**FOAM FREIGHTER**

Terry Adams' successful indoor/outdoor twin 'Bristol Wayfarer' features a single rubber motor...

**Introduction**

I have always fancied building a free flight twin with synchronised props to completely remove the problems of asymmetric thrust decay, and tricky winding and launching techniques. My thinking initially went along the lines of a chain of ultralight spur gears spread along a main spar driven from a single rubber motor - the system seemed OK in practice, but soon drained my stock of gears after only 3 inches.

This idea was dropped in favour of the system used with this model - I will not claim to be the originator of the design, as others claim to have seen something similar in old Aeromodellers - but nobody has seen them fly.

A quick rummage in the broken servo drawer revealed three 2nd reduction gears from a Futaba 135 micro servo. There is nothing special about these and I am sure that many model shops, when persuaded, could find something similar in the broken servo dept (just keep to the same (ish) diameter - and very light).

**Construction Notes**

This was my second foam model using the Dow Corning Floormate 200 blue foam, so those with more foam experience should be able to improve the performance further.

**Fuselage**

Construction starts with the fuselage which should be shaped, and finish sanded to perfection. It is then cut in half along its length, along the motor datum line (producing a top and bottom), and both halves hollowed out to a thickness of 2-3mm at the front, reducing to 1.5mm (or as thin as you dare) at the rear. Put the two halves away until later.

**Wings**

Cut two blanks to rough oversize outline and shape the upper surface using 180 grit wet and dry. Trim to final shape and finish sand using 800 grit or finer.

Place the wing upside down on a spare piece of foam and carefully hollow the underside to faithfully reproduce the undercamber as shown on the plan - this is most important, to ensure a slow predictable flight.

**Tailplane and Fin**

Prepare a thin slice of foam and work down to a finished thickness of 1.5mm, finish sand and cut to shape.

**Nacelles**

Prepare in the same way as the fuselage, but keep an eye on the thickness and weight at all times.

**Gearbox**

Refer to the drawing for details on construction, use the lightest wood at all times and a minimum of adhesive (PVA - no cyano please). The shaft holes in the gears and props are larger that the wire diameter, so make up some tin paper bushings (just like EZB wing post tubes) to accurately remove any slop that could affect the gear mesh.

Assemble the gears to the fine piano wire drive shafts - this wire must be the correct diameter, as one gauge the either way will result in either drive shaft wing up or a (very) tail heavy model. For each thrust bearing use a pair of micro Teflon washers and a tiny steel disc, cut from a beer can and polished.

To achieve the correct end float at the gears, assemble the gearbox with a thin paper washer under the soldered washer, and remove when the soldering has been completed. The shafts must have just the smallest end float, to avoid the gears jumping out of mesh.

At this stage leave the prop ends of the wires extra long.

**Assembly and gearbox installation**

Glue a small strip of 1/32" balsa onto the fuselage side inside edges, just where the gearbox fits, to distribute the motor loads evenly into the foam.

Glue the wings onto the top half of the fuselage and check the dihedral - when dry, fit a dihedral brace of 1/16" balsa as shown on the plan.

Accurately glue the upper nacelles only to the wings and check alignment. Fit the prop nose bushes only to the nacelles and leave to dry.

Feed the shaft support bushes onto the drive wires and insert the wires into the prop bushes - then accurately locate the gearbox and glue into place in the fuselage shell.

When dry, the wire support guides can then be fitted in the nacelles very carefully and, using balsa packing where necessary, ensure perfect thrust-line alignment.

The left shaft is set at 0° side and down thrust, while the right side is set to 1.5° left thrust - these must be perfect.

When the glue is dry, very carefully fit the lower nacelles using only a tiny amount of adhesive, and finally glue the lower fuselage half.

**Finishing**

The prototype model was spayed very lightly with Humbrol water-based acrylic paints, thinned 50-50 with water, to achieve the Silver City colour scheme depicted.

The windows and other detail were inket printed onto adhesive film and cut and stuck in place.

**Flying**

The model when built to the correct weight of 15g, or less, requires very little rubber to achieve a successful performance. Start with a 18” loop of 0.65” FAI rubber, loosely wound to take up the slack, and check that the centre of gravity is set per the plan position.

Lubricate the rubber well and insert a cocktail stick through the gearbox access hole to lock the rubber hook.

Start by winding 300 turns to check the gearbox and drive for correct operation. If all is OK, pull the cocktail stick and launch slowly (this model flies very slowly).

**Trimming**

If the wing incidence is correct and the thrust-line is accurate the only trimming that will be required will be tiny amounts of rudder for a left-left circuit, and tiny amounts of plasticine for stall correction.

When satisfied with the trim, gradually increase winds up to about 1000 turns. With the correct rubber thickness, the model will climb to about 15-20 feet, cruise, descend and land. The prototype is such a good flyer, that it has only hit the wall once in hundreds of flights.