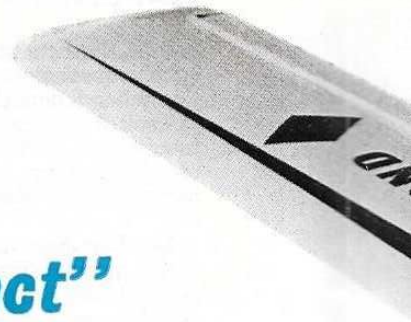


for fast, smooth thrills build this 52" span fun aerobatic "compact"

DIAMOND

by TONY WRIGHT

GIVEN a few basic criteria, I have always felt that a model which looks right, flies right. The criteria in this case were that it must have a wing to support the weight, a tail to hold the wing at the right angle, and something to join them together. After that it was merely a case of making a working drawing to test the 'design'. The original performed to my satisfaction, so the design was not changed except for a few minor construction points.

Only slightly contrary to what I said earlier (!), points to which I paid particular attention are as follows—

1. *Large tank bay*—I used the 10oz Powermax slant-front tank. This tank gives about 7½ minutes but I use an OS 40FSR with an ED pipe, a combination not guaranteed to improve fuel economy. However, a large tank is rarely a disadvantage, and the space is there.

2. *Large ailerons*—this allows you to set the feel as you wish. With the maximum movement shown on the plan the model rolls fast, but can easily be toned down. It is not so easy to increase a roll rate, so plenty was designed in.

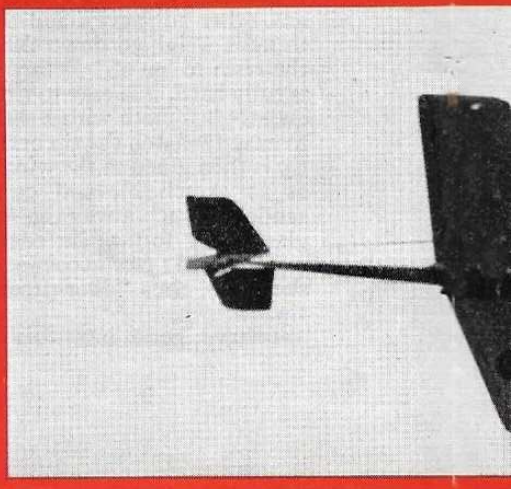
3. *Large fuselage side area*—this, together with the large rudder, really helps with manoeuvres like the four-point and slow roll, but do make sure you get as much rudder throw as possible. I always use a closed-loop linkage for the rudder and details can be seen in the pictures. The large rudder also helps with stall turns; in the figure "M" it is useful to have your model go the same way as you moved the stick!

Diamond was designed with "schedule" practice in mind, and it does this very well (with reduced surface throws to make it softer). The other point I would stress is to make sure that the wing has a slight positive incidence when sitting on its wheels. This will ensure a smooth lift-off, but watch your speed on landing or it will bounce for sure. It can be slowed down very well for landing though, and main-wheels landings are easier than you might think. If you fly off grass you may prefer to lengthen the undercarriage slightly, and increase the main legs to 8g, but for tarmac the design is fine as shown on the plan.

Finally, do make full use of the centre and reference lines as detailed on the plan. A little work with a fine line felt tip pen (not a ballpoint) will pay off when you fly it.

CONSTRUCTION

I like building, but I prefer flying. If you are pushed, the whole thing can be built and finished, including the 48-hour Tufkote waiting time, in two weeks. (This is using a foam wing, and also involves going without a certain amount of sleep, food, and other such non-essentials!) All balsa should be pretty soft; the strength of a model is in its construction, not weight of wood.



for .40 power!

