**The model on the cover!**

## BRIAN PECKHAM'S

# SWITCHB

THERE is something about a biplane that I cannot resist and, having built and flown a number of bipes, I felt they all lacked that snap that I was looking for—especially after watching the Rothman's *Pitts Specials* on several occasions. I was determined to reproduce that sort of performance in a model and, to achieve this, a clean design with the correct incidences, wing sections and loading was needed. The previous models I had flown had had ailerons on the lower wings only, and it therefore seemed essential to have them on both upper and lower wings, to achieve the sort of roll rate I had in mind.

*Switchback* has this feature—and the roll rate is very rapid.

Biplanes often have a tendency to "zoom" or balloon and, to kill this, I have used negative incidence on the upper wing and positive on the tailplane, with the lower wing—and the engine—at zero. Probably most important of all, however, the c.g. is in the optimum position.

The general configuration of *Switchback* is a mixture of several sporting biplanes, with the rear deck and side stringers added to the fuselage to impart that slight touch of individuality.

If you've read this far, you're probably on the way to being hooked, so let's get down to the nitty gritty, with the boring bit. . . .

### CONSTRUCTION

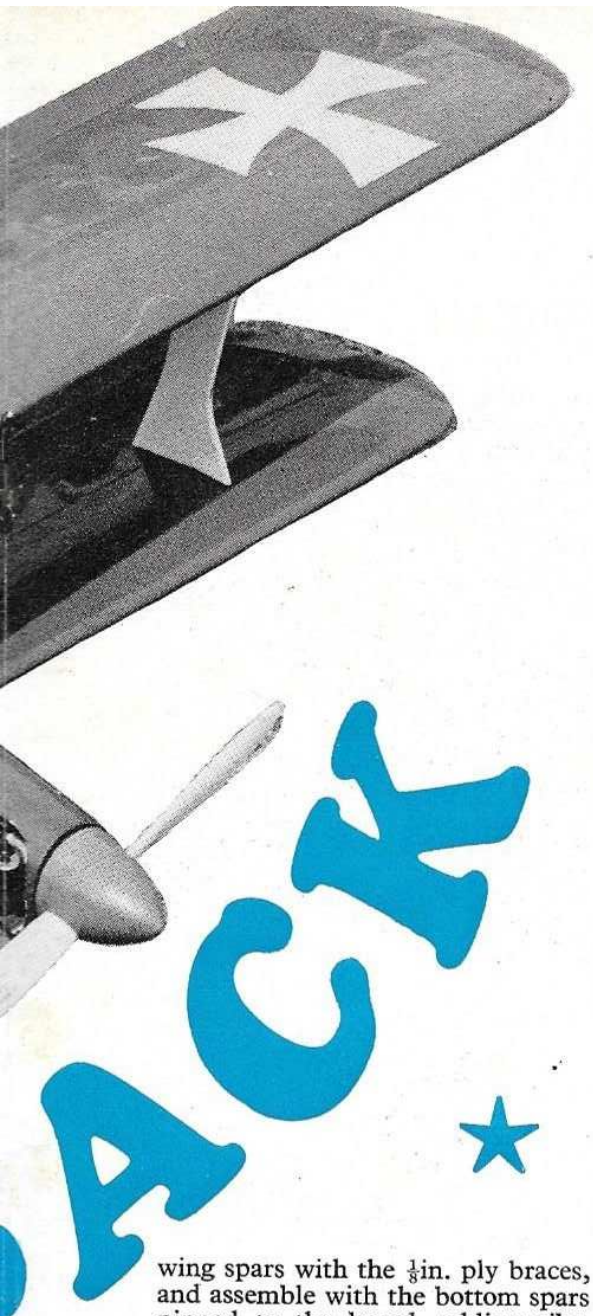
**Wings**

*All these notes apply to the upper and lower wings, except where noted.*

Make a basic rib templete to W1 from $\frac{1}{16}$in. ply, and cut out the required number of ribs (11 × $\frac{1}{8}$in., 28 × $\frac{1}{16}$in.), then make additional cut-outs as shown; in addition cut four false ribs from $\frac{1}{16}$in. ply for the strut mountings. Leave the slots for the $\frac{1}{4}$in. ply upper wing mounting plates until after assembly.

The upper wing is built flat on the board, the lower wing being built one half at a time.

