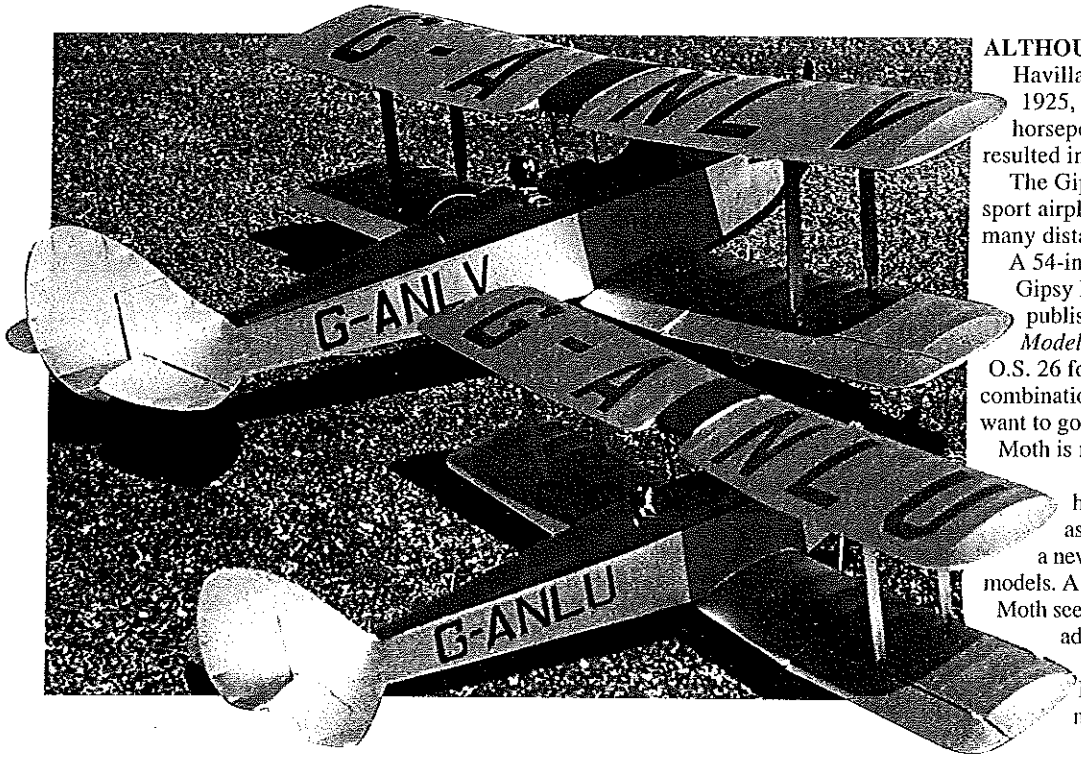
#901

GIPSY MOTH

■ Frank Baker

Add this ½A version of the popular 1930s British sport airplane to your model fleet



The author has built this design in two sizes. His O.S. .26-powered version poses with its ½A Norvel-powered little brother. Note long tail moment arm.

ALTHOUGH THE DESIGN of the de Havilland D.H.60 Moth dates back to 1925, the introduction of the 100-horsepower Gipsy engine in 1928 resulted in the D.H.60G Gipsy Moth.

The Gipsy Moth was a very popular sport airplane during the early 1930s, and many distance records were set in it.

A 54-inch-span Radio Control (RC) Gipsy Moth construction article was published in the September 1994 *Model Aviation*. It was powered by an O.S. 26 four-stroke. This was an ideal combination of model and engine. When I want to go out and fly for fun, the Gipsy Moth is my favorite model.

The advent of ½A engines that have reliable throttle control, such as the Norvel series, has opened up a new dimension to flying small models. A smaller version of the Gipsy Moth seemed to be just the model to take advantage of this new dimension.

The 32-inch-wingspan Gipsy Moth is a replica of the earlier model.

CONSTRUCTION

As is the case with all small RC models, weight has a direct impact on performance.

