PHOTOS BY BILL NORTHROP

DE HAVILLAND GIPSY MOTH

By BILL NORTHROP . . . A little ahead of the recent trend toward quarter-scale R/C models, the editor's Moth was campaigning in AMA Nationals competition about 12 years ago. We have presentable plans at last!

• The August, 1958 issue of Aeromodeller solved a problem for us. By that time, we had been into radio control for about three years. First there was a Berkeley-kitted version of Walt Good's Rudder Bug, followed by about five original designs, including the first three of a long string of biplanes. One of the bipes was a 40 inch span Great Lakes Trainer, which became our first published construction article.

All of the above were single-channel escapement, pulse rudder, or Galloping Ghost (pulse rudder and elevator) radio controlled models. This may seem unusual to those of you who have come into the hobby in the past 10 or 15 years, but in those days, single-channel dominated R/C about 10 to 1 over multi-channel, and digital proportional was unheard of.

Anyway, we felt ready to build an Ace R/C five-channel reed/relay radio kit, and operate it with a Bramco (who!?) five-channel transmitter that a friend was ready to sell (By the way, "channels" in a reed radio did one thing each . . . like right rudder was one channel and left rudder was another channel. So with five channels, you could have elevator and rudder, plus a sequencing escapement that was kicked by the fifth channel to select two or three throttle positions!).

That 1958 Aeromodeller issue featured an article and excellent scale drawings of the Gipsy Moth, a biplane designed and first built by De Havilland back in 1925. In fact, it was the first airplane built by Captain G. De Havilland, in collaboration with Major F. B. Halford, of the Aircraft Disposal Company (!). It was also, therefore, the first Moth, a famous name in aviation and De Havilland history. Actually, the first Moth was powered by the 60 h.p., 4-cylinder Cirrus engine, and was designated "D.H. 60 Moth." The later, 120 h.p. Gipsy engined Moth became the "Gipsy Moth". There was also a 5-cylinder radial "Genet Moth."

The Gipsy Moth was the immediate forerunner of an even more well-known De Havilland aircraft, the Tiger Moth. Basically a Gipsy Moth with the top wing moved forward, and then both wings swept back about 10 degrees to regain proper balance, the Tiger Moth was the backbone of military pilot training for England's World War II pilots. To this writer's mind, these two biplanes are the epitome of light horsepowered, personal aircraft, throughout the history of aviation.

Two things influenced our decision to draw up construction plans for a 3 inch scale model of the Moth . . . an engine, and a pair of wheels! About this time, Forster Brothers was making the .99 with a two-speed, ignition system. And about the same time, we came across a pair of 6 inch M&S Airwheels, made in England. What better excuse could a modeler want than to build an airplane to suite these items!?

The original drawings (which still exist) were made on the backs of blueprints brought from our engineering job. Several had to be taped together to accommodate the huge size of the fuselage. A flush-panel door was used for building the fuselage sides. At the

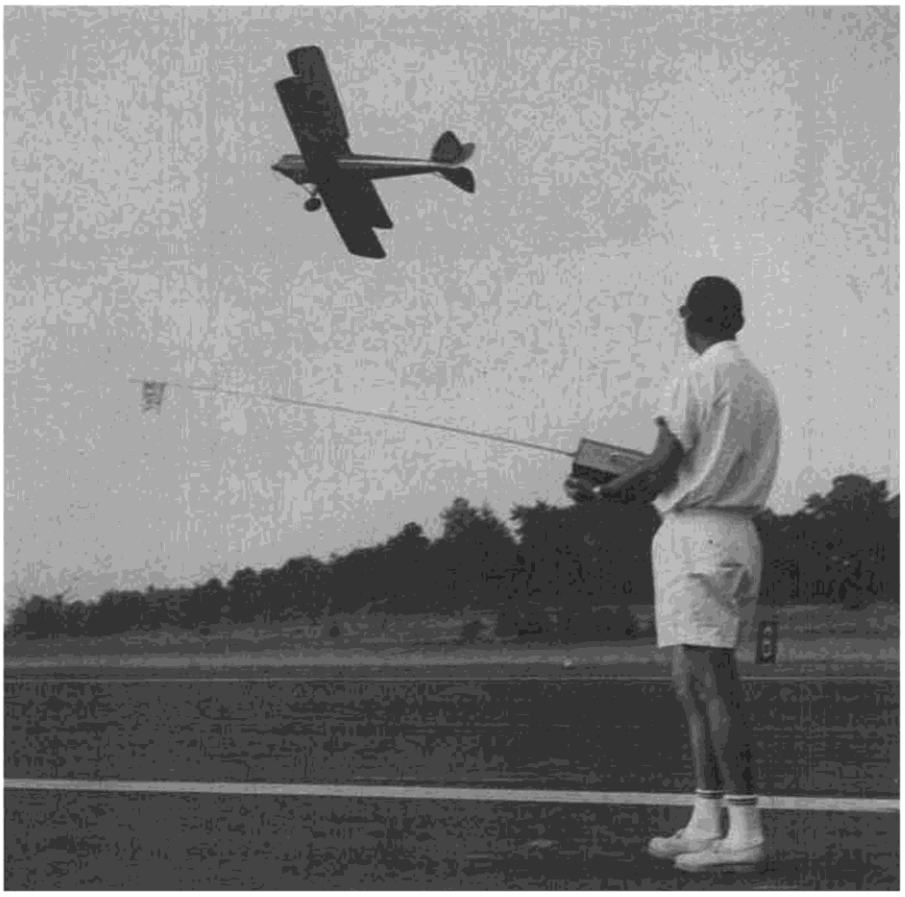
This photo, and the one at the top, were taken soon after completion of the Moth, in 1960. Sprung tailskid was later replaced by steerable wheel. Functional exhaust from Forster .99.

time, our workshop was a small laundry area off the family room. The door was temporarily set up on the dining room table while the sides were built. Later, when working on the fuselage in the shop, it was necessary to carry it into the family room in order to turn it around when we wanted to work on the "other" side!

