

# DH Moth



**Another of those AT "Specials": a glamorous old gal reappears as a control line beauty or as a rubber powered free flight.**

**By William Winter.**

No private plane ever built had greater claim to lasting fame than the De Havilland Moth. First seeing service in the mid Twenties, this English plane was a leader for nearly a decade. It got in its share of the glamor flights, to Australia, over the Atlantic, but all that merely pointed up why what ordinarily should have been just another light plane, actually was considered both here and abroad as one of the real greats in the private aircraft field.

As originally designed, the Moth was powered by the 60hp Cirrus, on which it had a top speed of 90 miles an hour and a minimum speed of 38 miles an hour, a performance almost identical to late 65hp American monoplanes like the Cub and the Champion. Being a biplane, it was small, spanning only 29 feet and its wings could be folded. Some 686 pounds were available for the two passengers who rode in its open cockpits, gasoline, oil, and luggage. That's a pretty fine performance, as any present day light plane owner can tell you. Moreover, the engine was so smooth and so well muffled that pilot and passenger could communicate without a speaking tube.

In appearance, the Moth was a recognizable little brother of the DH-4 and the DH-9 of colorful World War 1 days. Since most of us don't recall those days, it can be pointed out that the Tiger Moth biplane that trained tens of thousands of airmen in the Second

World War bears a striking resemblance to the Moth. Students of airplane histories will recognize in all three machines the typical DH landing gear, vertical tail, and planform shapes. All these things, and the many other distinctive features, like the long exhaust pipe that carried fumes well behind the cockpits, and the thick, center section gas tank, have been reproduced faithfully in our model. The drawings are accurate enough for competition scale models, having been scaled from a three view that appeared when the Moth made its first test flights.

The plans present complete information for making either a rubber powered flying scale model or a U-control job for either the Cub or the Baby Spitfire. Somewhat on the large side for an Infant, the Moth should fly on new engines, smaller than the .045-.049, which were promised when this was written.

Although the planes are identical in size, all the design factors important to top performance in either version have been considered. Dihedral and tail surface size vary. So do wing construction and other, less important, details. If you are handy with the drawing tools, you may be interested in making a free flight one-half again this size for the Cub, featuring the rubber model type construction or a big engined control job with its appropriate frame.

Before starting fuselage construction be sure you have located on the plans the details pertinent to the type you select to build. For example, the front end of the fuselage is altered to take the gas engine, the rubber job having the conventional plug for winding.

The fuselage sides are cut from hard 1/32" sheet balsa and are assembled onto the 1/16" medium grade sheet-balsa formers. Note that sharp breaks in outline (see top view) are achieved by scoring the outside of the sheet sides. Start with formers C and D, then score sides, and bring in toward former A at the nose, and G, near the tail. Finally, connect together the two sides at the rudder post, and slip in the remaining formers. The rounded top of the fuselage consists of two pieces of 1/32" sheet (select pliable wood, easy to bend).

# DH Moth

The front piece, which ends behind the rear cockpit, is easily installed, but the rear portion, due to its taper, should be soaked for ten minutes in hot water, then wrapped around the fuselage with strips of cloth and allowed to dry. It is advisable to make this wood oversized, then rule it off, and trim, before gluing it in place, once the shape has been permanently assumed.

However, before closing in the fuselage completely, be sure to install the landing gear, bell crank, rear rubber peg, tank or other interior fixtures, depending on the model selected. The landing gear is assembled from three pieces of .045 wire, the joints wrapped with fine wire, and neatly sweat-soldered. It will help to install the two main struts pieces in the fuselage before binding the three sections together for soldering. Note that the rear piece is bent to be sandwiched in with sheet balsa fill. This is clearly shown on the detail of the gas model Moth.

Incidentally, note the position of the bell- crank mounting block and the manner in which the center-section struts enter the fuselage. These struts are virtually indestructible, being made of 1/16" dowels, faired with balsa. Make up blank lengths for the struts before streamlining them and, where the struts enter the wings, sharpen the ends of the dowels to enter the wood.

The bottom of the fuselage is a single piece of 1/32" sheet with the grain running fore and aft. Place the fuselage upon the sheet and trace the outlines. It is best to let the wood extend on either side, though, and then trim it off when the cement has set. Special details on the plans show the construction of the fuselage, where it supports the tail, and the construction of the gas model nose. The latter consists merely of a soft bottom block and two sheet sides, which follow the contour of the firewall behind the engine. The bottom corners are rounded off once the cement is dry.

Sand lightly the finished fuselage, then coat with Testor's sanding filler and sand again with wet and dry paper. If you have selected the gas model repeat the process to gain a good filled base for the final paint

job.

As to tail surfaces, note that larger areas, with built-up construction on the stab, are specified for the rubber job. The gas model surfaces are true scale. If making the rubber version, pin down the stabilizer parts on wax paper as they are cemented together. Materials and patterns are supplied on the plans. After the usual sanding to round the leading edges, taper the trailing edges, and remove all cement bumps, cover each side with one piece of light rubber tissue. This may be water doped, held under weights to insure against warp while the paper stretches, and then doped twice with clear that is cut half and half with thinner.

The vertical tail for both versions is made from sheet, although the larger rudder is made of 1/16" sheet and is plasticized with dope that has had added to it a few drops of castor oil (per ounce). Use material that resists bending. The vertical tail for the control version is 1/8" sheet to resist breakage in flip overs. Note the cross section indicated; also the hole cut through for the one piece elevator. The stabilizer for the gas model likewise is 1/8" sheet. Cloth hinges are used as shown, with a reinforcement of 1/16" dowel across the middle, and a bent- wire horn. Note the offset to the outside of the circle in the control line rudder. Sanding filler is used on all sheet surfaces with a final wet and dry paper sanding.

