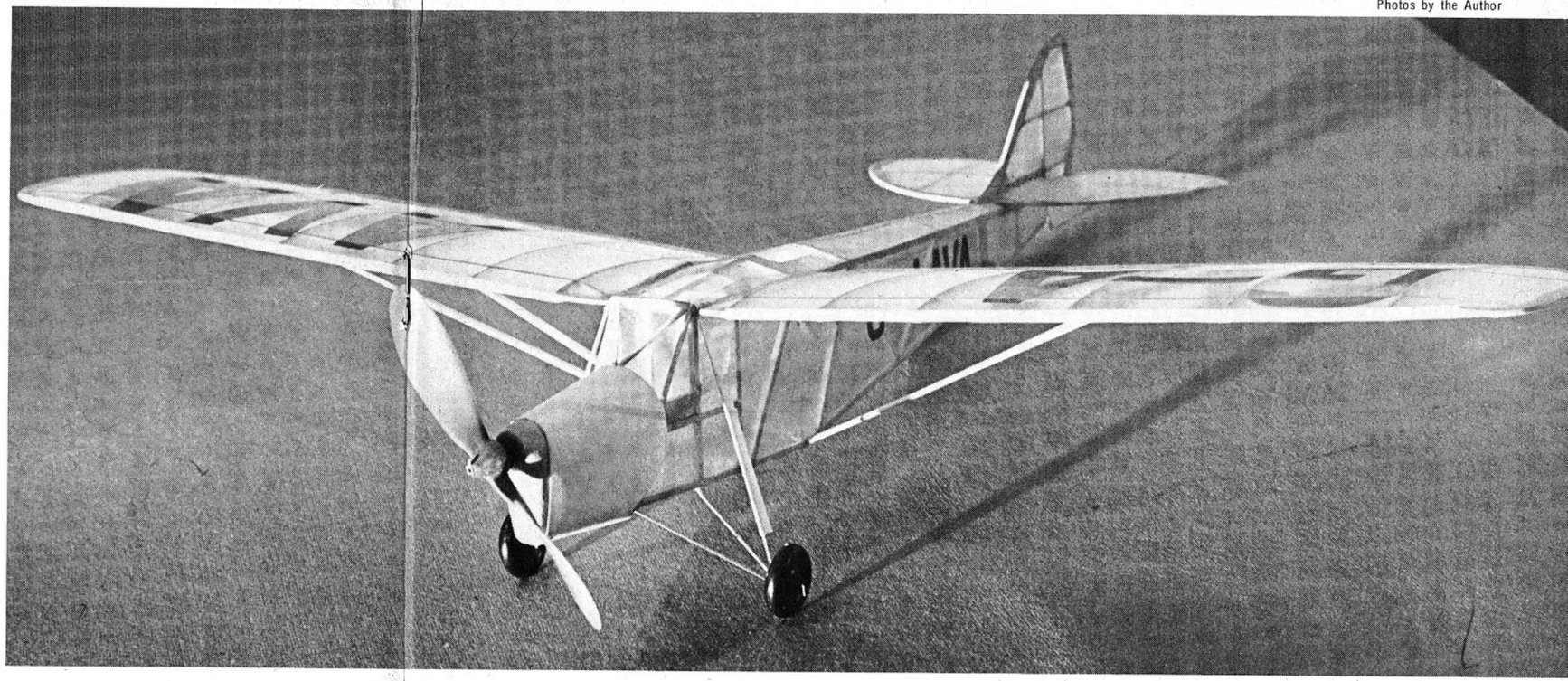
deHavilland "Puss Moth"

by Ray Booth

Some aircraft are made for modeling. This is one of them. A simple Rubber Scale ship to fly in the calm of twilight.

Photos by the Author



The prototype "*Puss Moth*", G-AAFA, was designed and built by deHavilland in England during the early part of 1930, and was destined to make a considerable contribution towards the progress of civil flying all over the world. The first machine was fitted with the (then) new De.H. 120hp "Gipsy 111". It was a four-in-line inverted aircooled engine, though later models were fitted with the "Gipsy Major" of 130 hp. These later models differed quite considerably from the first ship, with welded steel tubular fuselages, instead of plywood covered wood construction.

The airplane was designed as an optional two or three place ship, the third seat being fixed to rails, which enabled it to be positioned alongside and slightly to the rear of the second seat. The wings and tail were quite conventional in construction, wood with fabric covering, and the wings were capable of being folded about the rear spar attachment point, supported on vee struts. One rather ingenious device for the period was the airbrake. This was achieved by swivelling the main landing gear fairing through 90 degrees, which produced quite an appreciable amount of drag. This idea was retained on two later designs, the "*Leopard Moth*" and the "*Hornet Moth*".