As work progressed slowly, while other models were being built and flown, it wasn't until sometime in 1959 that we were ready to purchase the engine. Forster had been advertising a trade-in deal . . . any old engine and 26 bucks for a new .99. But wouldn't you know it? When we finally wrote in to get ours, we were told that there were no more 99's available! After a fruitless search, for a new or used one, we again wrote to Forster Bros. and explained that we had this plane well on its way, designed around the .99, and now, no engine. Could something be done?

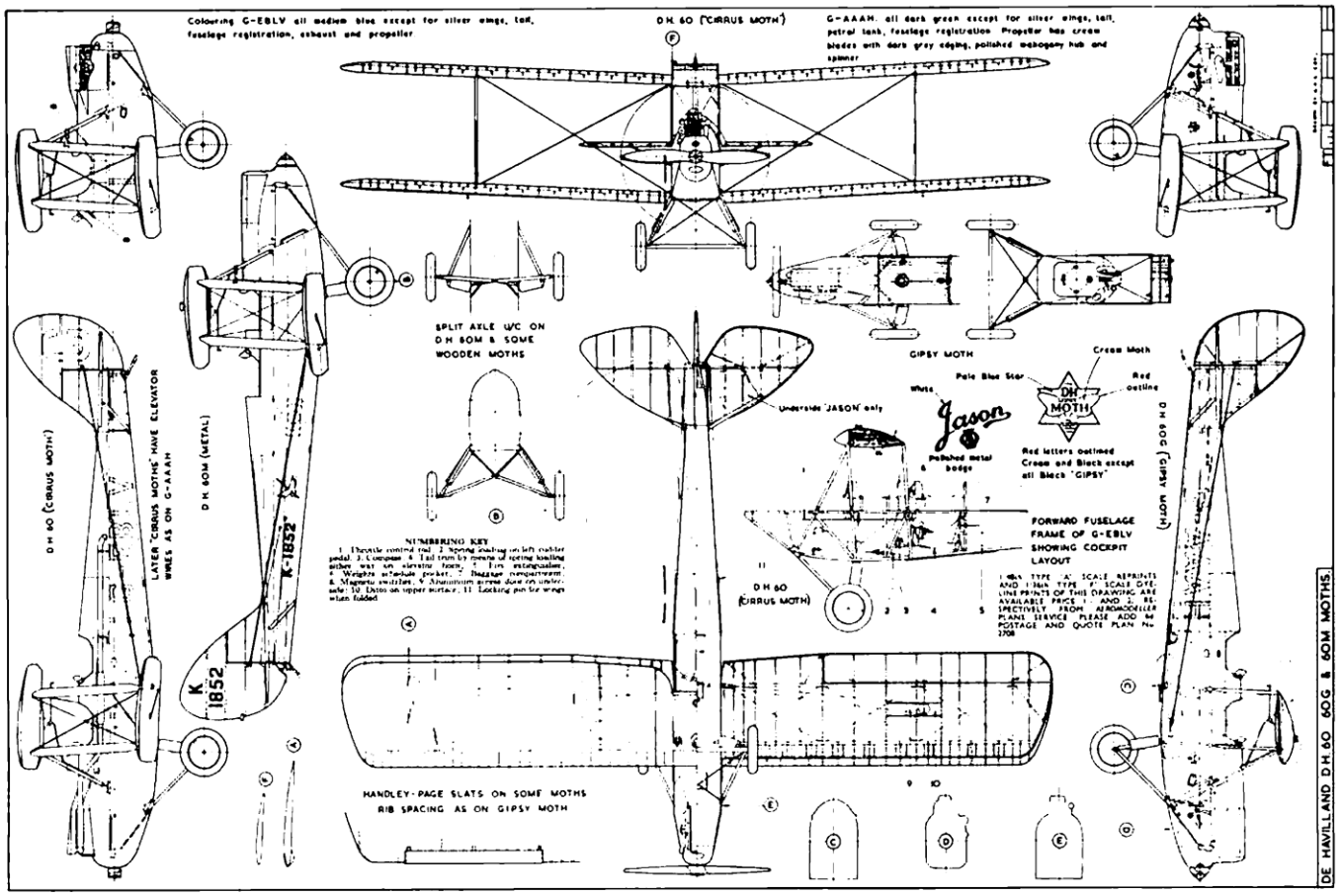
We received an answering letter that is still in our possession. In it, one of the brothers said that our letter was so plaintive that they couldn't turn it down, and they were assembling one last engine from available parts, to accommodate our drastic situation! Perhaps we can claim, with written proof, to own the last Forster factory produced .99!

