage. I applied this technique to one of my own designs with good results; yet the construction technique left much to be desired. After several years and five different aircraft designs, I have most of the construction problems solved. By using my method (a male type building jig) you can build a perfectly aligned fuselage with very little cost, time, or effort.

Don't let the idea of building a jig scare or discourage you. This jig can be constructed quickly and easily from most any material you have in your shop, 3/4" pine, which is easy to work with and very economical. If you have access to a table saw, this jig can be built in an hour. It can also be used to build a number of fuselages easily modified for different designs. Adjustable bulkhead stations, and clamp arrangements to hold the bulkheads in place, may be incorporated into the jig, but the one I describe is easy to build and use.

If you have decided to give the Fugitive a try, you will not only be satisfied with its flying characteristics, but you may become hooked on plywood as a building product, too. Your flying "buddies" will think it's fiberglass, or plastic but never will they believe it's plywood! So much for the selling job, now let's proceed with the construction. See your local hobby dealer, or order your 1/32" plywood in sheets of 12" x 48" or 48" x 48", from Sig Manufacturing Co. Pick up some scrap 3/4" pine and proceed with the building jig. The only requirement for the jig is to properly space the bulkhead stations and tail post. Make sure the stations are large enough to secure wood screws into, but are smaller than the bulkheads so they do not interfere with the wrapping process. After the jig is completed, transfer the center line and thrust line to each bulkhead station. Do this job carefully as this is the only way to align each bulkhead. Cut two braces 3/4" x 3/4" x 25" long. These will be used to hold the aft section to the proper shape.

If you have all the materials handy, let's begin. You can build this entire fuselage in one evening without additional help. Cut out the bulkheads from 3/32" plywood. Use 1/4" plywood for the firewall, employing a jig or coping saw for this job. Drill all holes at this time (later may be too late), and also mark the centerline and thrust line on each bulkhead. Cut the fuselage outline from the sheet of 1/32" plywood, using a pair of good scissors. If you don't have an understanding wife, use a common Stanley utility knife for the job.

If you are using 12" wide material, it will be too narrow at the front end, but don't let this slow you up. You can patch in these areas after the fuselage is removed from the jig. Draw a centerline on the outside of the plywood skin and drill or cut a 1/4" hole, as shown on the plans, to limit the splitting of the skin. Due to the short radius at the tail, the plywood skin will crack but should cause no problem as this area will be cut away when the vertical fin is installed.

Cut out the fuselage side doublers from 3/32" balsa. Mark the thrust line on the inside so it can be transferred to the outside of the completed fuselage. Cut this doubler with care as it will be used as the guide for trimming the plywood after it's wrapped.

Attach the bulkheads to the jig in their proper locations, using the centerline and thrust line to locate them both horizontally and vertically. Wood screw them into place using two screws per bulkhead. Keep in mind that the wood screws will not be removed until after the fuselage is wrapped.

When you are satisfied that the bulkheads are in proper position and alignment, attach the fuselage doublers with five minute epoxy. Remember the thrust line goes to the inside. Attach the 1/2" balsa tail post to the jig with straight pins. Now you are ready for the wrapping process. The idea here is to wrap and glue the plywood skin around the building jig. Take a wet sponge and wet down the 1/32" plywood skin along the centerline about 4" wide. Repeat this process two or three times or until the plywood begins to curl a little. Lay the plywood skin on top of the jig and slowly bend it around the bulkheads using one hand to form it around the tail post. Let it relax a time or two. Mix up a small batch of five minute epoxy and apply it to the balsa tail post and to the top of bulkheads "D" and "E", lay the plywood back on the jig and clamp it to the tail post using clothes pins or clamps. Use one hand to hold the skin to the bulkheads and the other hand between bulkhead "E" and the tail post to shape the rear section. After the epoxy is dry, rubber band the two 3/4" x 3/4" x 25" long braces between bulkhead "E" and the tail post to keep the rear section in shape.

Take a coffee break and then coat the balsa doublers liberally with five minute epoxy, or slow drying epoxy, press the plywood skin to the doublers and hold them together with clamps, clothes pins, rubber bands, and two hands until dry. If you use five minute epoxy for this job you may want to do one side at a time, due to the fast curing time. If you don't, you will be required to be swift of hand to get all the clamps in place before the stuff sets up.

