

MACH

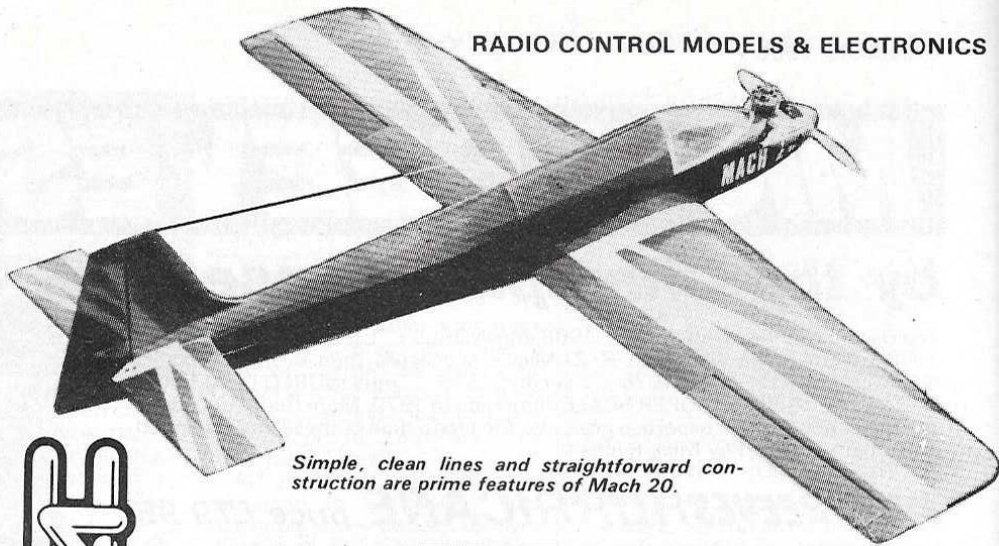
C

H

2

0

AN
EXCITING
42in. SPAN
AEROBATIC
MODEL FOR 0.20
SIZE MOTORS AND
2-4 FUNCTIONS R/C
SYSTEMS.
DESIGN BY KEITH HART



Simple, clean lines and straightforward construction are prime features of Mach 20.

FULL SIZE
PLANS —
£2.65
+ 30p&p

BEING AN AVID Club 20 pylon race fanatic, I was most interested when the Club 20 Association inaugurated an aerobatic class.

The rules at that time were extremely simple; no limit on size, weight, (under eleven pounds of course!), plus the fact that the restricted engine class of the pylon race rules did not apply. However the original was powered with an HB20 fitted with a Perry carb, which though not an exotic Schnuerle ported motor, has proved more than adequate for this design.

I had always fancied the 'Dirty Bird' shape; so bearing this in mind, armed with all the tools of my trade I set to and 'Mach 20' was born.

The design parameters I set myself were as follows:

1. Wing area around 350 sq.in.
2. Maximum weight of 2.75lb.
3. Clean functional lines.
4. Upright engine for ease of starting and maintenance.
5. Thinner wing sections than usual to reduce frontal area and thereby give better vertical manoeuvre performance.

Other armchair aerodynamicists may scoff at the wing sections used as outlined in (5), thinking that the LE is too sharp and the sections too thin, thinking that such sections can only lead to sudden wing dropping and tip stalling. However, after flying 'Mach 20' now for two years this problem has not been encountered.

To obtain the lower weight desired, all the balsa to be used is medium soft to soft. Where maximum strength is required then spruce, ply and hard balsa have been specified.

So taking balsa, ply, knives, glasspaper and cassette deck in hand to the workshop I commenced with:

Wings

I always build these first, reasoning that interest tends to wane (with me anyway) as the project progresses, and the accurate nice free flying model that you require to make the schedule easier is totally dependent on an accurate warp-free wing.

Prick through each rib shape from plan. Some experienced modellers might shudder at this and think maybe the sandwich method ought to be used. I have never agreed with this, as it tends to give incorrect forms at certain stations which must be doctored with the sanding block afterwards.

Pin down the $\frac{1}{8} \times \frac{1}{4}$ in. (3 x 6mm) spruce spar and add ribs using scrap balsa to pack up rear end, ensure ribs are upright. Add $\frac{1}{16} \times 1\frac{1}{2}$ in. (1.5 x 40mm) T.E. sheeting, $\frac{1}{16} \times \frac{3}{8}$ in (1.5 x 10mm) false leading edge and top spar.

Cut away the ribs in the aileron area and add $\frac{1}{4} \times \frac{3}{4}$ in (6 x 18mm) false T.E. Cap strip

ribs and sheet centre sections and leading edge. Remove the structure from the board and invert.

Important. Ensure at this stage that when pinning or taping down no warps are apparent, because after the lower sheeting and cap strips are added it becomes extremely difficult to remove them. Add scrap balsa infill for wing location dowels and sheet the leading edge. Cut out W1 to W4 locally to accept the $\frac{3}{8} \times \frac{1}{2}$ in (10 x 12mm) hardwood U.C. mount blocks (if required) also add $\frac{1}{32}$ in (0.8mm) ply reinforcement to these ribs.