In 1961, the Nationals were scheduled for Philadelphia, only 50 miles or so

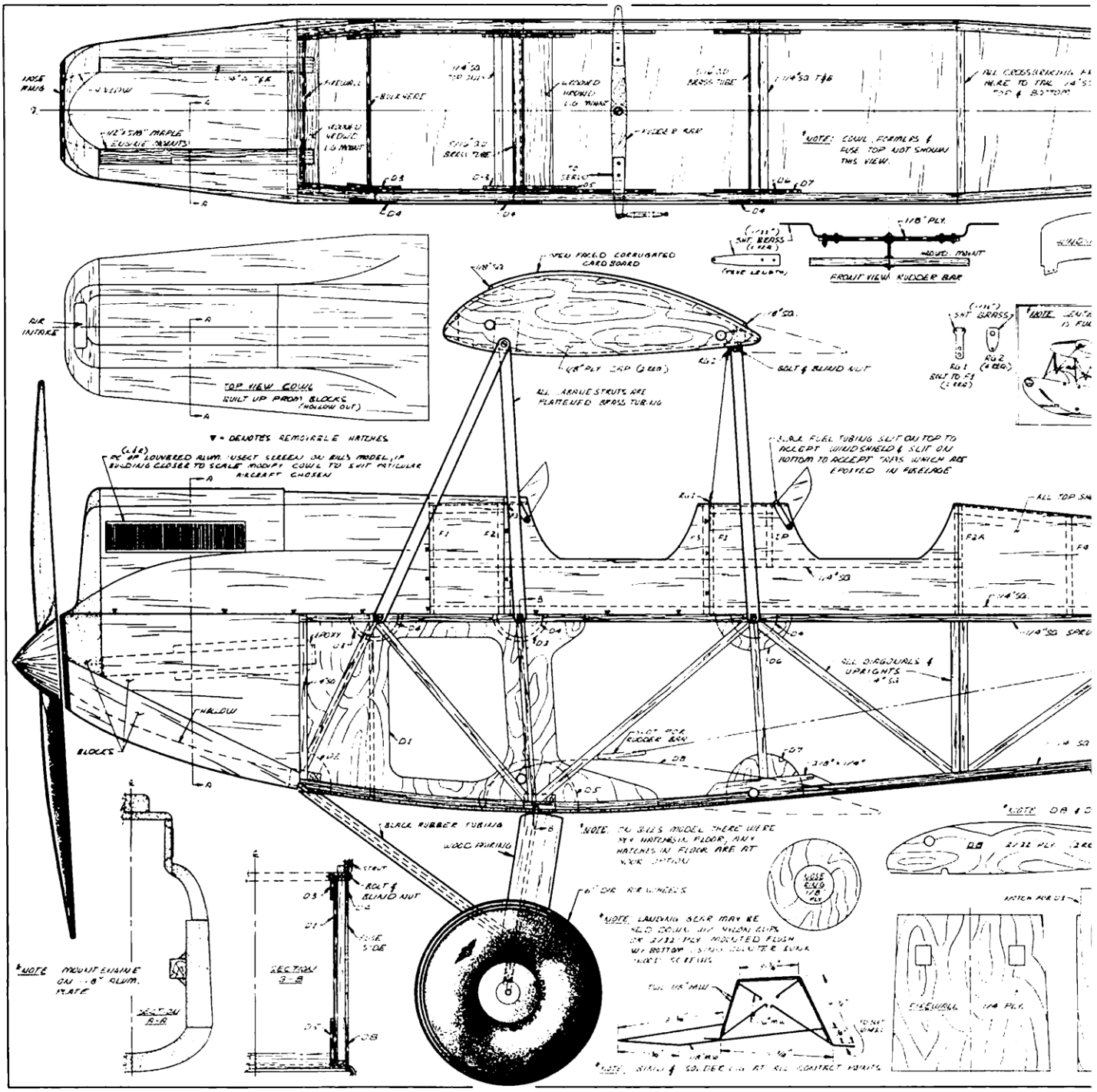


Completing Figure 8 at 1965 Willow Grove, Pa. AMA Nationals. All of flight was about this high off the ground. Every owner of the early Quadruplex system developed a strong left arm!

PHOTO BY BILL COONS



Reproduction of Gipsy Moth scale views from August 1958 Aeromodeller. These plans, in 1/48th and 1/36th scale, are still available from Aeromodeller. Write to Model & Allied Publications Ltd., PO Box 35, Bridge St., Hemel Hempstead, Herts, England HP1 1EE.