Use the lightest balsa that is consistent with the strength of the component under construction. And sand all balsa sheets before cutting out parts.

Begin construction with the wings; they will be fitted to the fuselage before the model is completed.

The plans show that the two main wing spars are ⅛ x ¼ spruce; however, basswood or hard balsa could be substituted. The plans show one size of wing rib, even though there are ribs of different lengths.

In the tapered sections of the wings, cut the rear part of the standard ribs to the lengths shown on the plan and glue them in.

After removing the wing from the building board, sand the ribs until they conform to the ¾ trailing-edge stock. However, do not thin the wing rib; the maximum height of all ribs should be the same.

Each wing is actually a three-piece assembly, with two outer panels and a center-section composed of a short spar and dihedral braces.

At the front of the lower-wing front spar, the dihedral brace has a rectangular section that sticks out above the top of the front spar; this serves as the rear of the three-layer plywood main landing-gear retainer.

The Sullivan #507 tube and cable for aileron control should be installed after the lower wing halves and center-section have been joined. Check the cable and the ailerons for freedom of movement.

The two root wing ribs should be in place, but should not be glued until the bottom wing has been installed on the fuselage.

The brass shim stock wing-strut fittings are designed so that they are folded around the wing spar, then soldered along the top edge, and the tab is bent up 90° to the spar. Pay attention to which fitting goes on which spar; there are different fittings for the front and rear spar.

Once the fittings are installed, glue in the pieces of sheet balsa that surround the vertical tab. The balsa provides a place to attach the covering material.

On the full-size Gipsy Moth, the center-section of the top wing contains the gas tank.

After the dihedral braces have been glued to the center-section spars, the top outer wing panels can be attached. Glue the four large center-section ribs in place, and sheet with 1/32 balsa. Lengths of thread could be glued on, to simulate the tank's corrugated metal.

Install the four top wing-strut fittings with the tabs facing down and pieces of sheeting glued around each one.

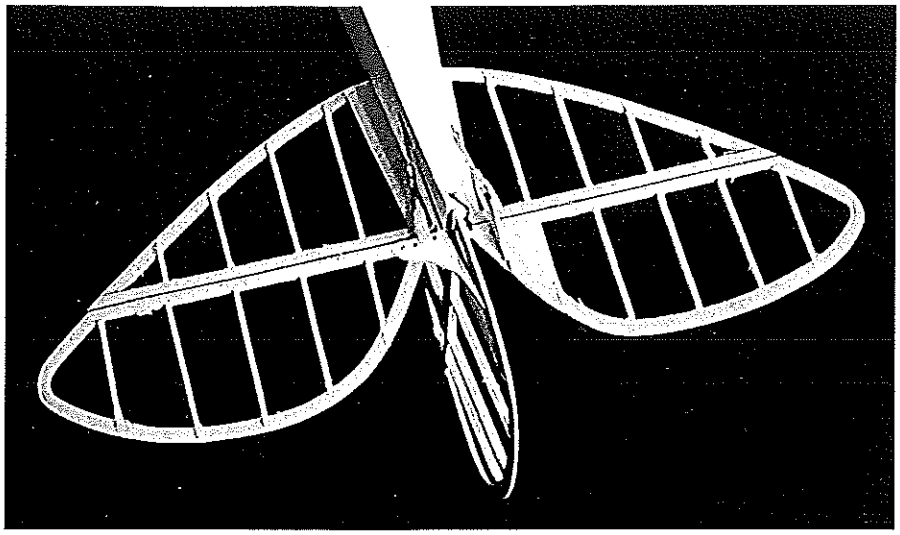
Do not install the cabane strut retainers at this time.

Set the wings aside for now.