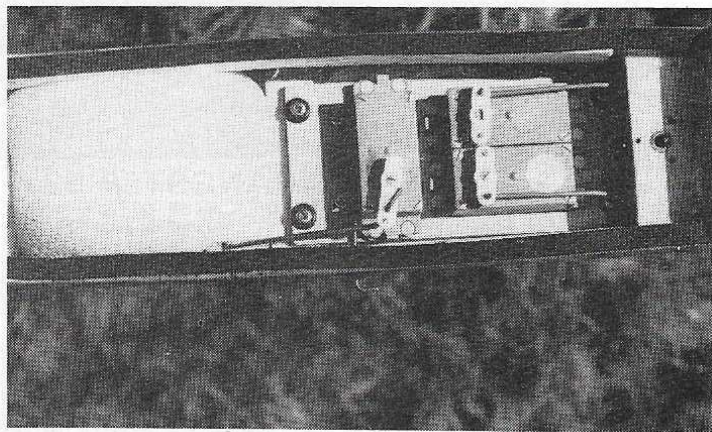
Cap-strip ribs and cut T.E. away locally in aileron area and insert $\frac{1}{4} \times \frac{3}{4}$ in (6 x 18mm) aileron L.E. Add riblets in this area plus reinforcing blocks for aileron horn fixing.

Determine bellcrank position and add $\frac{1}{8}$ in (3mm) ply support plate. After sheeting the pushrod outlet area, cut slots for 16swg pushrods.

Cut through T.E. in W6 area and sheet T.E., cut holes in each rib to accept pushrod from servo and sheet the centre area. After leaving the adhesives to thoroughly dry remove from board.

Sand L.E. sheeting flush with false L.E. and add $\frac{1}{4} \times \frac{3}{8}$ in (6 x 10mm) L.E. and soft wing tip blocks.

Sand each wing half all over taking



Left: any of the popular .20 size motors will provide sparkling performance; Keith Hart chose the HB 20. Above: room for three servos in the fuselage plus one for ailerons in the wing - a minimum of aileron and elevator control is required.

especial care that the wing root ribs (W1) are a good fit with one another.

Fix down both wing halves inverted on the building board smearing each root rib with five minute epoxy. Pack up the T.E. so that when sighted through no warps are apparent.

Remove from board and cut away the centre section as required to accept the servo to be used, line with scrap balsa.

Use glassfibre tape and either polyester or epoxy resin to reinforce the centre section. Cut through the top sheeting in the aileron area and detach the ailerons. Sand the aileron L.E. and mark R or LH. Add the bell-cranks, sand all over, and place to one side.

Fuselage

Cut two fuselage sides from matched medium soft 1/8 in (3mm) sheets.

Add 1/32 in (0.8mm) ply doublers using contact adhesive (ensure you have one of each hand!) Add wing saddles. Next add 1/8 x 3/8 in (3 x 10mm) tailplane doublers. Position F3, F4 and the wing nut support plates vertically and add opposite side, make sure that top edges of the sides are in line and not twisted.

Add F1, F2, F5, F6 and sternpost. When fixing F1 a slow setting epoxy such as 'Araldite' is recommended. Fix 3/8 in (10mm) triangular fillets in place in the nose area (not forgetting the area immediately behind F1) to fuselage sides.

Add 1/4 in (6mm) fuselage top and 1/8 in (3mm) upper decking. Soft balsa must be used for this area. Epoxy wing nut support plates in position.

Cut out fin rudder and tailplane from soft 3/16 in (4.5 mm) sheet also the tailplane tips which are fixed in place prior to sanding.

Sand fins, rudder and tailplane to the sections shown on the plan leaving the centre area flat for fixing to the fuselage. Sand both tailplane and fin seating area in

the upper decking of the fuselage and fix the tailplane in position with five minute epoxy.

Add the fin ensuring squareness with tailplane. (To make sure tailplane is square with fuselage centre line in plan view, I always drive a pin into F1 on the centre line and measure from each tailplane tip to this pin).

Cut down a commercial cockpit canopy to fit (original used 1 1/2 in. *Micro Mold* type) and prior to fixing paint the cockpit area matt black.

At this stage if you are considering using an undercarriage, drill and position saddle clamps as required.

Make up all pushrods and cut slots in fuselage sides for pushrod outlets, ensure these are 'staggered' when looking in plan view.

Covering and finishing

The original was covered and trimmed in 'Multikote'. Hinge all control surfaces with commercial nylon hinges or use mylar film and cyanoacrylate in positions.

Screw all control horns in positions and link up pushrods. Liberally fuel proof engine bay and tank areas.

Fit the engine and tank and connect up the plumbing not forgetting a fuel filter.

Install radio equipment and if C of G is not exactly as shown adjust position of servos and battery as required.

Flying

As outlined earlier the 'Mach 20' is completely vice free. So if you are a reasonably experienced flyer and everything is set the right way round, start-up!

The original has been flown extensively without an undercarriage, so obviously a 'pressganged' friend is required, the method of launching that has been used, is to rest the model in the left hand under the wing centre and grip the rear fuselage with the other.

A smart heave with engine singing will send 'Mach 20' surging heavenwards. Trim, if required, for hands-off performance and then enjoy yourself.

Keep the weight down by careful selection of materials and sparing use of paint and the performance bonus will be well worth the effort. Keith used heat shrink film for this attractive (and striking) colour scheme.