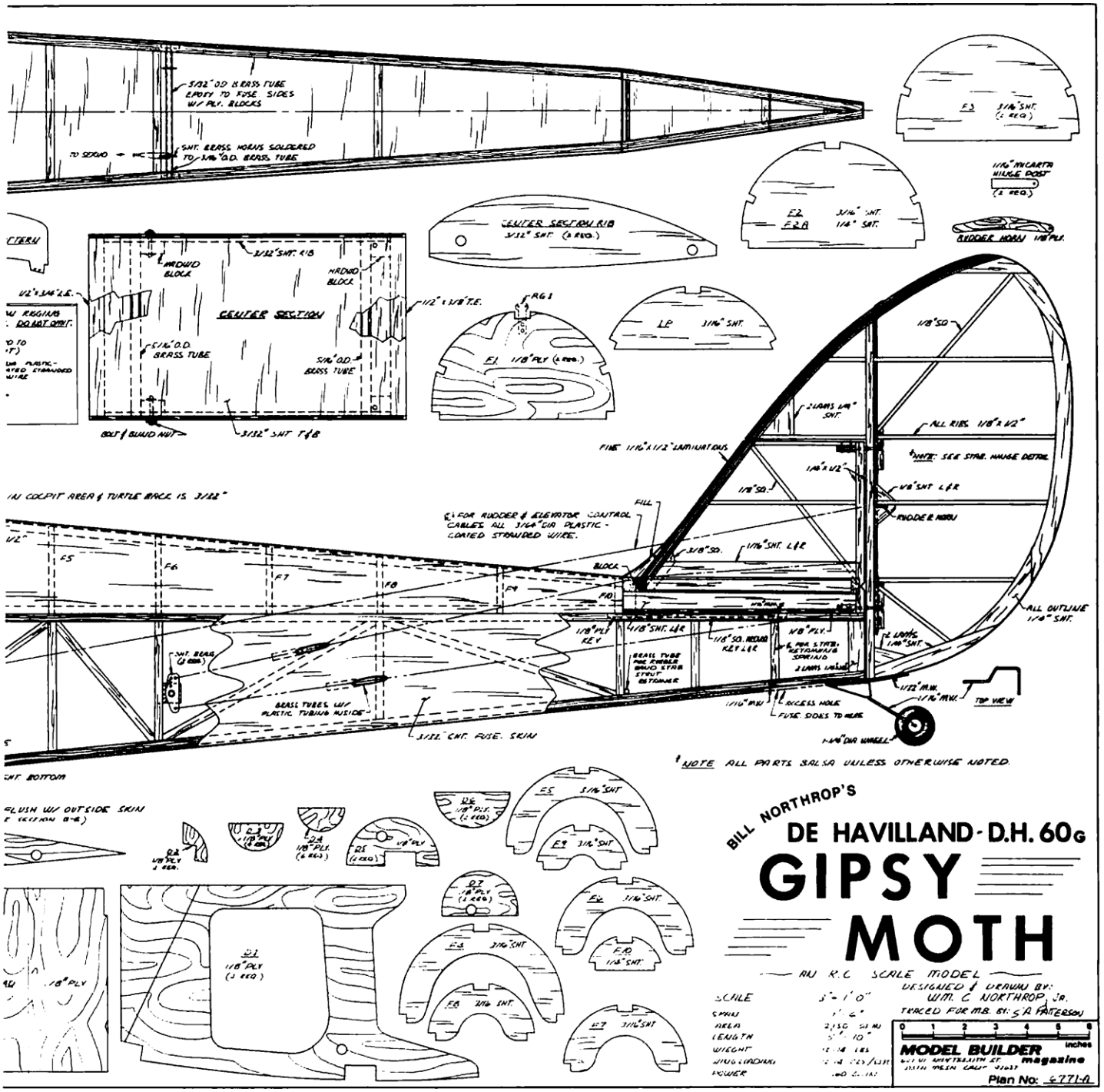


Another just-completed photo. Forster .99 was unable to get the plane off of a close-cut grass field . . . was later replaced by Fox .59 that powered very first "Big John".

from our home town of Wilmington, Delaware. We decided that, although we had always built and flown for our own amazement, that we should take a whack at the "Biggie" for our first competition. Sound familiar?

The plane was to exact scale outline, rib spacing, exterior construction appearance, etc., but we had painted and decorated it the way WE wanted it . . . not to any one particular full size aircraft. Consequently, our presentation stated that we finished it as we would do if we were restoring a real Moth. How's that for trying to pull a fast one?

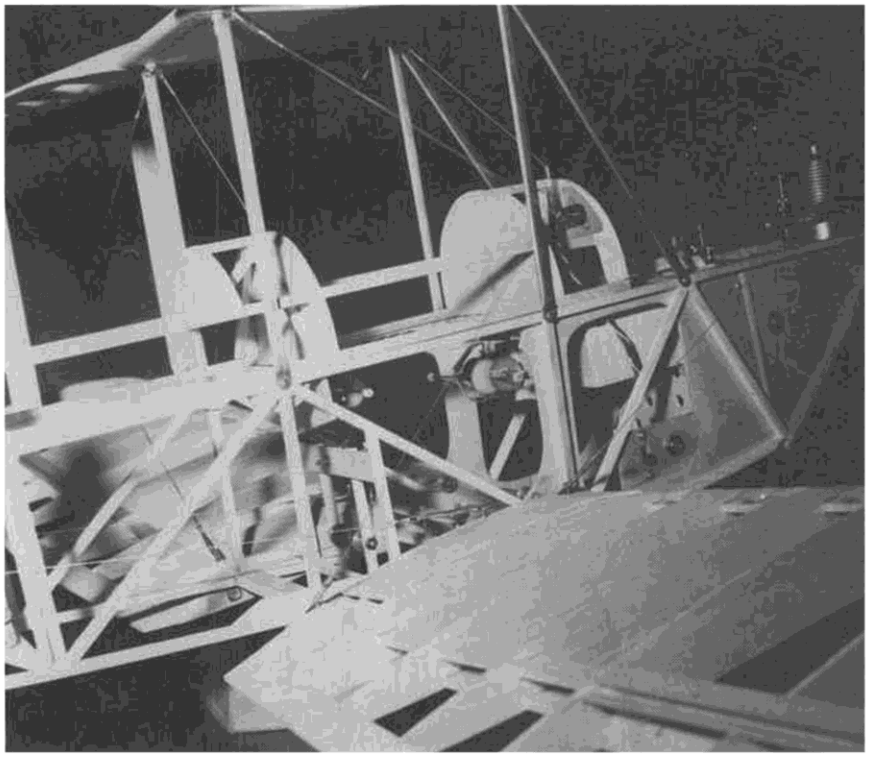
To make a long story a little shorter, the Moth didn't fly in 1961 . . . probably very lucky for both plane and pilot. Only one test attempt had been