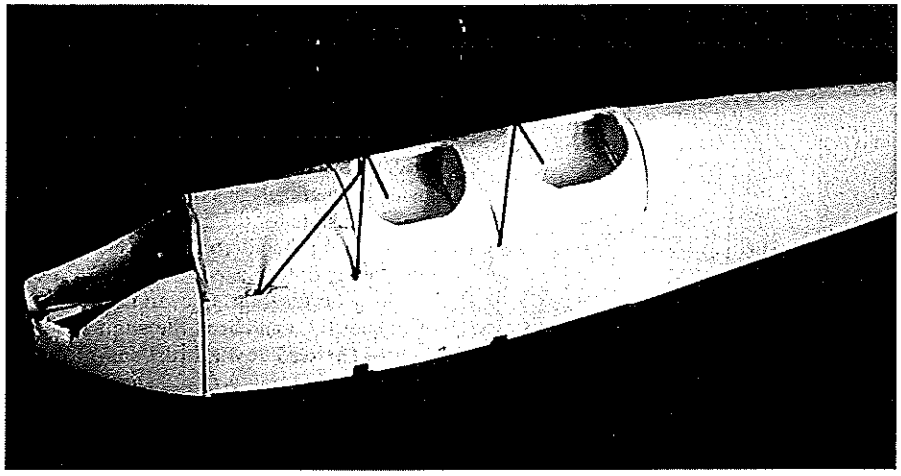
Fuselage: Cut formers F1 and F2 from ⅛ plywood, and use epoxy to install the ¼ x ⅜ hardwood engine mounts in these formers.

The Cox Tee Dee .049 and Norvel .061 share mounting-bolt hole patterns,

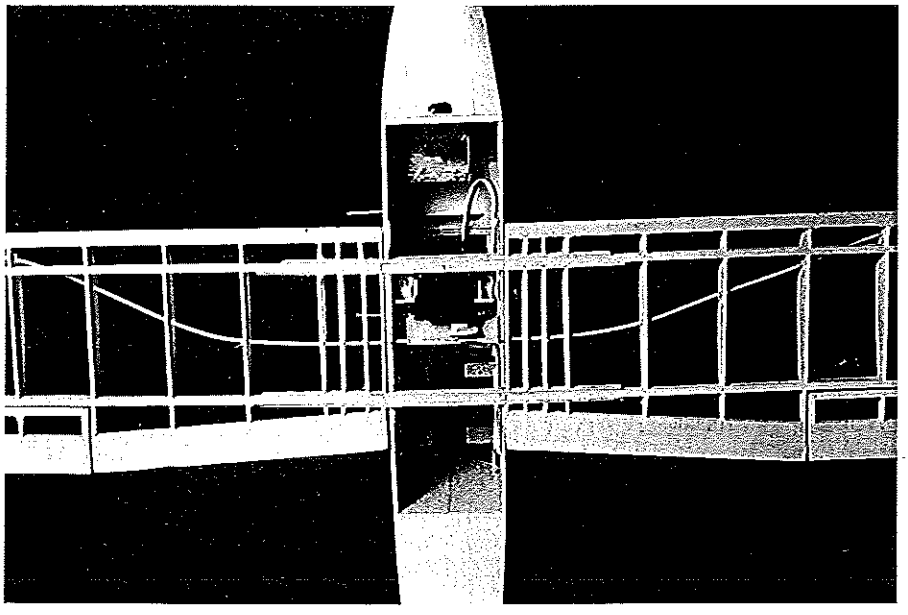
Photos courtesy the author Graphic Design by Carla Kunz