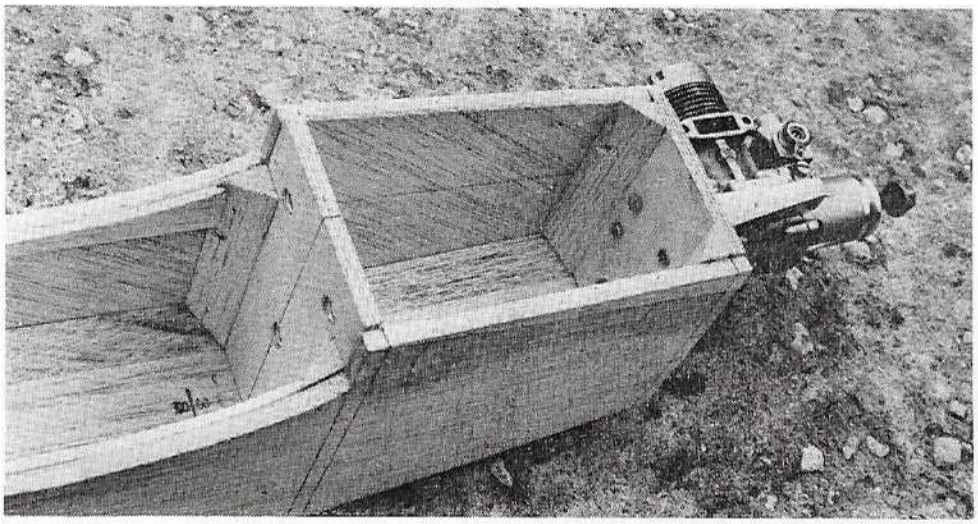
Fuselage

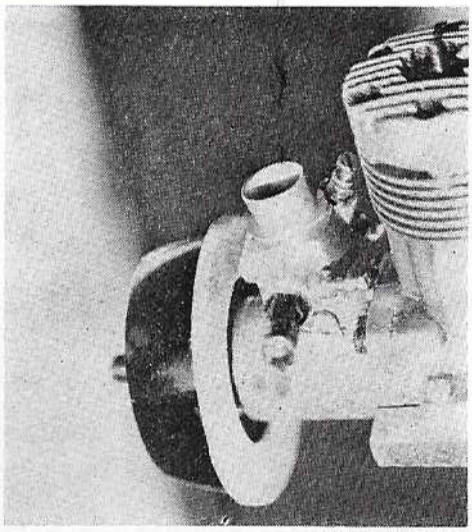
Cut the sides from $\frac{3}{16}$ × 4in. sheet; the wood left over under the tail should be glued under the front between F1 and F2 to give the necessary depth. Make sure you mark the reference line and the doubler line. Mark the former positions and reference line on the edges of the cut sides. The doublers should be glued to the side using contact glue. One and a half sheets of 4in. wide $\frac{1}{16}$in. sheet will be required. The glued sheet is pressed onto the fuselage side starting from the rear, cutting and doing the next bit; this is far quicker than cutting doublers to the exact shape on the plan. Trim the edges afterwards and sand the doublers at the rear to give a smooth line for the longerons.

Since formers F2 and F3 are not the same width, a jig is required to glue the two sides and F2/F3 together. This is simply a piece of $\frac{1}{2}$in. sheet cut to the inside dimensions of the fuselage. The parts are assembled inverted on the plan by pinning the jig sheet in position, pinning the sides to the jig sheet and gluing the formers in position. Use white glue, not epoxy, as the adhesive needs to penetrate the wood. While this is setting cut the rear fill-in block. Make this oversize vertically and horizontally. It can be trimmed after the tail and fin are glued in position. Add this block and F1 at this stage, checking accuracy with the centre-lines and a square. The $\frac{1}{4}$ × $\frac{1}{4}$in. longerons can now be added and the bottom $\frac{3}{32}$in. sheet (cross-grain); also the $\frac{1}{2}$in. triangular behind F1.