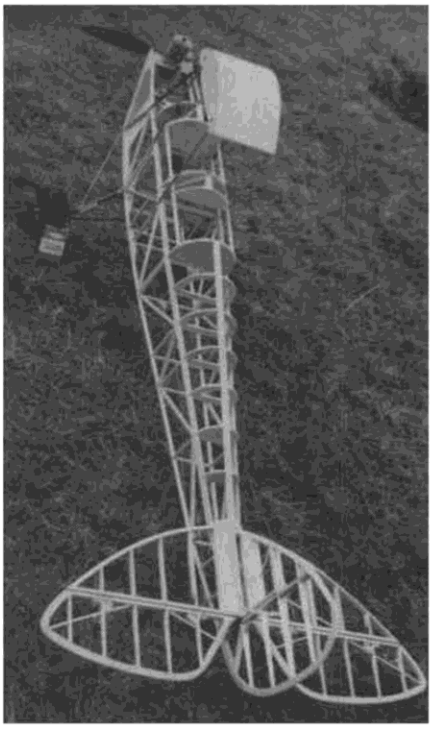
made prior to the Nats, and that was a stall on takeoff that caused only minor damage. Rebalanced and trimmed, it made one beautiful and realistic takeoff run at the Nats, only to have the ignition shut off a foot above the ground (Ignition coil was later found to have opened up).

By 1965, when the Nats again returned to Philadelphia (that old rotation system was really great, and the ideal way to give every modeler a shot at the "Big One" at least once every four years), we had a lot more flying experience under our belt, and had acquired one of Don Brown's great Quadruplex analog proportional systems. The big Forster, somehow unable to pull a 15 pound, 2400 sq. in. biplane off the ground, had been replaced by one of those amazing old plain-bearing Fox .59's. This engine leaked more fuel out through the front of the case than it burned above the piston (Duke said, "You don't want that bearing to run dry, do you?"), but it pulled the Moth around on a 12 x 6 (boiled) Grish nylon at just about scale speed . . . and realistically as the devil!

At the Nats, with a couple of sodium butysol tablets to relax the nerves, and old flying buddy, Graham Lomax, to handle and start the juicy Fox, we taxied out, poured on the coal, and am proud to say, put on a scale flight that brought cheers from the very large crowd that always assembles when the scalers do their thing. The whole flight consisted of takeoff, straight flight out, procedure turn, straight flight back, figure eight, touch-and-go, traffic pattern, and landing. The thing is, that it was all done at not over 25 feet of altitude! The Navy pilots, who were supposed to be judging, were instead, snapping pictures a mile-a-minute, and must have filled in the score sheets later. On the touch-and-go, the old Fox, loaded up from idling during the approach, luckily caught on when the throttle was opened, and as it belched out a huge cloud of blue smoke, the Moth hauled out after gently rocking gracefully from one fat airwheel to the other as it gained airspeed. The long cheer after that touch-and-go and was undoubtedly the peak award of our modeling career. We



Initial control system was kit-built reed receiver with scratch-built servos based on Mighty Midget electric motors with clutch drives! Sprung hatches in outside skin gave access to switches.



Fuselage and tail framework. Fuselage sheeted with 3/32 balsa. Nylon covering over all.

placed third in Scale, and turned out to be the first recipient of the annual Sterling Models' Scale Achievement Award trophy.

The Moth picked up a 4th place trophy at the 1966 Chicago Nationals, and was then more or less retired. Everything but the fuselage is still intact to this day. The fuselage lost an argument with a shifting television set, when we U-Haul trailered it to Southern California in 1970.

CONSTRUCTION

The first step in construction is deciding what kind of a model you will build. For Sport Scale, you have everything you need on the drawings as shown. If you're going for Precision (AMA) Scale, the drawings are still good for scale outline, rib and spar spacing, etc., though the wing airfoil thickness was increased slightly to improve structural strength. Before getting too far into the finishing, however, you will probably want to do the usual researching for documentation, which will turn up details that can be added as construction progresses. As mentioned previously, the August 1958 Aeromodeller provides a great deal of information, if you can still find one. That is all we used for our presentation in 1961, 1965, and 1966, but things weren't as picky-picky in scale 10 to 12 years ago.

