

# Jack Headleys

## 52in. Span Semi Scale

# PIPER CUB



## Free Flight or Radio Control

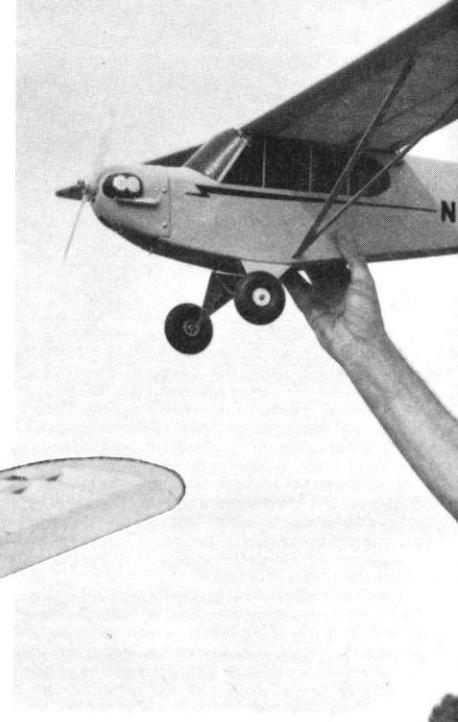
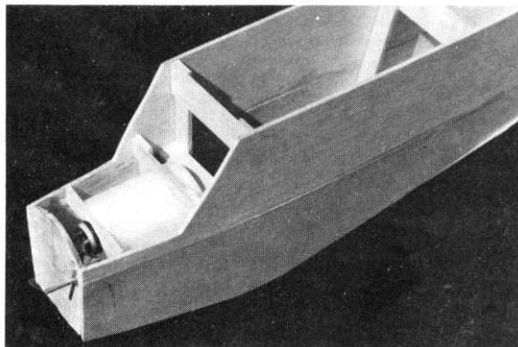
USUALLY AT THE BEGINNING of a construction article the author presents a few words on how the model was chosen/developed/agonised over, and if it's a scale model, provides a capsule history of the type on which the model was based. However, for our Piper Cub we can omit the historical details as these are already provided elsewhere in the Aircraft Described feature. (At least I hope so.) As for the reasons to build this particular model, this came in a letter from ye Ed., requesting a simple Radio Controlled cum Free Flight version of the Cub as a companion feature.

I must say that having Maurice Brett's excellent scale plans of the aeroplane was an unexpected luxury. I usually have to work from a minute 3-view copied from Janes, or some Polish equivalent when doing a scale project. In fact it was rather difficult not to get carried away and produce a super detailed version. However, my good sense and inherent laziness prevailed resulting in a sport scale model for three channel (or less), rudder, elevator, and engine control. An F/F version with suggested modifications for conversion from R/C will be discussed following the construction notes. Rather a switch, don't you think?

### Fuselage

Begin the fuselage construction by making the two sides, gluing together two 3in wide 1/8in sheets. Trace, using carbon paper or pin prick method, the outline of the side, shown with small triangular markers and slot for tailplane. Five fuselage formers are required, the firewall F1 is made from 3/16in plywood, the remaining formers being either cut from or built up, using 1/8in sheet.

Glue F2 and F3 to the two sides, then install F1, F4 and F5. Pinch sides together at the rear, sandwiching 3/16in sq. in between. Take care all components are "square", and that the sides bow equally.

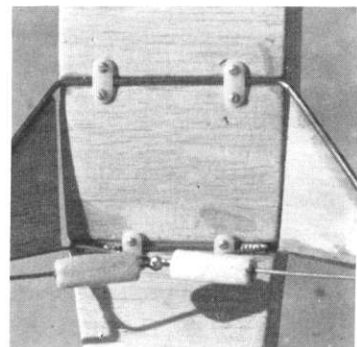


Install F6 the triangular strips behind the firewall; F7 and F8 3/16in sheet doublers in the lower front fuselage; F9 the 3/16in sheet saddles for the servo tray mounts; F10 the 3/16in doublers for the wing mount; F11 and F12 the 1/8in plywood undercarriage mounting plates.

### Tailplane & Fin

Next make the tailplane and elevator from 3/16in. sheet, leaving in place the "Vee" shaped notch in the elevator. Sand the edges smooth, then cut elevator from tailplane. Recess forward edge of elevator for dowel, epoxy into place and reinforce with nylon patch. When set, the "Vee" notch can be cut away. This ensures the two elevator halves are correctly aligned. An 18 SWG wire joiner adds further strength, being epoxied across the Vee notch. Reinforce elevator locally at control horn location with 1/32in ply. Hinge elevator to tailplane using mylar strips epoxied in place.