Join both upper wing and lower



# really sporty— for your forty!

wing spars with the $\frac{1}{8}$in. ply braces, and assemble with the bottom spars pinned to the board, adding ribs, packing up their trailing edges with $\frac{1}{4}$in. sq., making sure that all is true and square. Add the top spars, leading edge, trailing edge spar and sheeting. Before fitting the top leading edge sheeting to the upper wing, cut out and fit the 1 × $\frac{1}{4}$in. ply mounting plates for the centre-section strut fixings.

When dry, remove the assembly from the building board and fit the interplane strut mountings, consisting of $\frac{1}{16}$in. ply false ribs with $\frac{1}{8}$in. hard balsa packing between for distance pieces. Ply mounting tongues are then fitted to the underside of the upper wing panels. Install the aileron bellcranks and linkages on $\frac{1}{16}$in. ply plates, to the lower wing or, alternatively, use tube-and-cable linkages, whichever preferred. Fit the leading edge and trailing edge sheeting, followed by the centre section sheeting and cap strips.

Cut the tip outlines from $\frac{3}{16}$in. sheet and fit them in position, adding soft block for their leading and trailing edges, and sand to final shape when set. Cut out the servo box, in the lower wing, adding $\frac{1}{16}$in. ply reinforcing, and fit the $\frac{1}{4}$in. dowel to the leading edge. Make the cut-out in the upper wing centre section trailing edge, and line it with a strip of 3/32in. sheet with the grain vertical, as shown, to give a stiff "edge."

Cut the ailerons from the trailing edge to the outlines shown, making allowances for clearance—and t.e. and spar sheeting. Add the $\frac{3}{8}$in. riblets in the positions shown for horn mounting, sheet the leading edges of the ailerons (cut back at an angle) and the rear spars of the wings, with hard $\frac{1}{16}$in. sheet. My ailerons were top hinged, with film and, of course, if hinges are preferred, then block will be necessary to take them. Make up the aileron horns as shown, from $\frac{1}{16}$in. paxolin —or cut from commercial horns— and slot them into the ailerons. (They are best fitted after covering, of course).

**Fuselage**

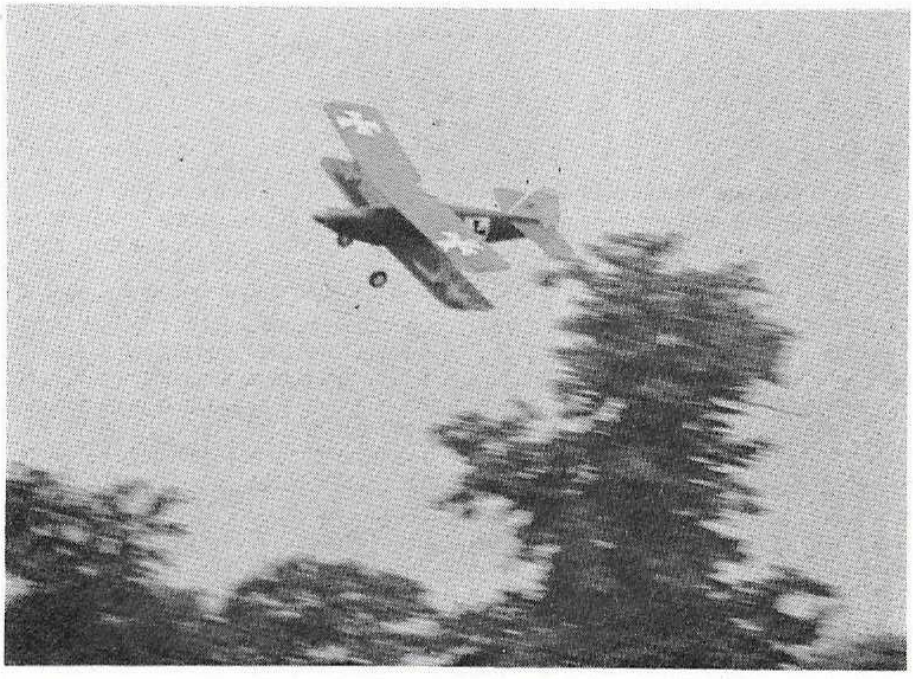
The formers should be cut from ply or balsa, as indicated. Assemble the engine mount to former F2 with 6BA bolts and blind nuts. Make cut-outs in F2 and F3 to suit the tank to be used. Leave the stringer slots in F6-F9 until after assembly, as these formers will otherwise be vulnerable.