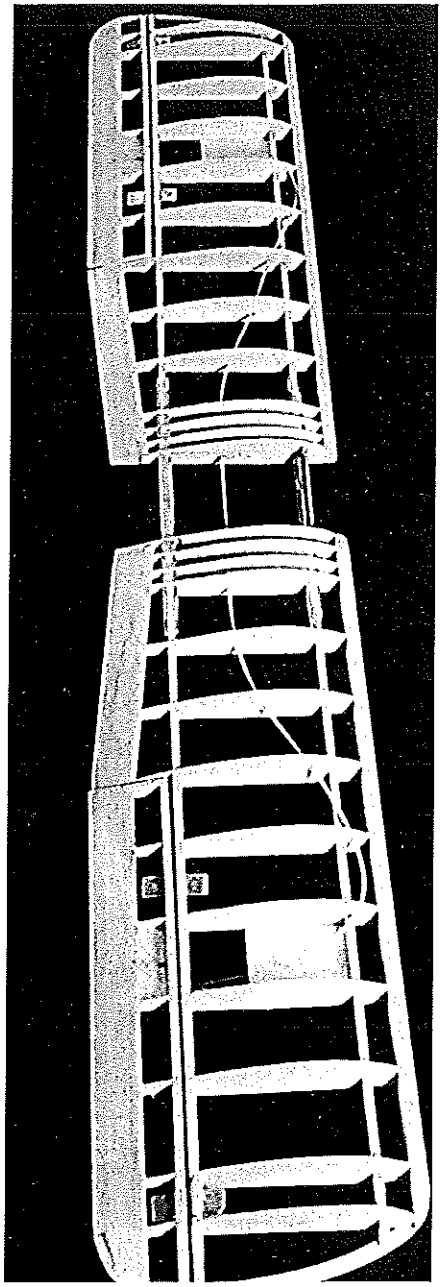
The Gipsy Moth has a distinctive tail shape. The rudder and elevator control horns are made from 1/16 plywood, but they accept the normal nylon clevis.



With the cabane struts installed, the fuselage turtledeck can be sheeted and the cockpit openings crafted. The real Moth character emerges at this point.



In this view, you can see how the lower wing center-section spars fit into the slots in the bottom of the fuselage. Plenty of radio equipment room here!



The bottom wing is built on the spars in halves. The first rib on either side is left unglued until after assembly.

Gipsy Moth

Type: RC Sport Scale

Wingspan: 31 inches

Engine: Norvel ½A

Functions: Rudder, elevator, aileron

Construction: Balsa and plywood

Covering: Heat-shrink film

so the engines can be easily interchanged. Drill the engine mounts for 3-48 bolts, and install blind nuts in the beams.

I like to make metal tanks for my models, because they can be custom-fitted to the confines of the individual model. Cut the tank from K&S #524 tin sheet, using the pattern shown on the plan.

Fold up the left and right ends and solder the overlap, but leave the sides down for now.

I use ⅛-inch soft copper tubing for the fuel line and vents. Mount the engine on the beams, and decide how far the tubing will extend into the engine compartment. Cut one long and one short vent line and the fuel line, then solder them into the tank.

Fold up the sides, and finish soldering the tank. Be sure to pressure-test the tank for leaks at this time.

Drill the holes in F2, and slide the tank on. Use epoxy to hold the tank to the firewall, and seal the space around the tubes.

Use contact cement to glue the 1/64 plywood doublers to the 1/16-sheet-balsa fuselage sides. Cut the fuselage sides to the shape shown on the plans.

Glue the 1/32 plywood tripler to the inside of the fuselage sides, then cut the ¼-inch-high slots for the bottom wing spars and a slot for the aileron tube and cable into the lower fuselage.

Glue the fuselage sides to the outside of former F2, and check the engine mounts for zero down-thrust and zero side-thrust.

Install former F5, and pin a piece of ⅛ square plywood at the tail post. Check that the fuselage sides meet properly at the tail post, and are not twisted.

Once the glue on F5 has set, glue in F6-F9; do not sheet the turtledeck or the bottom of the fuselage at this time.

Bend the front cabane strut from 1/16 music wire, and cut the plywood pieces for F3 approximately ⅛-inch oversize.

Lay the cabane strut in the slot cut in the 1/16 plywood, coat both sides with epoxy, and clamp on the 1/32 plywood. Be sure that the struts are parallel to the axis of the plywood sandwich.

Use your Dremel™ saw to trim the plywood sandwich to the shape of former F3, and glue the former to the fuselage sides.