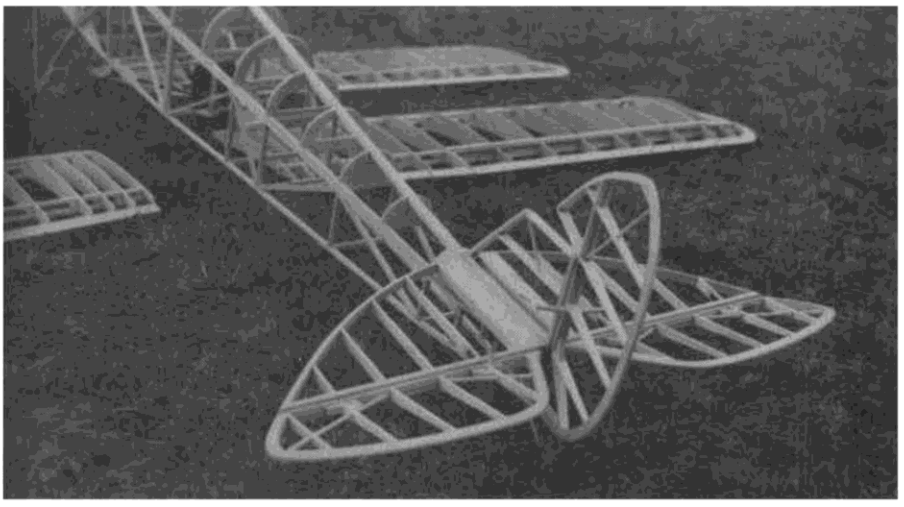
We'd venture to say that detailed building instructions for an airplane of this type are quite unnecessary. When we started building it back in 1958-59, we were looked upon as the typical nut who trys to build a B-17 with working windshield wipers for his first attempt at modeling and/or R/C. But let's just run through the basic parts and see what's in store. It's not really difficult . . . just big, and material consuming!

Our way of building airplanes has almost always been to construct the tail surfaces first. They are usually easy to put together, therefore getting them done makes you feel like you're making good progress. They also set the tone of the construction for the whole project, establishing size, amount of detail, and a feel for the quality you intend to impart to the entire aircraft.

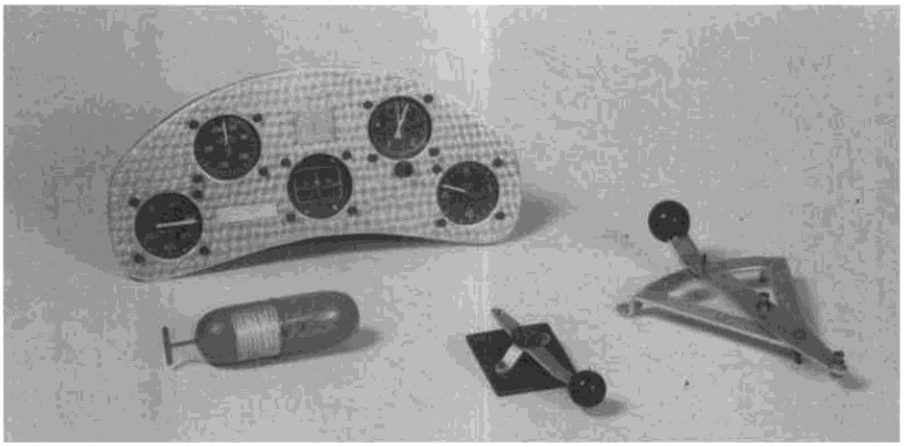
Just to prove that laminating is nothing new, maybe just in size, we used this method for the leading edges. Perhaps you might want to follow through with the trailing edges too, but as far as strength is concerned, fear not. The original model was covered with nylon, and that stuff really pulls!

The hinging system could certainly be simplified with today's ready-made products, but if your masochist tendencies dominate, the system shown certainly simplifies covering and finishing, with assembly coming last. Sections explain the set-up.

As the wings are supported by functional struts and rigging wires, there is no need to build them as though they were to be cantilevered. The joiners primarily locate the wings, and carry no bending loads. They will support the panels during rigging, but once the flying and landing wires become "strumming tight", the joiners carry sheer loads only, while the struts and wires do all of the work.



Tail surfaces are exact scale. Hinging system allows assembly after covering and finishing is completed. Deck is straight curve . . . can be covered with two sheets of wood.



Some cockpit goodies. Instrument panel was engine-turned using drill press and guide, with hard eraser for burnisher. Instruments behind a layer of plastic. Others include fire extinguisher, throttle, and elevator trim quadrant.

Hinging system for ailerons . . . provides neat and scale-like closed gap, also more efficient.

We made an aluminum rib template and punched 2 or 3 holes by driving a nail point into the template while resting it on soft wood. The resulting flash holds the pattern firmly in place while you cut out a rib. An hour or two in front of the T.V., with a cutting board in your lap, should get you a complete set of ribs.

All four panels are basically the same, except for obvious differences, such as left and right (!), and upper and lower (!!). Again, the ailerons are hinged in a fashion similar to the tail, and provide a nice closed-slot appearance . . . plus looking scale!