The "*Puss Moth*" had many fine long distance flights to its credit, particularly those of the late Jim Mollison and Bert Hinkler (an ex AVRO test pilot, incidentally). Hinkler made a 10,000 mile flight in the Fall of 1931 from New York to London *via the South Atlantic crossing*. In March 1932, Mollison flew a "*Puss Moth*" from the South of England to Cape Town, South Africa, in four days seventeen hours, and in August the same year he flew from the U.K. to Newfoundland on the first solo flight across the Atlantic from east to west.

About 260 ships of this type were built in England, with a maximum speed of 130 m.p.h., crusing at 105 and landing at 45 mph. Span was 36 foot 9 inches.

The Model Design

Unlike most rubber powered scale ships, the tail assembly is scale outline, thereby preserving the attractive outline of the ship. The dihedral has been increased slightly, for lateral stability considerations. The general constructional design was based on relative simplicity, but maintaining a realistic appearance when completed. The original model had a weight of 1¼ ounces ready to fly, which included a small cube of clay (¼" cube) fixed behind the balsa nose block inside the cowl. Power was supplied with one loop of 3/16"x1/24" rubber 13½" long.

Construction

A *flat* building board of not less than 16"x5" is required, though a bigger size is desirable in order to maintain a reasonable building schedule. There is no particular building sequence for the major components, most modelers have their own preferences regarding which items are built first. However, when transfering the various outline shapes by your own favorite method to the balsa sheet (1/16" medium), take particular note of the grain direction indicated for the various parts on the plan. You might save a little on the wood by placing things differently, but you lose patience later when they split! On the subject of glue, the modern PVA white glue will give a good warp-free structure, even if it does take longer to dry!

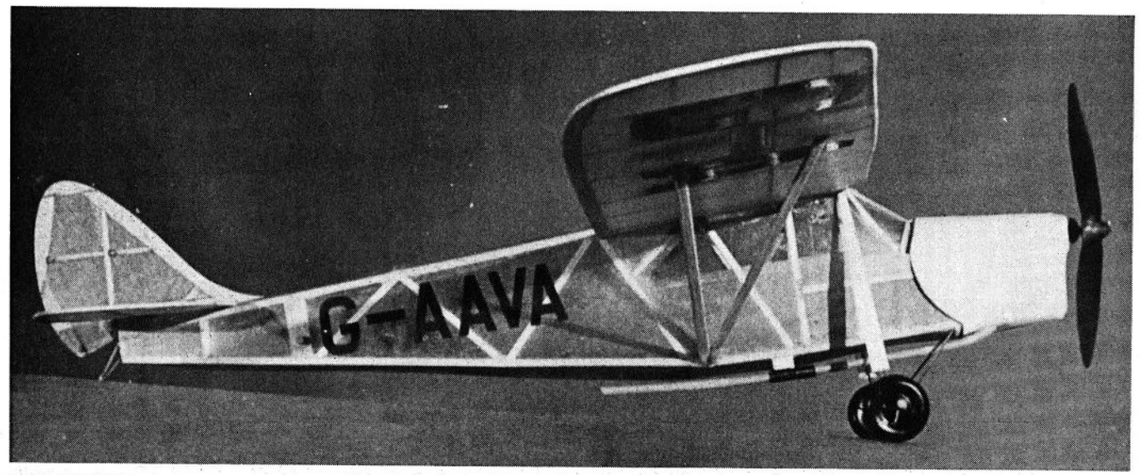
Fuselage

First cover the plan with wax paper or rub wax or soap on the drawing at all the joint positions. Select some reasonably hard 3/32" sq. balsa for the basic fuselage structure, then pin down the top and bottom longerons over the plan as illustrated at the top right-hand side of the plan. Note that both sides as assembled together, one on top of the other, for accuracy. Add the various diagonals and verticals to complete the basic sides, plus the 1/16" strip for the rear motor peg. Remember that one of these strips must be pushed down to the level of the building board, but the upper one must be fitted flush with the top of the uppermost fuselage side! Very obvious, but it will be annoying later if you forget!!

I prefer to leave things pinned down overnight if at all possible, but in any case for not less than six hours. This leaves time to cut the various cross members of the fuselage to correct length, noting that some cross-pieces are at the top only, some at the bottom only, with others at both top and bottom! When the two basic sides are completely dry, remove from plan and carefully separate the two sides by sliding a thin razor blade between the joints. Next, make a slight 'vee' cut on the inside of the longerons at the point indicated on the planview, gently crack and glue them at the correct angle. From time to time as the fuselage sides are drying, check that the planview angle is being maintained. When set, lightly pin down the rear portion of the bottom longerons over the planview and add the various cross members in their appropriate positions. This operation is probably the most tiresome of the entire model, but be patient. As the assembly dries out, periodically check that the sides are vertical and the whole assembly square. Small triangular gussets (cut from 1/16" sheet) can finally be added to the top and bottom inside corners of the fuselage on the diagonal which runs from F9 to F4. These will assist in keeping the fuselage square. Parts F1 through to F12 may now be added, followed by the 1/16" sq. medium hard stringer top and bottom and the 1/16" sq. windshield frame pieces, as shown in the front view. Add the triangular pieces (2 off) R8 to the top longerons (flush with outside edges) at the rear of the fuselage. Make sure the top edges are level so that when the stabilizer is ultimately added it is not tilted over in relationship to the top of the fulelage where the wing is mounted.