Bend the diagonal cabane support from 1/16 music wire, and cut the three plywood pieces that form the support plate. Put the wire in the slot in the 1/16 plywood, and glue on the top and bottom sheets. The wire need not be rigid in the sandwich.

Lay the plate across the top of the fuselage and bend the ends of the diagonal wire to match the front cabane strut.

The bottom ends of both struts extend roughly 1/16-inch beyond the sides of the fuselage. Once fitted, glue the plate to the top of the fuselage, use fine wire to wrap the tops of the diagonal struts to the front cabane strut, and solder them.

Make the aileron servo plate from 1/32 plywood, and slip it in the fuselage. Hold the lower wing in the spar slots, and lay the aileron servo in. Adjust the servo-mounting plate until the aileron servo is in the proper position to drive the cable, and can be concealed by the hatch cover.

Glue the aileron servo plate and the two ⅛ square supports in place.

The lower wing can be removed for now, and the fuselage can be set aside.

Empennage: The rudder and elevator are built flat on the building board.

Cut all the ribs from 1/20 x ⅛ balsa, and cut the 1/16 x ¼ slots for the leading and trailing edges.

Use scraps of 1/32 balsa to hold the ¼-inch outlines at the centerline of the ribs, and glue in the ribs.

The hinges are made from .005-inch frosted Mylar™, which you can purchase at a local art-supply house.

Use an X-Acto™ knife to cut slits in the spars, and slip in the Mylar™ strips. Once positioned, a drop of cyanoacrylate (CyA) on the frosted side will hold the hinges in place.

Wait until the covering is completed to glue the hinges.

Sand the rudder and elevator ribs to a symmetrical airfoil. The rudder and elevator control horns are cut from 1/16 plywood.

Glue the elevator assembly to the fuselage, and make sure that the rear elevator spar that rotates is in front of the rear post of the vertical fin.

Remove the ⅛ square stock that was pinned in when the fuselage was assembled, and replace it with the post of the vertical fin.

Installing Servos: An annoying problem is that servos from different manufacturers rotate in different directions.

Therefore, it is imperative to check servo rotation before installing the control tubes and cables, to learn the direction of the control surface motion for a given transmitter input.

In this model, you can use double-stick servo tape to hold the servos in place. Be sure that the servo wheels are spaced away from the fuselage sides.

Install the Sullivan #507 tubes and cables, with a 1/32 wire Z-bend soldered to the cable at the servo end and a quick link at the control-surface end. Be sure all control surfaces are in neutral when soldering the cables.

Install the throttle servo, and run the nylon tube through holes in F3 and F2.

You will have to install the throttle arm on the Novel .061 so that it points up (rather than down). Do this carefully; the throttle barrel rides on a screw thread; it is possible to lock the barrel in one position, and it is tough to get free.