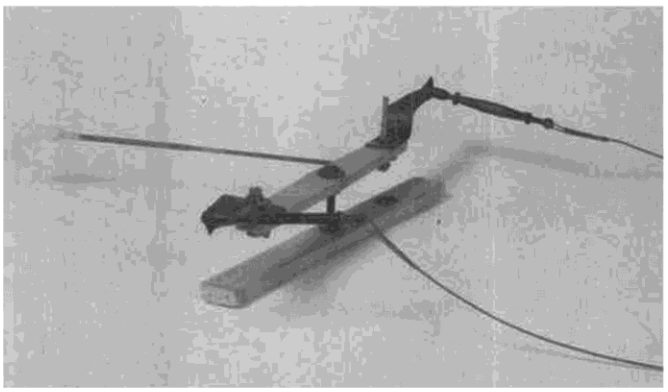
An interesting note on aileron differential: In keeping with our discussion in George Wilson's basic aerodynamics article in the March 1977 issue, De Havilland *really* went for differential. Cable from the control stick went out through the wing to a disc which was located flush with the bottom surface of the lower wings. The cable wrapped around the disc, in a groove, and ran back to the stick. Movement of the stick obviously rotated the disc. The aileron pushrod was mounted on the disc in such a location that full side movement of the stick would raise one aileron about 4 inches (at the trailing edge) and lower the other one by only a quarter of an inch! So much for down-aileron drag pulling the wing in the wrong direction!

To maintain realism, we would suggest using the aileron disc/bellcrank, but run a wire pushrod from the servo instead of a continuous cable! And speaking of servos, there's almost no way in the world to avoid using a servo in each lower wing panel for aileron control. Install the servo where indicated, with a removable sheet aluminum hatch cover on the bottom surface for access to the servo. Run the lead through a 3/8 inch diameter hole in the root rib, with a corresponding and matching hole in the fuselage side. The suggested ply hatch in the fuselage bottom provides access for connecting the leads to a "Y" connector from the aileron output of the receiver.

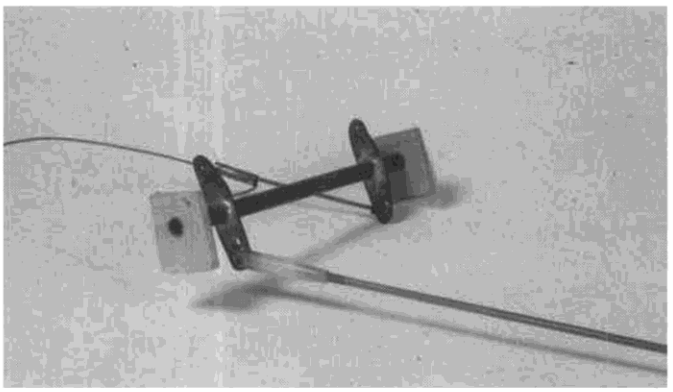
Incidentally, we flew our Moth with coupled ailerons and rudder, with rudder really doing most of the work. The ample dihedral makes ailerons almost unnecessary.

Now comes the fun . . . unless you couldn't resist temptation, and have already begun fuselage construction! After building the wings, you've probably already found a source of long wood, though there's nothing wrong with careful splicing. The main longerons of 1/4 square spruce are later covered with 3/32 sheet balsa, so any splice joints will be well reinforced. The ply doublers forward of the balance point need not be lightened by cutting away material, as the model will probably need nose ballast due to the long tail moment. We carried our own wet-cell nickel-cadmium starting battery just behind the firewall. It weighed about 11 or 12 ounces, and balanced the model perfectly. It was permanently wired to the glow plug through a hidden slide switch. It was usually left on during the whole flight.

After framing up, and before covering with sheet balsa, the various attachment and control rigging devices are installed in the fuselage. Even if you don't go for Precision (AMA) Scale, using the scale rudder bar and outside cables is the most convenient method of controlling the rudder. Back then, we used stranded control line leadout cable for the rigging and controls. The size required for adequate strength was way below scale diameter, so we simply selected the wire for scale appearance. Nowadays, the best material is nylon coated stranded steel wire, which can be purchased from Lou Proctor (Proctor Enterprises), or possibly your local deep



Sled-type rudder bar. Ends stick through slots in fuselage side and cables are on outside. Pushrod from servo operates bar.



Idler bar for elevator. Pushrod from servo rotates bar, and four cables (only one shown) go through fuselage skin to elevator horns.

