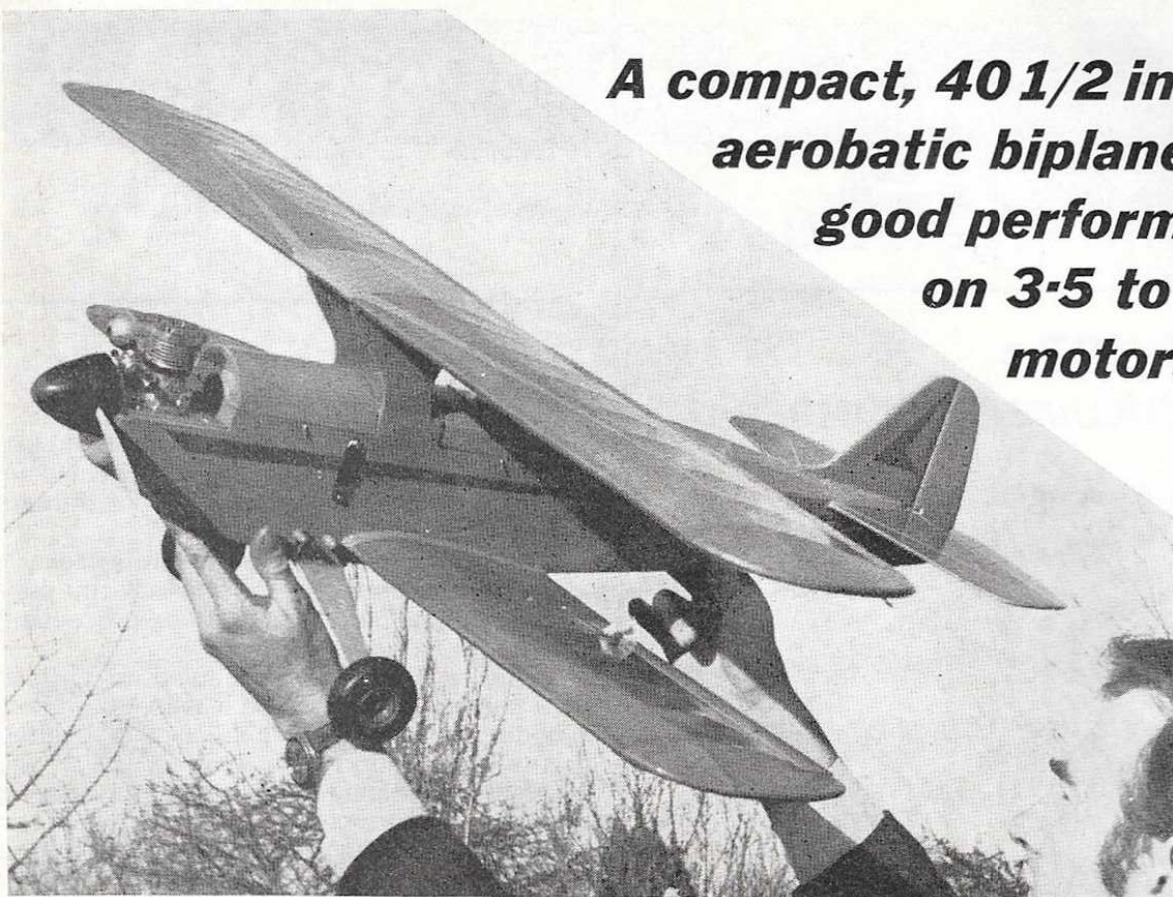


**A compact, 40 1/2 in span  
aerobatic biplane with a  
good performance  
on 3.5 to 5 cc.  
motors.**

**By  
M. GARLAND**



'FLI-BI' is an aerobatic biplane designed to be flown from a small field with a 25 size motor and capable of being hand launched if R.O.G. conditions are not suitable.

It will fly smoothly in most weather conditions and will loop, roll, fly inverted, spin and fly really tight turns. I made it a 'one piece' model, gluing wings in position so that I could just take it out of the car and fly in the lunch hour. If this creates a transport problem, the addition of a wing platform, would allow the wings to be held in place with rubber bands and dowels. Construction is simple but strong and capable of withstanding the 'heavy landing'.

### Fuselage

This is of ply and balsa construction. Begin by cutting the basic sides to shape and gluing  $\frac{1}{8}$  in. strips, braces, etc., into position. Then cut the  $\frac{1}{8}$  in. and  $\frac{1}{16}$  in. sheet doublers, noting the direction of the grain.

# FLI-BI

While the fuselage sides are setting, cut out all the formers and the two ply cabanes. Although the cabanes may appear thin, they have proved to be quite strong, provided you use good quality birch ply. Now glue these in position. Glue sides together at F3 and F4 and allow to set, checking that they are square and formers vertical. Pull the tail end of the fuselage together, chamfering  $\frac{1}{8}$  in. strip prior to gluing and hold in position with a clothes peg or sticky tape.

