

AERONCA CHAMPION

A classic scale design from the mid-50s which disappeared along with the magazine in which it was originally published. Complete building instructions included with plans. Background story by Bill Northrop.

• To the new generations of modelers who came into the hobby over the past 25 years and may not have heard of him, we introduce the late S. Calhoun Smith. Cal Smith was a former designer of control line and R/C models during the post-World War II years, and his work mostly appeared in *Air Trails* magazine. At the time that his R/C *Aeronca Champion* was published, the magazine was using one of its less than model-type aliases, "Young Men". To be exact, it was the July 1956 issue.

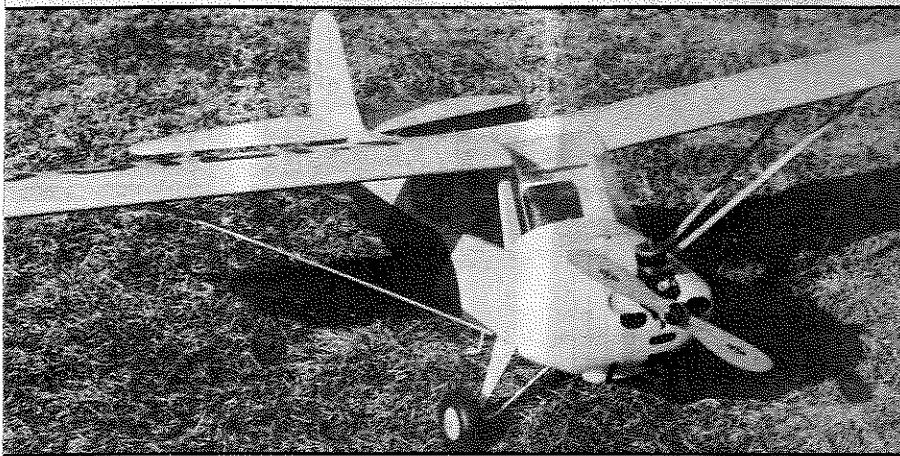
In the July 1956 issue of . . . er . . . "Young Men", just to give you an idea of the status of R/C at the time, there were only ten ads that had anything to do with R/C materials in the whole magazine, and of the companies represented, only three exist today . . . Ace R/C being the most prominent. There were 65 other model advertisers in the 68-page magazine.

As this was an era when rudder-only was the primary control system in use, most designs published featured this meager arrangement. And of course, the model pretty much had to be an inherently stable design that could fly well without any control, as this was the normal condition! It's funny, but old-timer free flight with radio assist, the perfect type of model to use as a start in R/C, was unknown in those days! Certainly, scale R/C was very limited in the choice of subjects, with cabin-type light-planes such as the *Champ* being almost the only way to go.

Cal Smith mentioned in his article that the *Champ* structural design was based on the famed J-3 *Cub* design by Chuck Hollinger, which had previously appeared in *Air Trails* (or whatever). This *Cub* went on to be a popular kit by Berkeley, and eventually, with improvements, became the early Sig J-3 *Cub*.

Rather extensive building instructions were included with the full-size plans for the "Air-Knocker", and not published with the article. We'll follow the same procedure. The scale is 2" = 10", and the only deviations were the span, stab outline, and dihedral. Plans are quite accurate, as they were developed from dimensions taken from the real aircraft. The span had been reduced to increase wind penetration (by raising wing loading), an important feature when flying rudder-only. The stab area and dihedral had been increased to improve stability. Dotted lines provide the necessary modifications for scale outlines. Control surface hinge line locations are fairly easy to guesstimate. Other mods to suit modern construction materials and adhesives are up to the individual builder.

If any of our readers would like to see



other "lost" designs from the old *Air Trails* publication, or have full-size plans they would like to share with other readers, drop me a line. Famous designs never die, they just fade away for a couple of generations, only to return again, just as new now as they were then . . .

Construction can be started with the fuselage. This is the most difficult structure; wing and tails are quite conventional. Begin by cutting out the $\frac{1}{8}$ " sheet fuselage sides and doublers. Sides are a bit deeper than 4" wide stock so a strip will have to be cemented to bottom edge. Length exceeds 36", so extra piece is added to front end; $\frac{1}{16}$ " plywood doublers should be cut out also. Two layers of $\frac{1}{8}$ " sheet and plywood should be joined with Weldwood or similar glue, instead of cement. Align pieces with short brads or tacks and put pile of magazines or other weight on the sandwich for even bluing pressure.