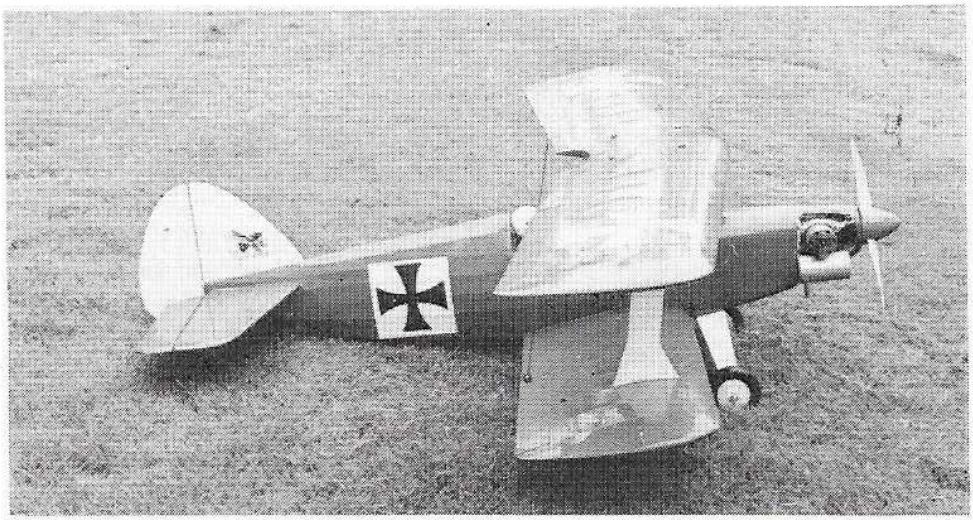
Make up the fuselage sides from $\frac{1}{8}$in. hard(ish) balsa, adding the $\frac{3}{8}$ × $\frac{1}{8}$in. keel stringer to the top; the $\frac{1}{16}$in. ply doubler is attached using contact adhesive. If it is attached at the nose first, and the sides and doubler then rolled together, this simplifies pre-bending the sides to conform to the plan-view curvature.

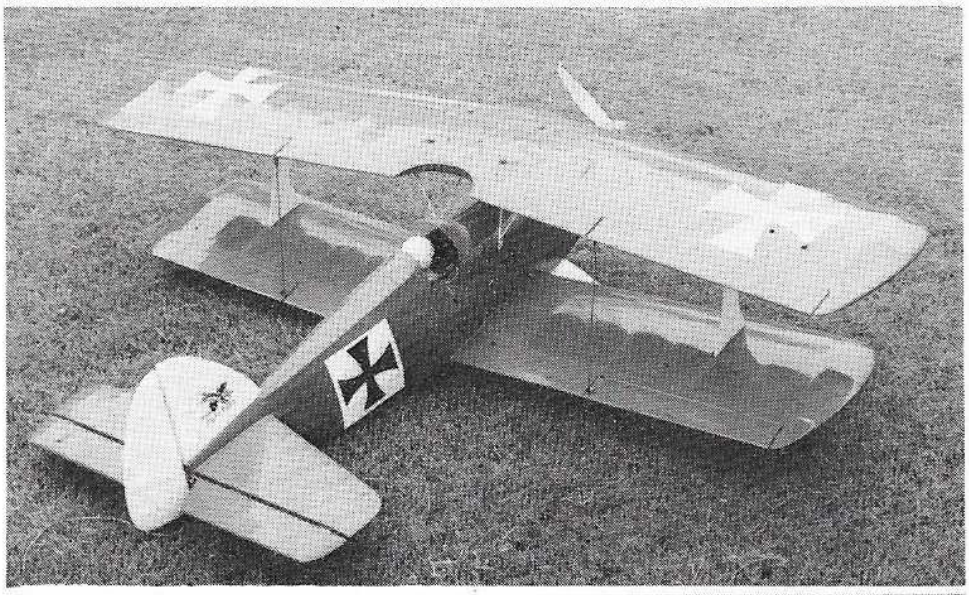
Assemble the fuselage sides to formers F2, F3 and F4 with epoxy, checking alignment, then follow with F5 and F6, pulling the sides into the rear. Finally add F7, F8 and F9. Fit the $\frac{3}{8}$in. triangular strip to the underside of the nose, between formers F2 and F4, and across F3 and F4. Fit the bottom rear sheet, cross-grain, and follow this with the $\frac{1}{8}$in. sheet nose doublers to the line shown, and $\frac{1}{4}$in. sheet, cross-grain, under the nose. Slot formers F6-F9 for stringers at this point, and fit the stringers in place.