The engine bearers are of  $\frac{1}{2}$  in. x  $\frac{3}{8}$  in. beech and these should now be fitted to F1 and F2, then glued in position between the fuselage sides. Once again, check for squareness and also down-thrust angle. Formers 5-7 can be added

and then the stringers, followed by the bottom, together with the tailskid which is sewn to a ply plate and glued to the fuselage sides. This is followed by the  $\frac{1}{8}$  in. ply piece which separates the engine bearer from the power pack compartment. Balsa block is then fitted between F1 and F2 to form the nose area. At this stage, check that the power pack will fit into the nose area, if correct, then fit the ply bottom from F2 to F3.

### Tank Hatch

F2A and F3A are glued to  $\frac{1}{8}$  in. x  $\frac{1}{4}$  in. strip on a flat surface and when completely set, the  $\frac{1}{8}$  in. sheet is glued to these and held in position with pegs or tape until dry.



'FLI-BI' is ideal for a '25' size motor, is conveniently small and is sturdy enough to absorb a fair amount of flying field punishment. Its aerobatic performance should satisfy most.

## Cockpit Hatch

The 3/32 in. cockpit floor is cut to shape and the formers glued to it, checking for squareness. The sheeting is then fitted as per the fuel hatch. The fuselage can now be lightly sanded around the hatch area and the wire hooks epoxied in position.

## Fin and Rudder

The fin and rudder are now cut to shape with the grain of the fin at approx. 45°. The rudder grain should be vertical. The corners are now sanded around and the cut-out for elevator clearance removed from the rudder.

## Elevator

The parts are cut out and the hardwood strip glued to the 1/8 in. sheet elevators. When set, the complete assembly is sanded, the hinges are fitted, glued and pinned in position. The tailplane is next glued to the fuselage, checking for squareness in plan view and horizontal. The rudder assembly is now glued to the tailplane, checking once again for accuracy in lining up.

When everything has set firmly, the fuselage tail area, etc. can be covered with tissue, doped on. The stringer area is then covered with nylon.

This completes the model apart from the wings. At this stage the radio can be

fitted, holes cut etc.

Having fuel-proofed the engine bay, the engine is then installed on its dural mount and screwed to the bearers with four woodscrews.

## Wings

These are of simple construction. The upper wing has no dihedral, but does feature sweep-back at both leading and trailing edges, of 1/2 in. on each wing panel. The lower wing has a dihedral of 1 in., measured at the wing tip when one wing is flat on the building board.

First, cut out all the ribs for the wings, followed by the four 1/8 in. sheet wing tips.

## Upper Wing

Lay the trailing edge of the port wing on the plan and cut the level where it will eventually join the starboard panel trailing edge. Pin the trailing edge to the plan and also the lower 1/8 in. sq. spar which may be either balsa or spruce. Having fitted the ribs, they can be glued to spar and trailing edge, packing up the spar where necessary to clear the plan. The upper spar is then added, followed by a leading edge of either balsa or spruce.

Repeat the above for the starboard panel, but if you intend to secure the wings with rubber bands, there is no need to leave the 1/8 in. spruce between

the ribs at the centre section for ply cabanes.

Now fit ply braces each side of the main spars, behind leading edge and at the front of the trailing edge, leaving to set firmly.

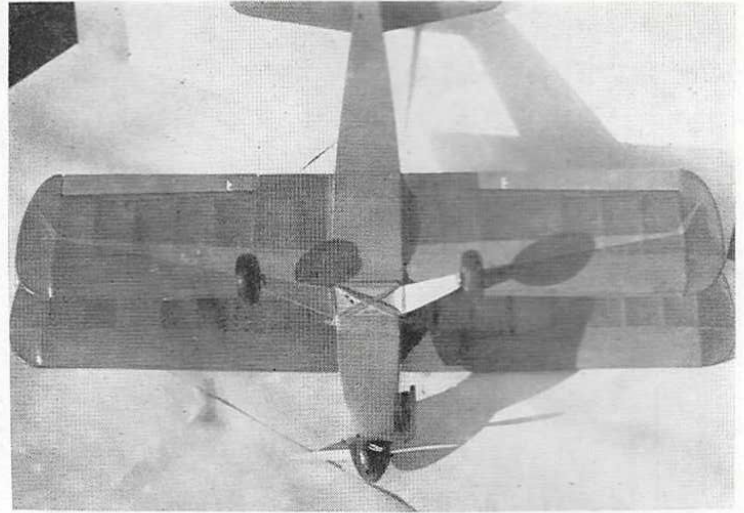
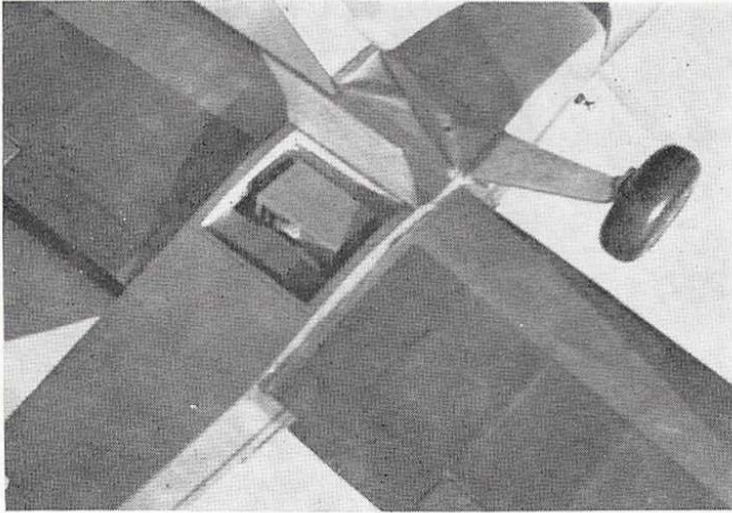
Remove the upper wing from the plan and sheet in the leading edge to the mainspar top and bottom, followed by fitting of the wing tips and triangular supports. The wing can also be sanded to shape and fitted to ply cabanes without gluing in position.