While sides are drying the formers can be assembled. Firewall F-2 is $\frac{1}{4}$ " plywood or thicker if desired. Be sure sides are cut square. Next make formers F-4 and F-5. These are $\frac{1}{8}$ " plywood with hard $\frac{3}{8}$ " sq. cemented along top and sides. Cut out lightening holes and other holes for Lord mount and 5-prong sockets as required. Cut out $\frac{1}{4}$ " plywood landing gear mount plate. Be sure firewall F-2, formers F-4 and F-5 and gear mount plywood are all exactly same width since fuselage sides are parallel in this section. Build balsa formers F-7 through F-10 directly over plan. Lay down cross members, then cement vertical pieces over them. Drawings show maximum width so edges should be beveled to match slant of fuselage sides and bottom by referring to fuselage top and side views. Cut out formers F-10A, F-11 and tail post wedge also. Bottom formers can be made too. There are two of F-4A and one each of F-5 and F-6.

With fuselage sides dry and ready for assembly, they should be laid over fuselage side view and position of all formers transferred to inside surface. To allow

for curve of rear section mark former positions holdings side over top view. Check sides against each other for identical former position markings. Rear formers mount vertically so mark position with square held against top edge. Now cement a length of $\frac{1}{8}$ " sq. along front line of former positions F-7 through F-11. These will serve as guides for aligning formers and act as guessts.

Since plywood side doubler does not extend back to former F-5 the sides of former F-5 touching the fuselage side should have strip of $\frac{1}{16}$ " x $\frac{1}{2}$ " hard balsa cemented on to make former the required width.

To assemble fuselage sides to formers use Weldwood or similar glue for firewall F-2 and formers F-4 and F-5. Fuselage side bottom edges are flat from F-3 to F-6 so sides can be erected over to view on this edge. Glue F-4 and F-5 to one side then the other. Use brads or small wood screws put in from outside for clamping pressure. These can be removed later. Firewall is attached in same way. Add triangular gussets at rear of firewall. All this hardwood assembly should be done with hard glue and ample clamping pressure. Use cement only where balsa surfaces join. If this construction method is used the strength of the assembly is terrific and will withstand crashes that would demolish the average R/C job.

While the Weldwood pot is still wet add the $\frac{3}{8}$ " cabin top longerons and $\frac{1}{8}$ " plywood cabin top. Clamp and nail as required.

Front fuselage assembly should be allowed to dry thoroughly before continuing with rear section. Add F-7 and begin to draw rear together. Add F-8, F-9, F-10, F-11 in that order, then tail post wedge. Check alignment with square over plan and brace or block for proper alignment. Add $\frac{1}{4}$ " sq. longerons along top. Stringers can be added later after work on inside is completed. When this basic fuselage assembly is dry it can be taken up from work board, all additional work on fuselage can be done in the hand.

Fuselage bottom is next on the program. Glue $\frac{1}{4}$ " plywood landing gear mount in place now. Bevil front edge so

it fits snugly against rear of former F-4. Use hard glue here and add $\frac{1}{4}$ " triangular pine gussets along inside. Make up tail wheel wire and stitch to piece of $\frac{1}{16}$ " plywood. Cement assembly in place on bottom. Plank fuselage bottom with $\frac{1}{16}$ " sheet from tail to former F-7. Run grain cross-ship.

Landing gear assembly can be made now, since it must be fitted to fuselage before bottom covering can be completed. Gear looks like a plumbers nightmare and it will take a bit of extra care to fabricate. Axle piece has all bends in same plane and is easily formed. Rear piece slants in several directions so work carefully. Best procedure is to start in the center and work outward to ends. Make U bend in center of a length of wire first, then bend U at right angles. Next make bends outward at right angles in plane of plywood bottom. Then bend rear leg slant and ends to meet axle piece. Check bends carefully over plan as work proceeds. When alignment is complete, wire wrap and solder where indicated. Make up mount plates of $\frac{1}{32}$ " sheet steel. J-bolts could be substituted for mounting if desired; if used remember to slide them into place on wire before the assembly is soldered together. Wire for dummy triangular shaped leg is bent to shape and bound and soldered into place. Gear can now be bolted in place on plywood mount. Make up $\frac{1}{16}$ " wire wing strut attachment piece. Bends are all in one plane. Center U bend is anchored to plywood with small aluminum plate and two wood screws. Outer ends of wire should lie snug against back of gear wire mount plate, two wood screws hold wire in place.

With gear completed work on fuselage bottom can be continued. Add formers F-4A, F-5 and F-6. Note that center portion over gear wire is left open to allow gear to swing downward. Box in this space with $\frac{1}{8}$ " sheet. Add $\frac{1}{8}$ " x $\frac{1}{4}$ " stringers and cover bottom with $\frac{1}{16}$ " sheet. Flat center portion has grain cross-ship while slanted sides have grain running fore 'n aft. Section of bottom from F-3 to front of landing gear is built up of blocks on sides and $\frac{1}{4}$ " sheet across center. Put $\frac{1}{8}$ " sheet floor in bottom from F-3 to front of F-4 flush with bottom edge of sides before covering bottom. Note that this $\frac{1}{8}$ " floor and $\frac{1}{4}$ " belly sheets are notched in center to permit passage of gear shock-absorbing rubber. Install $\frac{1}{16}$ " wire hook on firewall and put rubber in place to determine clearance needed.