Solder a Z-bend piece of 1/32 music wire

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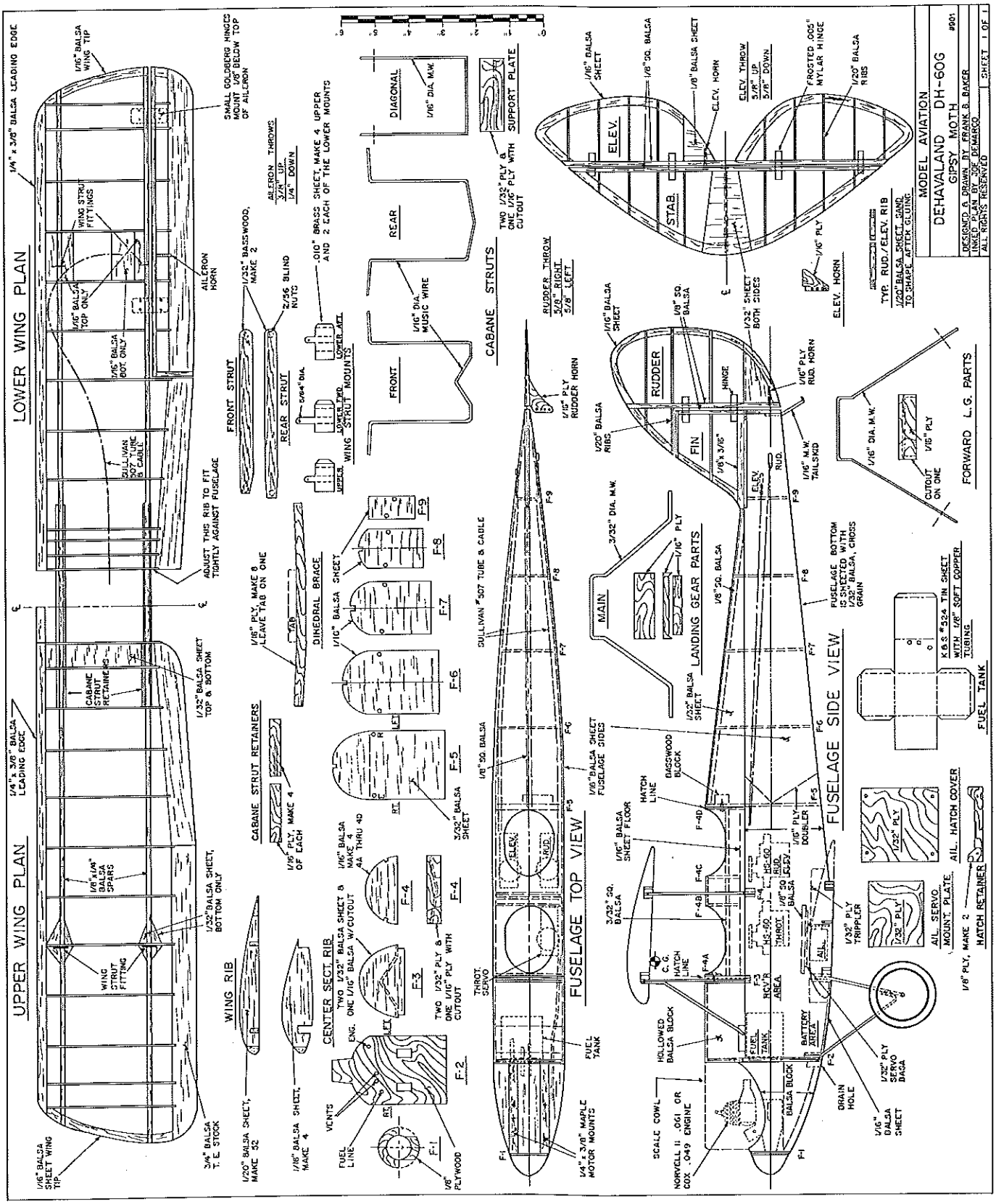
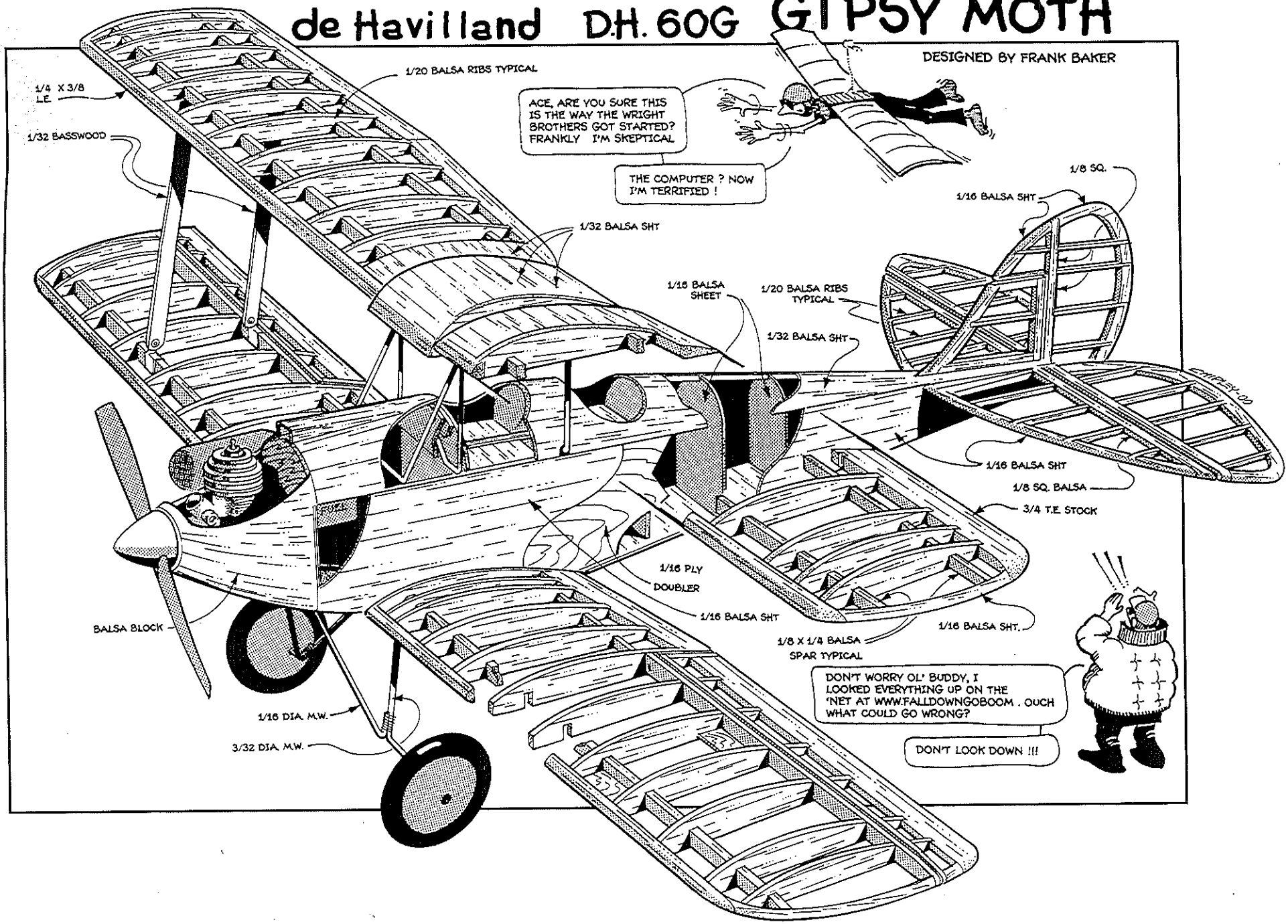
Full-Size Plans Available—see page 189