The lower wing is constructed in similar manner to the upper wing, apart from the necessary cut out at the trailing edge for the aileron and the positioning of the bellcrank and servo supports. When the basic framework is completed, the starboard wing tip is raised 1 in. and with the centre section in position, marked for trimming of the spar etc. prior to gluing. When this has set, the complete assembly can be sanded smooth.

The lower wing is now fitted to the fuselage, checking squareness and alignment with tailplane and fin. If the wings are to be held with bands rather than being glued to the fuselage, the dowels can now be fitted to the fuselage.

## Undercarriage

This is of dural using 2 1/2 in. wheels, with a 10 1/2 in. track at wheel centres. Fit



the undercarriage to the fuselage with rubber bands and mark position for hardwood positioning strips for either side of dural undercarriage.

### Covering

The wings were covered in nylon and the tail surfaces tissue covered. Give the complete structure two to three coats of clear dope and then fit ailerons with mylar hinges.

If the wings are to be fixed per-

mainspar and for good performance in windy, gusty weather should not balance further back than this position. The undercarriage should be as shown on the plane. If the undercarriage is placed in front of the position indicated, 'Fli-Bi' will spin around in either direction on opening up the throttle. It's good for tread removing on tarmac but very little else. If the undercarriage is correctly placed, the model will take off on tarmac at about  $\frac{3}{4}$  throttle. If flown

off grass, naturally it must be reasonably short with only  $2\frac{1}{2}$  in. wheels and '25' power.

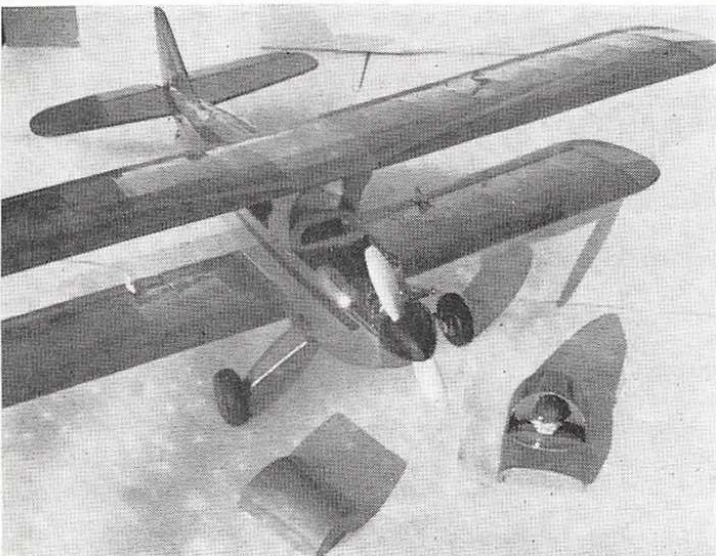
Provided the model has been trimmed out and flown R.O.G., hand launches are quite easily managed 'one handed' with transmitter in left hand, or with an assistant. 'Fli-Bi' will fly for some distance straight and level if trimmed correctly.

Performance depends on the finished weight, but weighted with lead and weighing  $4\frac{1}{2}$  lb, it would still loop from the inverted position. The model shown on the plan should weigh around  $3\frac{1}{2}$  lb to 4 lb depending on R/C gear used.

Rolls are good in either direction and so are spins, but take the model to a good height the first time you try one. For inverted spins, just climb inverted and throttle back for 'instant spin'.

This is a model I can fly without growing tired of. It looks right in the air, is quite cheap to build and with a '25' motor, fuel bills aren't too bad.

If you want a really lively small biplane, a '35' motor and the R/C equipment moved aft for balance purposes it would probably give you what you're looking for!



Top left: underside wing root hatch open to reveal aileron servo linkage - makes servicing easy. Top right: general underside view: note the undercarriage mounting. Left: tank and radio hatches are big enough to make the internals easily accessible.

manently to the model they are now fixed in position. I used balsa cement for the lower wings due to the dope being on the nylon and used Evo-stik Resin 'W' for the upper wings, gluing to the bare ply and balsa ribs.

It is very important that the lower wings are at zero incidence and the upper wing at  $1^\circ$  positive, so check carefully from fuselage datum line before gluing the wings in position.

### Finishing

The fuselage and fin of the prototype were given two coats of Humbrol enamel and the remainder of the model fuel-proofed over the clear dope.

### Flying

The model should balance level on the