After everything is dry, remove all the clamps and wood screws securing the bulkheads to the building jig. This may require an extra long screwdriver and a few four letter words to remove the screws. Remove the fuselage from the building jig by prying up on the firewall and tail post at the same time. The fuselage should come straight up with very little pressure, if it does not, check for forgotten screws. Complete the fuselage by adding the 1/4" x 1/4" longerons and cross braces. Now trim the excess plywood away using the balsa doubler and the longerons as a guide. Install the 3/32" x 3/4" fuselage stiffeners, 3/32" balsa doubler for the horizontal stabilizer, and 1/32" plywood rear fuselage bottom. Move to the front and install the 3/8" balsa side doublers, plywood tank floor, and 3/32" plywood wing cut-out stiffeners. Fit the fuel tank, install the NyRod for the steering cable, and flex cable housing for the engine speed control.

Install the motor mount with engine, cut the 1/2" balsa top block and glue to the fuselage, laminate the 1/2" sheet balsa to form the canopy, block in around the engine, fit the 1/16" plywood bottom to the front of the fuselage but do not glue in place until the nose wheel retract is checked and the wing is installed and aligned.

The following instructions highlight the assembly sequence without detailing all the techniques. Most of you who will build the Fugitive have very definite building habits, so if you don't like my way, try your own approach.

Cut out the vertical stabilizer parts and glue together. Tack glue the rudder only so it can be cut apart after sanding to final shape. Build up the horizontal stabilizer as shown. Transfer the thrust line to the outside of the fuselage and extend it all the way to the tail post. Cut a hole through the fuselage to the size and shape of the stabilizer. Now, install the horizontal stabilizer. Build, then sand the elevators to shape. Note: the elevator pushrod is installed at the same time the elevators are hinged to the horizontal stabilizer.

Cut a slot in the top of the fuselage in which to slide the vertical fin, then glue to the horizontal stab and to the plywood around the slot. If you are careful when you cut the slot for the fin, the plywood will form a neat fairing between the vertical fin and the horizontal stab.

Sheet the foam wing cores with 1/16" soft balsa. Also, line the wheel well cut-outs with 1/16" balsa. Lay out the aileron shape on top of the sheeted wing, allowing for the 1/4" balsa facing on the wing and aileron. Cut the aileron away from the wing by running it through a jig saw. Trim off the extra 1/2" from the aileron and install the balsa facing.

Drill a hole for the 3/4" wood dowel through the wing in the location for the wing hold-down screws, then epoxy the dowel into the wing as shown on the plans. Next, drill a 1/4" hole through the dowels for the wing hold-down screws. Cut the dihedral brace from 3/32" plywood and glue the wing halves together using the dihedral brace as a guide.

Fit the wing to the saddle and check for 0° incidence, using the thrust line along the fuselage to achieve the proper alignment. When you are satisfied with the wing alignment, drill holes through the leading edge for the dowels. Also, drill the holes for the 1/4-20 wing hold-down screws into the hardwood block.

I am going to leave the choice of a finish up to you, but I want you to keep two things in mind: first, the fuselage does not need any type of covering material and very little filler is required. Secondly, the finish on any aircraft can vary a full pound depending on the type used and the amount applied. A good rule of thumb is to use more sandpaper and less filler.

If you are hooked on the Brittain method of building and would like another project, I do have a scaled down version of the Fugitive, a .40 powered aircraft and, for lack of a better name, we will call it the Fugitive Jr.

I also have a high performance aerobatic .60 powered biplane using the plywood fuselage construction. If this article is successful, Uncle Don may publish the Fugitive Jr. and the Biplane in a future issue of RCM.

Good luck and good flying! □

CUTTING FOAM WING CORES

FUGITIVE

Designed By: Jim Brittain

TYPE AIRCRAFT

Pattern — General Sport

WINGSPAN

62½ Inches

WING CHORD

10⅞ Inches

TOTAL WING AREA

677 Square Inches

WING LOCATION

Low Wing

AIRFOIL

Symmetrical Root

Semi-Symmetrical Tip

WING PLANFORM

Double Taper

DIHEDRAL, EACH TIP

1 Inch

O.A. FUSELAGE LENGTH

51 Inches

RADIO COMPARTMENT AREA

(L) 13" X (W) 3" X (H) 3"

STABILIZER SPAN

25 Inches

STABILIZER CHORD (incl. elev.)

6¾ Inches (Avg.)

STABILIZER AREA

168 Square Inches

STAB AIRFOIL SECTION

Symmetrical

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

5½ Inches

VERTICAL FIN WIDTH (incl. rudder)

7½" (Avg.)

REC. ENGINE SIZE

.60 cu. in.

FUEL TANK SIZE

14 ounces

LANDING GEAR

Tricycle

REC. NO. OF CHANNELS

5

CONTROL FUNCTIONS

Rud., Elev., Ail., Throt., Retr.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa, Ply, Foam
Empennage	Balsa and Foam
Weight Ready-To-Fly	116-124 Oz.
Wing Loading	24.6-26.3 Oz./Sq. Ft.

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