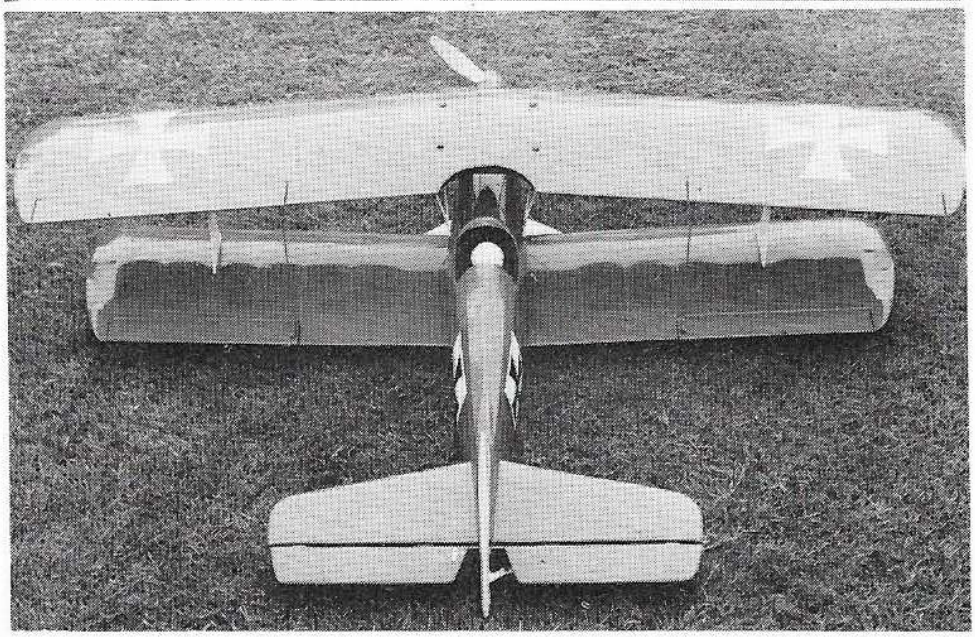
Make up the centre-section strut bearers with 12g. brass tube, bound with thread, and epoxied to $\frac{1}{4}$ × $\frac{1}{2}$in. hardwood. Cut slots in the fuselage side and epoxy the units in place, flush with the sides. Add the $\frac{1}{4}$in. sq. longeron, followed by the $\frac{1}{8}$in. sheet decking—in two pieces, steamed to shape. Alternatively, if preferred, one may use $\frac{1}{8}$in. strip planking. Note that the decking overlaps the fuselage sides by $\frac{1}{8}$in. and extends past F6 below the lower stringer. Fill in between stringers at F6 and shape, then cut out for the cockpit. Fit the cockpit floor from underneath, resting it on $\frac{1}{8}$ × $\frac{3}{8}$in. longerons.

Fit the $\frac{1}{2}$in. sheet to the engine bay, align the nose and add former F1, which should be made slightly oversize to allow for aligning with engine and spinner, later. Now fit









the two $\frac{1}{8} \times \frac{3}{8}$in. side stringers and $\frac{1}{8}$in. sq. stringers along the fuselage sides. Add the $\frac{1}{4}$in. sheet fairing around the wing seat, $\frac{1}{4} \times \frac{1}{8}$in. hard on underside of the fuselage at rear of the wing, and $\frac{1}{8}$in. sq. under stringer. Fit scrap $\frac{3}{16}$in. infill between the stringers at the push-rod exit slots. Make up the $\frac{1}{4}$in. plate with blind nuts for the wing mounting, and epoxy in place on the $\frac{1}{4}$in. ply bearers. The undercarriage plate is from $\frac{1}{4}$in. ply also, with 6BA blind nuts, and should now be fitted in position, using epoxy.

Plane and sand the fuselage to its final shape—the side stringers taper from their maximum depth at F5 to $\frac{1}{8}$in. fore and aft.