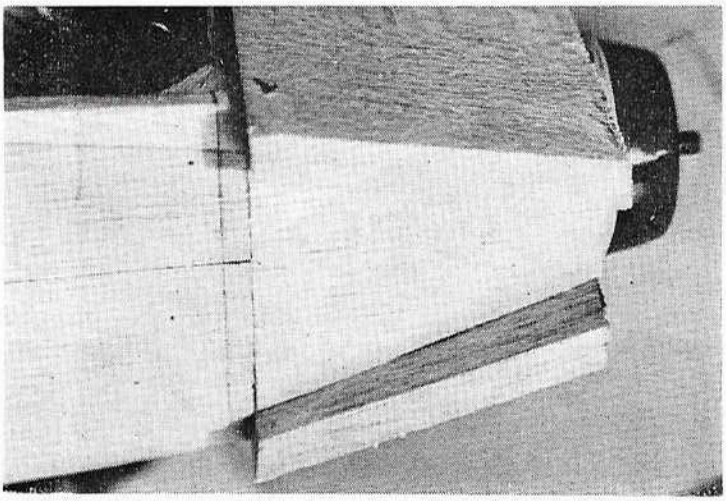
It's usually at this stage that you realise that you forgot to drill the engine-mount fixing holes and the tube and cable holes for the throttle and steering. That, I'm afraid, is your problem!

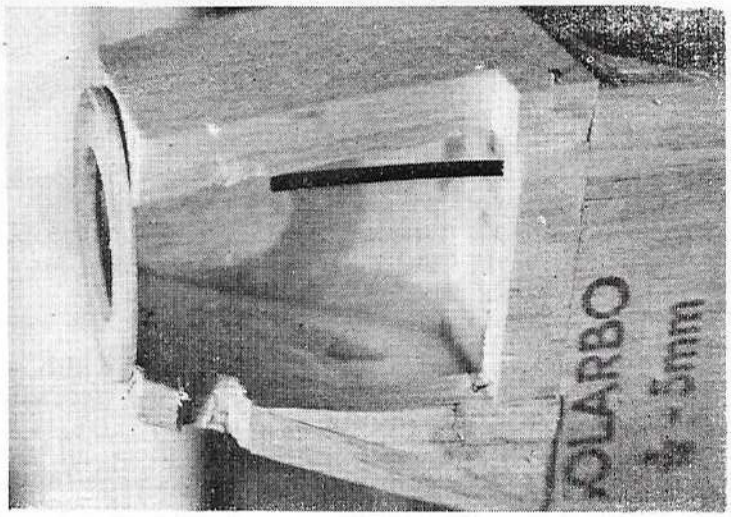
Remove the assembly from the board and fit the top $\frac{3}{8}$in. sheets. After this the cowl may be built (with the engine in position),





The spinner ring is tacked to spinner (with cyanoacrylate), with engine in place, ready for basic cowl assembly.





Top: front underside of fuselage showing triangular fillets and wing doublers added to the basic box structure. *Above and right:* cowl assembly before carving and sanding to contour.

triangular fill-in added, and wing doublers and wing bolt plate fitted. The servo mounts are now added, and receiver and battery compartments constructed if required. The throttle and nosewheel linkages are next laid in, the bottom hatch cut, and so on. A false ceiling should be built inside the tank bay to position the tank at the correct height.

One final point—do not glue the tailplane and fin in position until the wing has been "dowelled" and bolted; only with the wing bolted in position can the rear surfaces be accurately aligned.

Wing—built up version

Care in the initial stages of the wing construction will ensure an accurate wing. The leading and trailing edges should be cut 1in. wide ($\frac{1}{2}$ and $\frac{3}{8}$in. respectively) and a centre line drawn along the 1in. wide face. Strips of hardwood about $1\frac{1}{4}$in. square should be screwed on to your board with the plan beneath. The leading and trailing edges may now be pinned to the hardwood. The ribs are cut by the "Sandwich" method and the $\frac{3}{16}$in. doublers glued to ribs W1 to W4. The $\frac{3}{16}$in. may be trimmed to the rib shape after the glue has set. Cut the u/c block slots in the ribs to suit the hardwood you have. Centre lines should be marked on the edges of the ribs from the templates and, after the two marks have been joined (with the fine-line felt tip again), the ribs are assembled to the leading and trailing edges, using the centre lines. Add the spars and sheet the whole top, butting the sheet to the leading and trailing edges. Remove when set and add the bottom spars, u/c block and $\frac{1}{16}$in. sheet, leaving a gap at the centre section front so that the dowels can be glued. The dowel filler block should be added now.