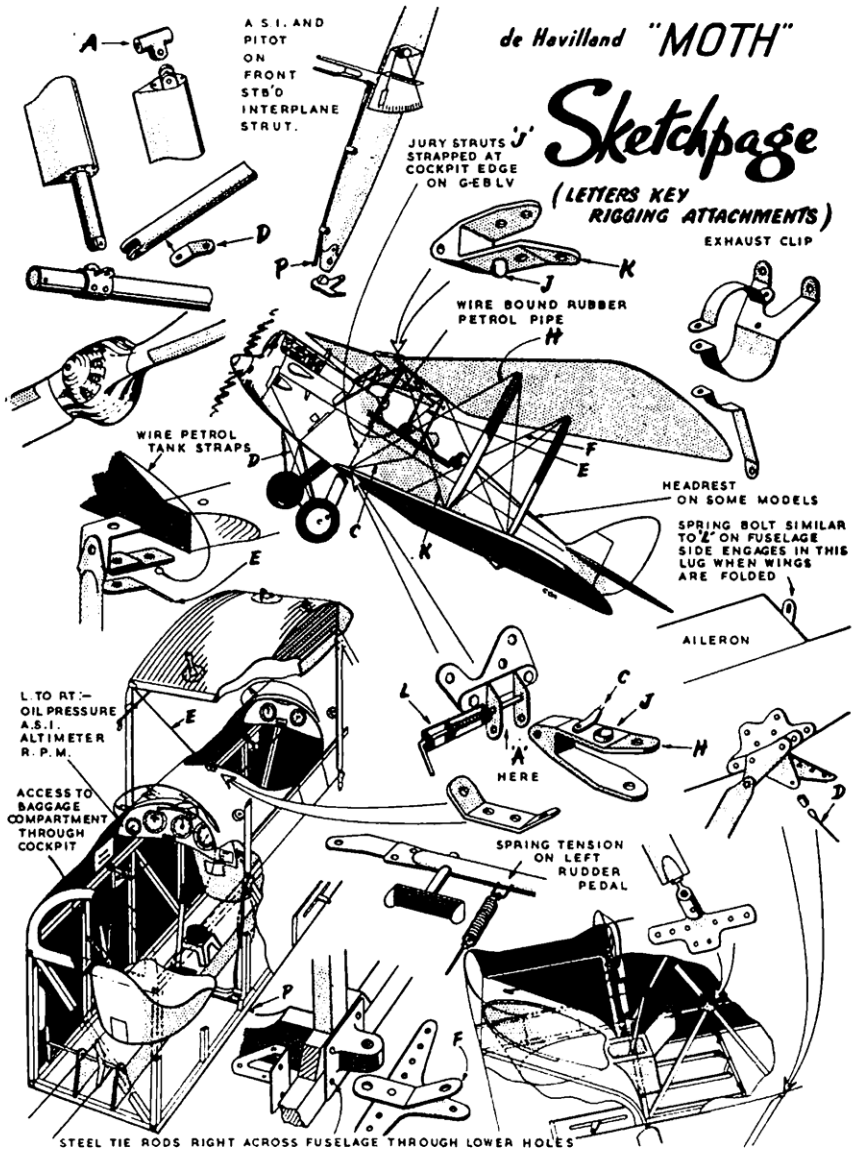
sea fishing equipment supply house. You'll be buying Lou's turnbuckles and other rigging fittings, so you might as well get everything from the same source.

The elevator pushrod is located low in the fuselage and leads to an idler bar across the fuselage aft of the rear cockpit. The idler bar carries metal horns to which the inside/outside elevator cables are attached. Having the pushrod mounted low permits unobstructed detailing of the cockpit . . . if you care to go that way. We had fun making bit sheet aluminum quadrants for the throttle and spring-loaded elevator trim. Lord knows if there ever was an engine-turned instrument panel in a Gipsy Moth, but ours had one!

We have redesigned the nose somewhat from our original model. The Forster 99 engine's crankshaft centerline is about a 1/2 inch below the mounting lugs, so the bearers were relocated to accommodate the normal crankshaft/mounting lug relationship of today's engines.

Speaking of engines, don't get the idea that because the Moth weighs 15 pounds and carries over 2400 sq. in. of wing area, that a large engine is needed. That old Fox .59 did a fine job, yet it would be eaten alive by even a moderate, present-day .60! The best choice is an engine that will comfortably turn a 14 or 16 inch prop. The Fox couldn't, and it wasn't until we dropped to a 12 x 6, that the engine could "get it on". However, a 12 inch prop looked like a toothpick on the nose of the Moth.

The rather large removable cowl was layed up from various balsa blocks, and then carved to shape. The inside was only hollowed out for clearances and to allow for good air circulation. A magnetic cabinet latch and a couple of locator dowel pins took care of holding it in place.



Reproduction of "Sketchpage" from August 1958 Aeromodeller gives many helpful details for the modeler who wants to add realism to his model.

Rigging the ship for a flying session takes about 15 to 20 minutes, once you get used to the system. After plugging in the wings, slip the struts into place and install the locking cross-wires. We used turnbuckles at the inboard end of the landing and flying wires. Once adjusted for proper alignment, safety-wire the flying wire turnbuckles, and don't ever loosen them. Install the flying wires first (the wings will sag slightly now, and the flying wires will slip into place easily). Now hook on the slackened landing wires, and begin tightening the turnbuckles until you get a little higher strumming note on them than you do from the flying wires. When adjusted, "safety-wire" the four turnbuckles with short lengths of Dacron string as used for 1/2A control line flying. Just cut 'em off when you're dismantling to go home.

Bob Lopshire built his Moth from Elmer Nowak's plans as published in FM some years ago. By coincidence, Bob painted his in the same medium blue and silver that we used. A pretty pair!

It's a good idea to install 2-56 bolts in threaded hardwood blocks that will pass through the wing joiner tubes and lock the wings on. Engine vibration and bouncing around on the ground might encourage the wings to slip out on their joiner tubes. As the rigging wires terminate on the root ribs, they do not prevent the wings from pulling away.

Unless you've already participated in the growing interest for ultra-large

Continued on page 67

R/C scale models, flying the Moth will be an experience you'll always remember with distinct pleasure. Flight is smooth and unhurried, so realistic in scale speed that you almost feel as though you're not really flying it at all . . . that the plane just happens to be going in the same direction that you're trying to urge it with the transmitter. Once you apply throttle and begin taxiing out to takeoff position, you are no longer dealing with a model . . . there is a quarter-size aircraft at the other end of the radio system you hold in your hands.

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