**Tail unit**

Make the tailplane and elevators, fin and rudder, from medium $\frac{1}{4}$in. sheet. Assemble the tailplane and fin into the fuselage, checking alignment, and that it has its correct +2°. Fit soft balsa block either side of the fin and fair it into the fuselage. Join the elevators with a 14g. wire joiner. (The rudder and elevators may be hinged temporarily by your favourite method, to be permanently fitted when covered).

Bend up the tailwheel bracket from 16g. wire and bind it to the appropriate length of $\frac{1}{4}$in. sq. balsa and epoxy into a slot made in the underside of the rear fuselage, as shown.

**This and that . . .**

Make a cut-out in the engine bay to suit the motor/silencer combination to be used. (I found that a 'dumpy' type silencer fitted well.) Don't forget to fuel-proof the engine bay and tank bay very thoroughly.

The undercarriage may be made up from 14g. or 12g. dural sheet, or a commercial item may be used —which is what I did. It is attached to the fuselage rigidly with 6BA bolts and using 4BA bolts for axles.

The windshield was cut from a Micro-Mold VS canopy.

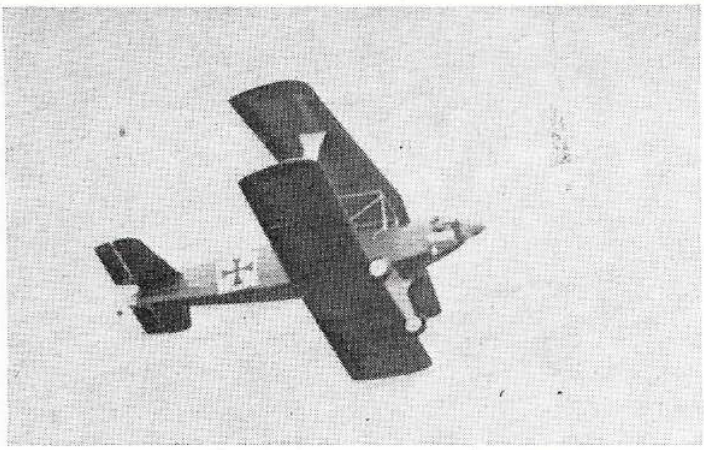
**Wire-bending exercise. . .**

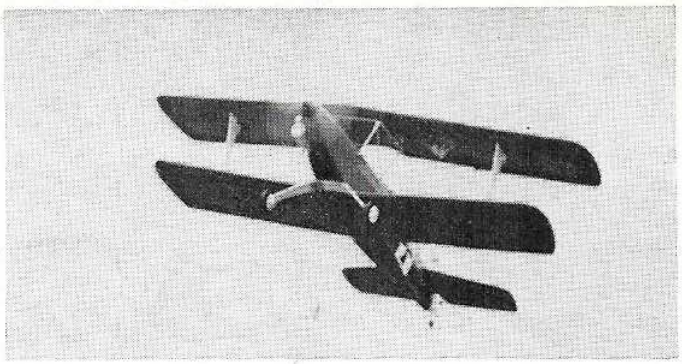
Now comes the fiddly bit—the centre-section assembly. Bend up the two side frames, not forgetting they are " handed " (one right, one left), from 12g. wire, projecting into the fuselage-mounted brass tubes about 1in. When satisfied with the incidence angle (1° *negative*) and squareness to the fuselage, epoxy the wires into the tubes. Next bend up the two cross-braces from 14g. wire, and bind and solder the complete assembly.

Bend up four 'P' clips from 18g. or 20g. brass, to the sizes shown, and solder these to the centre-section strut assembly to centre on the ply plates in the upper wing. Drill clearance for 4BA bolts.

Now bolt the lower wing in position and check for alignment. Place the upper wing on its strut assembly and line it up with the lower wing. Mark the positions of the bolt holes. Now drill through the upper wing, countersinking the top, and bolt it in position with 4BA bolts—it may be packed at either position for final alignment or incidence adjustment.

Cut card templates for the interplane struts, when finally satisfied that all is accurately aligned. The struts themselves are made up from $\frac{1}{8}$in. ply and epoxied into the lower wing after rounding off the edges. Drill the struts, and the ply tongues





*Switchback* does not hang about, but we managed to catch it in a couple of characteristic in-flight attitudes. With power off, however, as with most bipes, the glide is slow and steep, and not too stretchable.

in the upper wings, for 6BA bolts. Make the aileron link-rods from standard push-rod ends and clevises, attaching to the lower ailerons by bending the ends at 90°, and retaining in the horn in the lower wing by means of a washer soldered on.