Build the other half of the wing and join them, using epoxy or white glue ($\frac{3}{4}$in. dihedral under each tip). Razor-plane the leading and trailing edges and add the tips. Add the trailing edge extension with the torque rods and tubes in position and epoxy the $\frac{1}{8}$in. ply wing-bolt plates on the underside of the wing, after trimming the extensions with the plane. Hold the wing firmly and accurately on the wing-seat and "twiddle" a $\frac{5}{16}$in. drill through the holes in F2 to drill the leading edge of the wing. Cut two dowels and epoxy them to the filler block in the wing. Do this with the wing on the seat to ensure accurate alignment. Now drill the wing bolt holes.

With the wing bolted in place the tail, fin and sub fin are next added to the fuselage.

Fill in the hole over the dowels and cut the servo bay. Cover the centre section of the wing with lightweight glass cloth and resin—try to keep the resin within the fuselage side lines, otherwise the wing will not seat properly. In fact it is a good idea to remove some material from the seats at this stage to allow for covering and wing-seating tape thickness. Construct the wing fairing with the wing *in situ*. Basic construction uses $\frac{3}{8}$in. cheeks (cut to shape with the pieces cut out of the sides) and $\frac{3}{16}$in. sheeting. Use 1mm ply at the front adjacent to F2. Leave sufficient clearance at the rear (about $\frac{1}{16}$in.) to allow for wing removal.

Wing—foam version

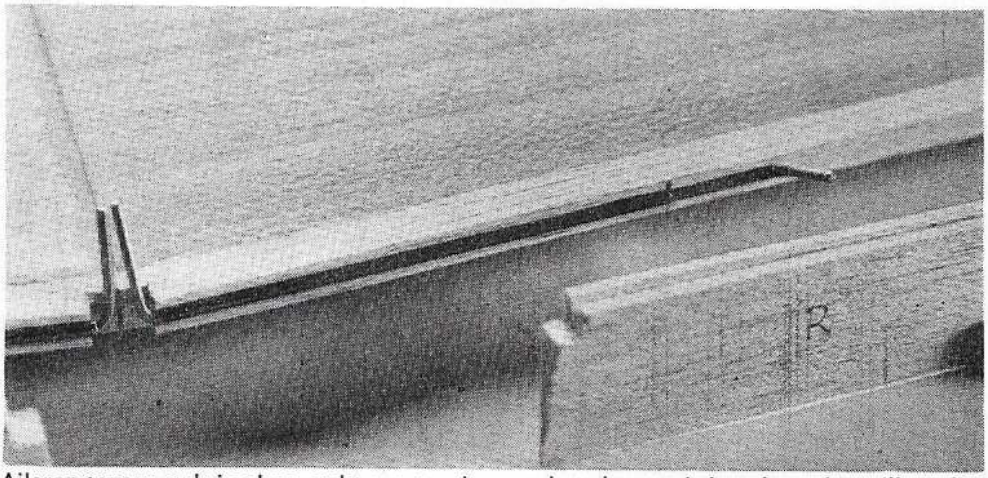
Foam wings are quick, cheap and easy if you have your own cutter. The templates shown on the plan

Designer Tony Wright did some high-speed touch-and-go passes for us (left) which showed Diamond very smooth *and* fast.