Depending on the ship to be built, wing construction differs radically. The rubber- model wing is conventional, with a 3/32" sq. spar on top, forward, and on the bottom to the rear. Only material not a standard size is the trailing edge which should be cut from a piece of hard 3/32" thick sheet balsa. The easiest way to build these wings is to assemble each panel on the plan without the thick root ribs that butt against the deep center section. When ready to install dihedral, put in the 1/8" hard joiner piece, the 1/8" thick center section trailing edge, the 1/8" sq. leading edge of the center section, the two 1/16" center section ribs only then install the two heavy root ribs. When the wing is almost finished the 1/32" sheet covering of the center section may be added. The tips are 1/8" sheet of medium hardness note, also, that the ribs to which the outer struts will be cemented are from 1/8" sheet.

# DH Moth

The bottom wing differs from the top in that the center section is omitted, the thick root ribs butting directly to the fuselage sides. An old trick to maintain your wing mounting is to work a thin piece of music wire through the fuselage at the leading edge of the lower wing panels, then bend over the ends to sink into the wood of the edge. Once cemented, this wire prevents a wing-tip crash from pulling back a panel. Or the wire may be cemented directly across the fuselage bottom if you don't mind the appearance.

To cover, use four sections of rubber model tissue, one for each panel top and bottom. The grain should be chord wise because the top spar will prevent the tip pulling up. Water spray and give two coats of clear dope, cut 50 percent with thinner. To mount the top wing, make four small holes precisely located to take the pointed ends of the center section struts. Cement the ends of the struts and work the wing in place. Align carefully by looking at the ship from the front and the top. In joining the wings with the inter plane struts, scrape away a tiny piece of covering where the joints will be made. Note the assembly sequence on the plan. A wood-to-wood joint is vital, or the struts will tear the covering to ribbons in a crash.

Construction of the control wing is simpler still. After some experimentation with the model, it was decided in the interest of appearance and durability to fill in the top surfaces of all panels with 1/32" sheet balsa. The finished wing can be paper covered, top as well as bottom, to provide a well-filled, smooth base for the finish. Note, however, that the edges are of heavy, wide material, as is usual with U control design.

The leading edge can be cut from 3/16" sheet (or from 1/4" sheet if the dimensions are turned around) if the hobby shop does not stock 3/16 x 1/4" Tips are from soft 1/4" sheet. Ribs are 1/16" with the exception of the 1/8" thick ribs that take the struts. The 3/16" trailing edge may be obtained from triangular stock but insist on hard balsa if you would avoid a "hook" from paper pull. The sheet covering is on the top surfaces only and requires that the ribs fit properly 1/32" below the tops of both leading and trailing edge. Detailed procedure is given on the plans for assembling the wings and struts to the airplane.

Flying wires and landing gear bracing wires were not installed on the original model due to the difficulty of keeping a taut rigging once the plane begins to take abuse. Position of the bracing is given.

There is nothing to say about the mounting of the Cub engine except that the nuts will have to be cemented to the rear face of the nose bulkhead B. One improvement that could be made would be to face the portion of the 1/16" balsa face of B with small plywood pieces (1/32") to prevent the nuts from crushing the wood if the screws are pulled up very tight. Or shim brass could be faced to the bulkhead and the nuts sweat soldered to it.

If mounting troubles are encountered, remove a small portion of the sheet balsa nose siding and replace it carefully after the engine is in position. If desired, the nose fairing can be left off after the fashion of most free flight models with the engine mounted on the bare firewall. Comet fuel-proofer was used over the entire fuselage, the center portions of the wings, and inside the nose compartment to minimize seepage of fuels into the wood.

The rubber model nose is a plug that may be pulled out for installation and winding of the rubber. Note the bent-metal bearing inserted into the nose block to reduce friction of the turning prop. Bend the hook first, then slide on the block, friction washers, and the prop, and finally make the winding hook. Cement the bearings, including the one against the back face of the prop hub, and the winding hook to the front of the hub. Power is six strands of 1/8" T-56 flat rubber. This may be overpowered, but four strands leaves something to be desired, unless your construction is very light.

The original model was trimmed with red. Use masking tape for clean lines. After the tape is put down, dope over the edge with clear dope and let dry then do your painting. Allow time to dry, avoiding ragged edges from impatient removal of the tape. The letters may be cut from Trim-Film or black tissue. These letters are the same as those on one of original real Moths. The full scale Moth usually had a solid color on the fuselage but plain fabric on wings and

# DH Moth

tail. The dummy engine block and exhaust stack may be black. One way to bend the metal tubing for the stack is to fill it with sand and plug the ends. This prevents buckling. Windshields are cut crescent shaped from light celluloid.

In flying, for control line use .008 wire of fairly short length as, say, 20 feet. The Moth flies in counterclockwise circles. For rubber, it will be necessary to add ballast to the nose. The ship is trimmed as built for control line but the position of the center of gravity shifts rearward when the rubber prop replaces the Cub and the rubber is strung along inside the fuselage. A number of inches of strip solder may have to go into the nose but don't let this alarm you. The proper glide will be somewhat fast without any trace of a swoop. Hand glide the Moth over tall grass if possible until enough ballast has been added to bring about an approximate trim. Now wind on 50 turns and hand launch over a "hospitable" surface to find if any stall remains.

If the glide is okay but power flight stally, put in down thrust until the power flight trims out don't add more weight. If slight stall remains it may be taken out by making the model turn, a desirable feature anyway. It is desirable to make the ship turn to the left under power. If straight glide is wanted and a power turn is not natural in your airplane, resort to a little side thrust. If the turn seems too tight under power, either make the ship glide to the right with rudder, thus alleviating the power turn, or add a bit of right thrust.