de Havilland D.H. 60G GIPSY MOTH



to the cable at the servo end and a quick link at the engine end.

Check the throttle for range of motion and low- and high-speed positions.

Mounting the Wings: Place the bottom wing in the spar slots and check the angle of incidence (it should be +2°).

Glue the lower wing. Make sure it is aligned properly in relation to the fuselage centerline, and is parallel to the elevator.

Slide the root ribs up tight against the fuselage sides, and glue them in place. You can also add the top and bottom 1/32 sheeting between the first two ribs.

Bend the rear cabane strut from 1/16 music wire and make the plywood retainer plates. Place the strut in the slot, and glue the plates together.

Slip the rear strut assembly into the fuselage, but do not glue it. The upper ends of the front and rear cabane struts should slip into the slots in the plywood retainers. Use a clamp (a clothespin works well) to hold the top wing to the cabane struts.

Check the incidence of the top wing (it should be +2½°); the rear cabane strut can be slid up or down in the fuselage, to get the proper angle.

Check the top wing; it should be parallel to the bottom wing and square to the fuselage centerline.

When everything is in order, glue the rear cabane strut plate into the fuselage.

Before installing the top wing, build the upper fuselage hatch.

Lay 1/16 cross-grain balsa in the cockpit area, and glue formers F4 A-D to the sheet. Glue in the two 3/32 square cockpit rails, and cover the whole hatch with 1/16 balsa.

When the glue is dry, cut the cockpit holes and drill holes for the cockpit hatch front and rear retainer screws.

With the hatch out of the way, you can install the top wing. Apply glue to the cabane strut retainer plates, and reassemble the top wing to the struts and hold in place with clamps. Check the alignment again before the glue sets.

At this point, the top and bottom 1/32 sheet can be glued between the first two ribs on each upper wing panel.

Cut the wing struts from 3/32 basswood, and check their length in place. Use the holes in the shim stock brass strut fittings to mark where the 2-56 blind nuts will be installed. Attach the wing struts to the wings with short 2-26 bolts.

Landing Gear and Aileron Servo Hatch: Bend the main landing gear from 3/32 music wire, and cut the retainer plates from 1/16 plywood. Clamp these to the front dihedral brace, and check for alignment.

Bend the wire until the axles are level and square to the fuselage centerline. Glue the assembly to the dihedral brace.

Bend the forward landing gear from 1/16 music wire, and cut the retainer plates from 1/16 plywood. Clamp the assembly to F2, and bend the ends of the wire to point up along the main landing gear.

When everything fits, glue the plate assembly to F2, wrap the wires together with fine wire, and solder. The 1/16 cross-grain sheet can be glued between F2 and the main landing gear plate.

Glue in the 1/8 plywood hatch retainer strips at the front and back of the lower wing center-section. They should be roughly 3/64-inch below the bottom line of the root rib. This provides a base for the aileron hatch cover and the screws.

Completing the Fuselage: Fit a balsa block between F2 and F3, and carve the transition between the formers. Hollow out the block to a 3/32- to 1/8-inch wall thickness, and glue in place.

Lightly tack-glue the nose blocks with the idea that they will be removed, and carve the nose to shape.

Once the blocks are rough-shaped, mount the Norvel .061. Make sure the muffler clears and that the needle valve can be rotated, and check that the fuel line and vents are accessible.

Remove the blocks; hollow them to approximately 3/16-inch wall thickness and glue them in place.

Remove the engine and coat the inside of the engine compartment with a light coat of epoxy, to fuelproof it.

Glue on the 1/32 balsa turtledeck, and glue the cross-grained 1/32 sheet to the bottom of the fuselage.

Covering: Before covering, give the exposed balsa areas a coat of AeroGloss balsa filler coat and sand smooth. Give the tops and bottoms of the wing ribs a couple coats, with sanding in between.

Being from the old school, I cover small models with silk and dope, although you could use silkspan. If you want to use Mylar™, get the lightest weight available.

The Gipsy Moths came from the factory in an all-silver finish with a minimum amount of trim in one color, such as blue, green, or red.

The registration numbers were the usual large letters across the top of the wings and medium-size letters on the fuselage sides in the trim color.

Add a Williams Bros. one-inch scale pilot to the rear cockpit.

Flying: Available space in the fuselage is limited, so small radio equipment is a must. I used the Hitec RCD Micro 555 receiver and HS-60 servos, although other equipment could be used (such as FMA receiver and servos).

The center of gravity should be 1¼ inches behind the leading edge of the top wing.

The battery pack contains four 250 mA AAA-size batteries, and it gives plenty of flying time.

Because of its size, the Gipsy Moth should be hand-launched with a smooth departure. Once in the air, it is a nice-flying model and the throttle control lets you do low, slow flybys that were not possible with most ½A models in the past. It also will loop and do open rolls.

On several occasions, we have had the "big" and "small" Gipsy Moths in the air at the same time, which is quite a sight.

One of my favorite maneuvers is performed at sunset, when the sun is at a low angle. I pull up into a down-sun wingover, and the registration numbers seem to glow when the sun's rays hit the upper wing. MA

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