The nose block is carved from soft balsa block or laminated from balsa scrap. Drill to suit commercial hardwood nose button, allowing for the downthrust shown on the plan. Finally, drill the 3/32" dia. hole for the rear motor peg. Lightly sand all the completed structure, then cut out the side window panels from thin clear plastic sheet, adding the frame cut from lightweight tissue in the color selected for the fuselage. Attach these window panels to the fuselage sides in the position shown on the drawing. Next, tissue cover the *sides* of the fuselage only. Before any further covering is undertaken, it will be necessary to form the landing gear parts from .032" dia. music wire. Chick that the two separate parts fit the fuselage in their appropriate positions before they are permanently epoxy glued into place. Wheels can either be made from laminated balsa disks or utilize lightweight commercial wheels.

When the landing gear is fixed, cover the top of the fuselage from the front of the cabin back to F4 with a piece of thin flexible plastic sheeting (a piece from a thin plastic bag will do fine), attaching it with suitable contact adhesive. Next, cut a piece of colored tissue with two panels cut out to the shape given on the plan, and lightly dope this on to the thin clear plastic roof. Cover the remainder of the fuselage, taking care to avoid wrinkles where



Piece by piece you build an airplane. Fingers used to the solid lumber of R/C designs will find a Rubber Scale a new experience. And builders who "remember when" will find the frame of the "Moth" charged with lost memories. The quiet evening air is a fun time for flying. A performer!

the covering goes round the landing gear legs. Water shrink before giving two coats of thin (50/50 dope and thinner) clear dope to which have been added a few drops of castor oil as a plastizer.

Cut the cowl pattern from bond paper and check its fit around the nose. The pattern allows for a slight overlap on the underside so that the edges can be glued together. Do not glue cowl permanently to the fuselage. The exhaust pipe on the original model was made from a suitable diameter plastic drinking straw, the end being gently heated over a flame until the correct degree of curvature was achieved and it was then fixed to the cowl with epoxy. Roll a paper tube to form the silencer, which is glued to the bottom longeron (starboard side) with a scrap of 1/16" sheet balsa. The exhaust pipe is then pushed through the paper tube, at the same time sliding the cowl into position. Add the tailskid, formed from .032" dia. music wire (or thinner).

Wings

Construction is very straightforward, but note the grain direction of the tip outlines and trailing edge. Select fairly light grade balsa for these items, but make sure that the 1/16" sq. spars are hard quality. When all the necessary parts have been cut out, pin down over the plan and glue together items W9 W10 W11 W12. Pin down the bottom 1/16" sq. spar, then add ribs W2 W3 W4 W5 W6 and W7. Kink rib W1 as shown, pin down and glue into position. Add the 3/32" sq. leading edge, leaving it slightly overlength at the tip. Next, add piece W13, noting that its *forward edge* has to be raised above the level of the building board in order to align with the center of the diagonally set L.E. Glue W14 into place, plus the gussets W15 and W8, then add the two top spars (1/16" sq.) finally adding the small triangular strip W16. When thoroughly dry, remove from the board and sand the leading edge at the wing tip to conform with tip planform.

Lightly sand framework and cover with lightweight tissue. Dampen tissue on the underside only, allow to dry, then give two coats of thin clear dope (50/50 dope/thinner). When completely dry, carefully pin down on flat building board, lightly water spray the top surface, allow to evaporate, then give two coats of thin clear dope. Allow a minimum of three hours before removing pins and you should now have a perfectly flat true wing panel.

Select lightweight grade balsa for the tail assembly structure. For the stabilizer, pin down the 3/32" sq. spar and ribs, carefully gluing joints, then glue and pin down parts T1, T2, etc. through to T13. When dry, remove from plan and gently sand outline to remove all sharp edges. Construction of the fin follows the same procedure. Tissue cover stab and fin, but do not water shrink. If carefully covered, one coat of thin clear dope will tighten the covering sufficiently without distorting the structure. Cement the base of the fin to the center rib of the stabilizer, making sure that when viewed from front or rear, the fin is vertical to the stab.

Final Assembly

Make up the two wing struts from fairly hard 1/16"x3/16" to the size shown on plan, and when jointed and dry, sand to airfoil. Chamfer the ends to suit the fuselage side and rib W5 underside.