Make fin and rudder individually from 3/16in sheet. Note fin extends into fuselage, and is glued on top of tailplane. Add 1/32in plywood horn reinforcements to





Location of the receiver and battery pack is used later to get C.G. into correct position. Use control cables or pushrods to connect servos to controls.

Hook up servos to control surfaces, and test out system. Correct anything that sticks, fouls, or bends alarmingly, then remove the radio, and close up body with 1/16in. sheet on top, grain also crosswise. At the front end install frames F13 and F14, then with 1/4in. x 1/8in. strips plank curved nose deck. Soft balsa block rounded to represent windshield finishes off the basic fuselage. Add spine pieces to rear top fuselage.

### Undercarriage

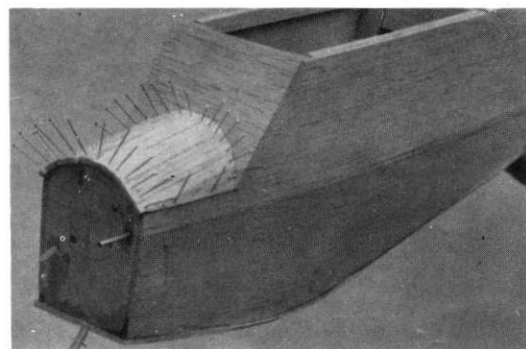
Bend U1 from 12 SWG wire. Forward legs, U2 are made from single piece of 16 SWG wire bent to represent bracing struts. Attach U1 and U2 temporarily to body using nylon saddle clamps, bind main joints with copper wire, and solder together. Cut 3/32in. sheet balsa fairing U3 and epoxy into place reinforced with nylon patch. Remove assembly from body, add simulated shock covers, U4, made from soft balsa. 2 1/2in. diameter

rubber as on the elevator, then hinge. Now glue fin to tailplane and add 3/16in triangular gussets.

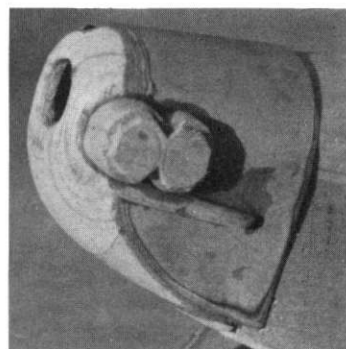
Install fuel tank of about 4 fl. oz. capacity with sufficient structure to hold in place. Assemble the tailwheel by making the bearing U5 from plastic or brass tube epoxied inside a length of 1/2" square balsa. Bend the 16 SWG wire leg, U6, solder bearing washer in place, insert into U5, and secure with top bend and epoxy into fuselage. The tailwheel is held by a modified control link, U7, soldered to wire U6 after model is painted. 1/16in bottom sheet is now cemented into place with grain running crosswise. Next install tailplane/fin assembly into fuselage slot ensuring correct alignment with fuselage. Before closing any more of the fuselage install servos and the engine temporarily.

### Radio Installation

The servos fit in line across fuselage, behind frame F2. Elevator and rudder servos go on left, with engine control on right. Notch hardwood bearers into two 3/16in doublers (F9) to hold servo tray.



Below left to right: *basic fuselage showing tank installation and built up formers; undercarriage retained by nylon saddle clamps, note balsa shock absorbers; stripwood planking for top deck; cowling made from 1/32in ply wrapped over balsa block hollowed out.*



wheels are retained with soldered washers. Trexler ballon wheels are ideal, available from David Martin R/C Products, see trade page.

### Engine Cowling

Fabricate with an "L" shape balsa block at the front with the rest bent from 1/32in plywood sheet. Bevel block to outline shown on plan. Cut away to clear all engine pieces and controls, then temporarily glue to the firewall. Make cowling pattern from stiff paper, trim to achieve fit around fuselage and noseblock, then cut from 1/32in ply. Epoxy ply and block together, then sand to final external contours. Bolt engine on its mount, then cut away cowling to give adequate clearance for the cylinder and needle valve. Add dummy cylinders if required on the "clean" side of the cowling. Attach cowling to the fuselage with four small wood screws.