**Installation**

My servos were mounted three abreast, under the cockpit, on a $\frac{1}{8}$in. ply plate, with the receiver and nicad between F4 and F5. For convenience, I fitted the switch and charging lead on former F5, so as to be accessible from the cockpit, thus making it unnecessary to dismantle the model for charging.

**Rigging and flying. . . .**

Unless things have gone awry somewhere, you will find that the balance is as shown—about $\frac{1}{2}$in. behind the main spar, in the upper wing, at the centre-section. This is the recommended maximum rearward position, and as flown, with the following control throws: *ailerons* $\frac{3}{8}$in. each way, *elevator* $\frac{1}{2}$in. each way and *rudder* $\frac{3}{4}$in. each way.

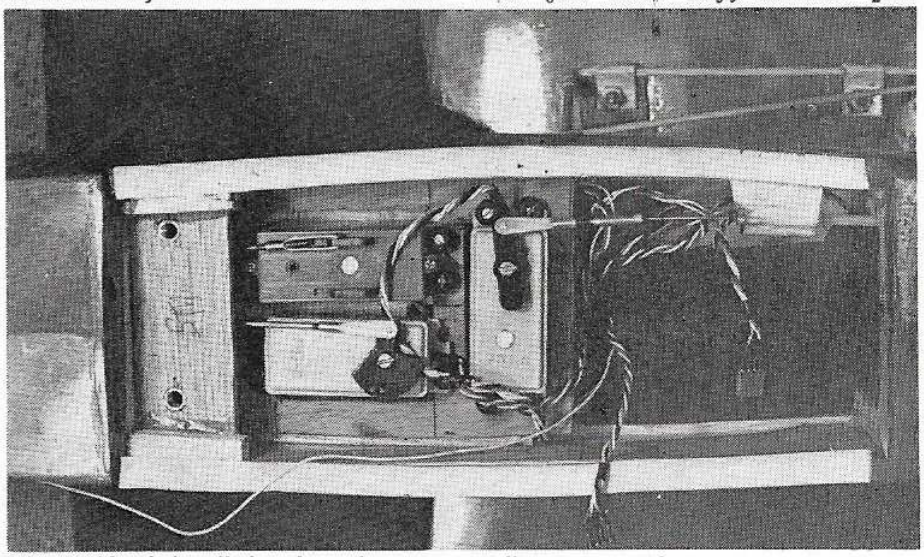
I would recommend reducing the aileron throws to $\frac{1}{4}$in. each way for the first flights, until you are used to the feel of *Switchback*, then increase any of the movements to suit your own style of flying. My *Switchback* was film covered, and the all-up weight came out at under $4\frac{1}{2}$lb. so, depending on the individual method of finishing, a weight of $4\frac{1}{4}$ to $4\frac{3}{4}$lb. should be O.K.

*Switchback* is very responsive and highly manoeuvrable. Take off with some right rudder held in to keep her tracking straight, and all of the up-elevator for the first few yards to keep the tail down. Then ease off the elevator and *Switchback* will unstick and climb away as only biplanes can. This model will " do the book " if you are capable of it (I'm not!) plus quite a few other manoeuvres other people have tried on it. In fact, if a *Pitts* can do it, so will *Switchback*.

You will probably find that the model needs a fair amount of down elevator when flying inverted, due to the drag, but other than that, it seems to have no vices. Landings will need some power on because of the inherent drag typical of biplanes, so that, if you find yourself in a " dead-stick " situation, you won't be able to stretch the glide too much—especially if there is any amount of wind. *Switchback*, it must be admitted, *will* drop a wing—but only if brought to a near standstill.

I have flown the model in a wide variety of conditions and find that the penetration is very good—as good as a conventional monoplane, in fact.

I wouldn't recommend *Switchback* for your first aileron machine, but if you have got beyond that, then this is the model for you. There simply is nothing like a biplane in the air . . . and all that extra work for the second wing will be amply repaid by the performance. Moreover, being for .40 motors, it is easier to handle, and takes less room in the car than its .60-size counterparts!



Brian Peckham's installation shown here uses one linear servo and two rotary output types. *Below*: the model goes into the back of designer's Princess fully rigged!