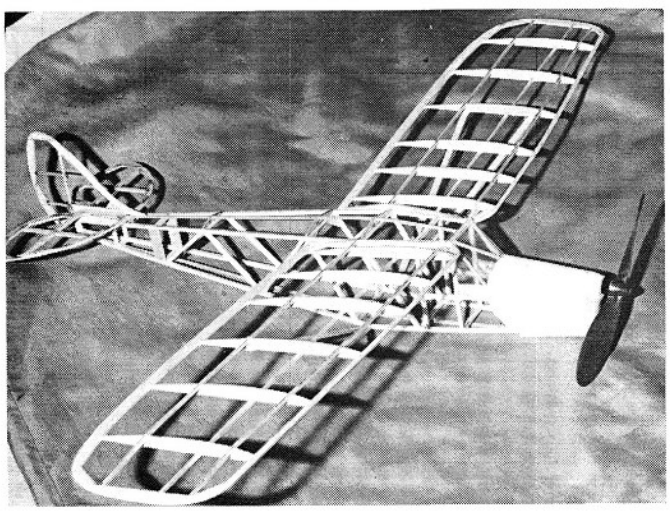
Probably the most complicated part of the model is the assembly of the wings to the fuselage, and it is essential that this be carried out with extreme care. Lay the fuselage on its side, supported with a book or block of wood so that the side of the fuselage in the cabin area is flat. I held the original in position with a few scraps of tape to prevent the model moving about. Next, glue rib W1 into position at the top of the fuselage in the fore and aft location shown on the plan. It is essential to have to correct angle of attack, and to do this the *underside* of rib W1 at its *leading and trailing edge points* should be level with the *bottom edge* of the top longeron (3/32" sq.). Check the dihedral angle when viewed from the front, then add the wing vee struts. When completely dry—not forgetting to check the various points mentioned above from time to time during the drying process—turn the model over and glue the other wing in position. When viewed from front or rear it is essential that both wing halves should have the same angle of incidence and dihedral.

The propeller on the prototype model was a cut-down plastic prop. from a cheap all-balsa ready to fly ship of 5 1/4" diameter. Any lightweight plastic prop. of about 5 1/2" will be satisfactory, unless you like work and wish to carve one from balsa. Balance the completely assembled ship at the point indicated on the drawing, adding a small amount of clay if necessary inside the cowl at the rear of the balsa nose block.

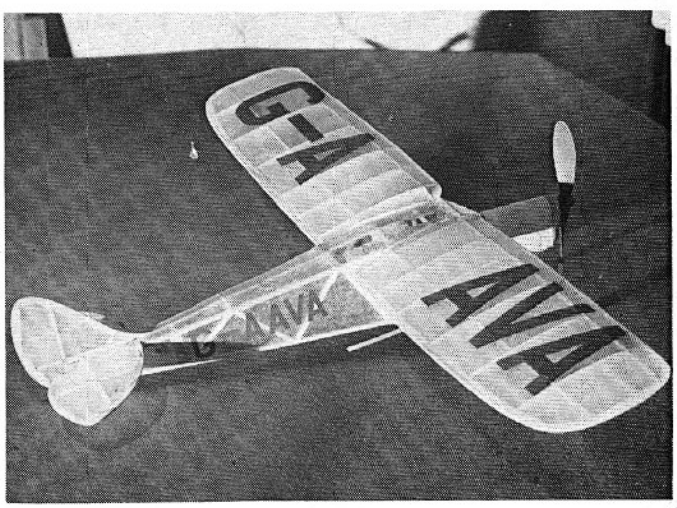
Test gliding should be carried out over long grass if possible, and in calm weather, after checking that all the flying surfaces are correctly aligned. Trim the glide by adding a little clay (nose light) or slightly bending up the trailing edges of the stabilizer. Once the glide trim has been satisfactorily established, further trim changes under power must be carried out by varying the thrust line to give more down and/or side thrust (right). This can be achieved by small packings placed behind the nose button.

With regard to the registration letters on the original model, these were not made by the customary method of cutting the letters out of colored tissue and doping them into position. For over thirty years the writer has made "transfers" by first of all spraying water-soluable glue on to fairly thick *absorbent* paper, and when dry spraying two or three heavy coats of colored dope on to the dry glue. It is then necessary to draw out the letters on the reverse side (letters backwards!) then carefully cut them out with a sharp modeling knife. Soak the letters in warm water for a few minutes then slide the letters off the paper backing onto the wings or whatever, pressing them firmly into place.

So, happy landings with your "*Puss Moth*"—and think of the value of your fuel conservation, going back to rubber power!



The skeleton of an aircraft. Each piece for a purpose, nothing less than needed and nothing extra to burden the flight. The old art of compromise.



Above and below: The decals are homemade, and text describes how. Water soluble glue on absorbent paper. Cut, moisten and slide onto the model.