Below left: *the Cub's front end, view showing Enya 15, don't forget you will need to fit a silencer.* Below right: *the dummy engine, note small screws retaining cowl.*



### Wings

Three sections, two outer panels with straight dihedral, and a flat, 4in wide centre section complete wing. Begin with the right panel, pin down trailing edge, lower rear 3/16in sq. spar, and lower 1/16in sheet leading edge. Cement lower 3/16in sq. front spar to sheeting, and 1/8in sheet leading edge piece. Cut wing ribs from 1/16in sheet, then cement all but inner rib into place and both upper 3/16in spars. Make left outer panel in similar way.

Joining these two panels should be carried out very carefully, so as not to build in any permanent warps. Pin both panels to building board over 4in centre section plan with the tips propped up 1in. Bridge between panels with strips of 1/16in leading edge sheet, 3/16in sq. spars and trailing edge, and 1/8in sheet leading edge piece. Make the wing joiners W1 and W2



Left: Completed Cub finished in Piper Yellow with black trim, registration and cockpit, note Cub insignia on fin.

from 1/16in ply then cement each side of spars. Trim four wing ribs allow for ply joiners and 1/16in sheeting, then cement in place in centre section. Add 1/16in sheeting on top of centre section.

When dry remove wings from building board, pin down right wing panel and add 1/16in top leading edge sheeting, and repeat for the left panel. Make wing tips from soft 1/8in sheet, and add small 1/8in sheet gussets to keep tips in place. Fill in underside of centre section with 1/16in sheet, and add 1/32in sheet webs to rear side of front spar. Finally, add true leading edge,  $\frac{1}{2} \times \frac{1}{2}$ in. Note how it is cut back in centre section to fit round the cabin. Sand final contours to aerofoil and clean up wing ready for covering. 1/16in ply wing strut attachments W3 are the last items to be attached to wing, reinforce with gussets.

### Wing struts

Make from 1/8in spruce strips – front strut is 3/8in wide and rear  $\frac{1}{2}$ in. Epoxy together at angle on plan, sand to radius, bend wire hooks, cut away struts to locate, then bind into place with strong thread, smeared with epoxy. Struts are attached to body with a small rubber band located inside paper or aluminium tube in lower fuselage. Outboard end of struts are sprung into holes in ply tabs W3 sticking out under wings.

### Finishing

The prototype was covered with heavy-weight tissue, clear doped, then finished in "Cub Yellow". The registration number and letters chosen came from a Cub that I saw often during a recent visit to the Reno Air Races, with the cockpit window arrangement simply painted black.

The Aircraft Described feature presents two other finishing schemes, so this gives you quite a choice of final colour trim. A little research into the back numbers of popular flying magazines should unearth a wealth of alternative colour schemes for Cubs. Don't forget to add the little bear symbol on the fin, or it's not going to be a true cub!

### Flying

Make sure the model balances as indicated, that all servos are operating control surfaces as expected, and the engine control is satisfactory. On the prototype, take-offs were investigated both from asphalt and the local soccer pitch, with the same results. An increasingly wandering run usually followed by tipping over! This should not discourage you, as it is quite typical of Piper Cub models, or many other type with such a narrow track undercar-

riage. The easiest way to do early flight testing is to hand launch with the engine at full power, to get the model painlessly into the air. Sort out the control throws and the "feel" of the plane. Reset the controls as indicated by these early flights, then, if you like, go back to the take-off phase. From here on it is all yours, so happy flying!

### Free Flight Version

To convert the model to Free Flight, I suggest the following:

#### Wings

Increase dihedral to 2in under each wing tip. Revise items W1 and W2, and wing struts. Some wash-out at the tips, say 3/16in, might also be a good thing.

#### Fuselage

Omit all pieces associated with the radio installation, and fuel tank. A smaller engine, about 1.5cc should be used, with its own smaller fuel tank in the cowling area. Change the engine mount and the cowling to suit.

#### Tailplane and Fin

Enlarge by adding a border about 1in wide around the tailplane, do not separate elevator, anti-warp strips are added cross grain into the structure. Enlarge fin, with a border about  $\frac{1}{2}$ in wide. No separate rudder of course, but do add small trim tab at back, hinged with strips of tin.

#### Flying

Flight testing should start with C.G. indicated on the plan, aim for leisurely climb, and moderate glide, similar to the full sized version; after all, it's not a contest model! Revise the glide by either shimming the wing, or moving the C.G. around.



Right: ready for take-off, Jack flips the propeller on one of the test flights, transmitter nearby to allow quick throttle adjustments once the motor is running.