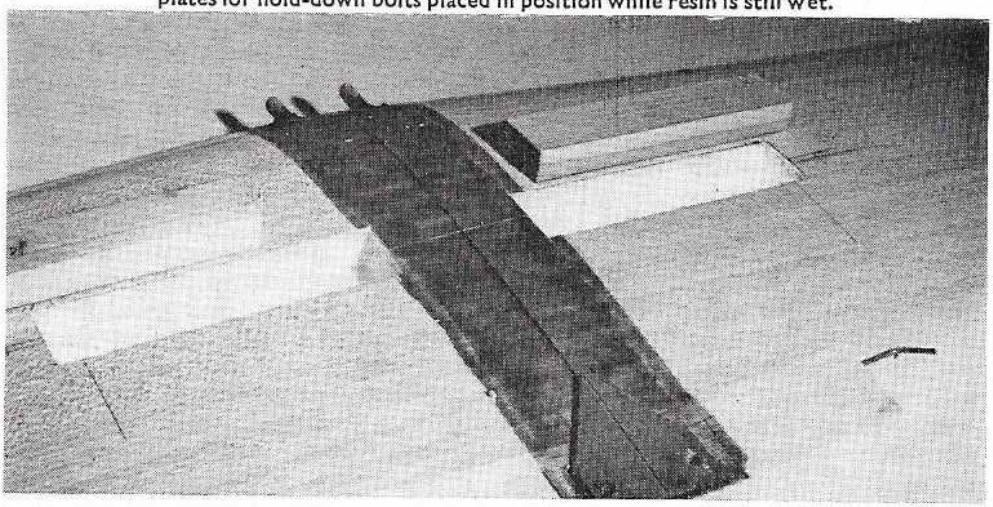
assume a 1mm veneer covering and the wing uses the same l.e., t.e. and aileron sizes as for the built-up version. Join the veneered panel before adding the leading and trailing edges to ensure accurate alignment, but add them as soon as reasonably possible after joining. The same goes for the tips; it is possible for the veneer to lift at the edges and the balsa surround will make sure they stay down. Use "Copydex" thinned about 10 per cent (with water) for the veneer/foam and liberal quantities of white glue for the surrounding balsa.

Tailplane and fin, etc.

The tailplane is constructed from $\frac{1}{2} \times \frac{1}{4}$in. flat on the board, followed by the $\frac{1}{16}$in. top sheeting. Remove from the board when set, sheet the bottom and pin flat again until dry. The elevators, fin, sub-fin and rudder are cut from soft $\frac{3}{8}$in. sheet. Lay in 1mm ply for the rudder and elevator horns after planing and sanding these items to shape.



Aileron torque rods in place, and t.e. extensions ready to be epoxied to the main trailing edge. *Below:* foam wing version, showing resin and bandage on the centre section wing join. Note ply plates for hold-down bolts placed in position while resin is still wet.



Finishing

Plane and sand the whole lot until all the edges are gone, but don't overdo it on the fuselage corners; about $\frac{1}{8}$in. to $\frac{3}{16}$in. of the triangular visible is fine. Everybody has his own finishing methods but, although weight will be saved by using heat-shrink film, in my opinion it is not as durable as a full dope/paint/Tufkote finish, which I recommend. Both the prototypes weighed around $5\frac{1}{4}$lb. with Fleet Radio, OS40FSR, ED pipe and a cellulose finish.

Installation

Depending upon the engine used, the battery may be mounted in front of or behind the receiver to achieve the required balance point. If the battery is behind the receiver, fit a solid bulkhead in front of it—for obvious reasons. Keep the servos low, and forward in the fuselage to give adequate clearance for the aileron torque-rods. (I mount the switch on the back of F2 with a rod through the fuselage side).

Flying

If you are like me, you always turn to this bit first when reading a review. Well sorry, but I have nothing startling to say. The *Diamond* flies exactly as you might expect—neutrally stable but responsive, and with a good turn of speed, depending upon the engine. It will fly any manoeuvre in the current FAI schedule, although the square figures are a little tricky because of the speed. Landings are easy, provided you are aware that the elevator is the speed control and the engine the rate-of-descent control. Incidentally, there is a fair amount of weight on the nosewheel and deliberately so—it's all very nice having a model which sits on its nosewheel *or* tailskid but try turning out of wind on tarmac in a Force-3. You will be in for a long walk.

Two or three weeks from now, then, I will expect to see lots of *Diamonds* in the sky . . .