Nose cowling blocks can now be added. Rough carve before cementing in place. Put $\frac{1}{4}$ " triangular gussets along sides where blocks and sides meet. Front nose block is 1" thick and it can be cemented temporarily in place for carving, and can be removed later for installing engine. Top cowl block behind firewall should be made removable for access to fuel tank and engine mount bolts. Cowl block under windshield is cemented permanently in place. Carve and sand entire nose area to shape using plan across-sections as templates.

Engine is installed. Original model had upright engine mounting but most '19's could be hidden in cowling if side mounted. Fit would be tight and additional holes would have to be cut in cowl for exhaust. Side mount engine with cylinder to left so that right thrust adjustments would swing cylinder away from firewall. If builder wished to form

a fibre-glass nose cowling space for engine would be increased.

Now would be a god time to make R/C installation. Battery complement is located directly behind F-4 and depending on builder's choice can be mounted in battery boxes screwed or bolted to plywood or kept in separate packs and held down with rubber bands, plywood or metal cover. To balance different models some batteries may have to be mounted ahead of F-4. Receiver is mounted on sponge rubber pad with rubber bands around a $\frac{1}{8}$ " plywood plate. Vertical slot mounting is provided by cementing two strips of $\frac{1}{4}$ " sq. to fuselage sides as indicated. Relay is mounted on 1" Lord mount bolted to F-5. Two 5-prong sockets are also bolted to F-5 below Lord mount. Receiver and relay are each wired with 5-prong plugs so they can be removed from circuit separately. Antenna plugs onto receiver and runs down inside of fuselage to tail. Escapement and bellcrank rudder drive are mounted on $\frac{1}{8}$ " plywood deck and bulkhead located at F-6. Cross-members should be at least $\frac{3}{8}$ " sq. or larger to absorb vibration. Since we use a small International Instrument millimeter for testing receiver, meter socket and potentiometer were mounted inside fuselage on bellcrank deck. DPST switch was mounted on left side off uselage below rear window. Pushrod is $\frac{1}{16}$ " dia. wire and has a fairlead at former F-8. Where pushrod comes through fuselage side at tail a strip of $\frac{1}{8}$ " sheet is cemented to former sides to provide slot. Pushrod horn end is fitted with bike spoke nut and wire clamp for vernier rudder adjustments. Tailwheel plywood mount has hole and plug for winding escapement rubber.

Add $\frac{1}{8}$ " dowel dummy tubing structure in sides at rear window. Cement curved rear window outline $\frac{1}{16}$ " sheet in place and add $\frac{3}{8}$ " x $\frac{1}{4}$ " top stringers. Final woodwork on fuselage can be completed when wings and tails are built.

Build horizontal and vertical tails directly over plans. Note that horizontal tail ribs have $\frac{3}{32}$ " sq. strips over them to help form airfoil shape and make neater covering job. Cover center section with $\frac{3}{32}$ " sheet to maintain same thickness. Rudder is hinged to fin with 1" lengths of $\frac{1}{16}$ " O.D. brass tubing cemented alternately to fin and rudder.

Put patch of fabric over each piece of tubing to reinforce. A length of $\frac{1}{32}$ " dia. wire passes through tubing from top forming the hinge. Rudder travel should be about $\frac{1}{4}$ " each side for test hope and can be increased when trimming out is accomplished.

Mount horizontal tail permanently in place on fuselage. Mount pad is carved with 2° slant on top providing 2° negative incidence in tail. Add fin, be sure both surfaces are aligned perfectly. If desired $\frac{1}{4}$ " triangular gussets can be added along fintail-fuselage intersection for added strength. Tails can be covered before mounting permanently or after—whichever is desired. Dummy wire braces were added to tails on original model but need not be used since they tend to catch in grass and weeds. If braces are used they should be made flexible by fitting short length of aluminum tubing to fin and stab where line passes through them. Brace is nylon fish line and one piece, anchored to fuselage bottom then running to stab, to fin, to stab then to fuselage bottom.

Wings next. Begin by making four full outline ribs of $\frac{1}{16}$ " plywood. These are used to face wing roots and center section. The two holes for wing key dowels must be accurately drilled so that wing panels will not be misaligned. Clamp all four plywood ribs together and drill holes with drill press if possible. Hole is $\frac{1}{4}$ " dia. for $\frac{1}{4}$ " dowel.

Center section is built on cabin top. Cut $\frac{1}{4}$ " sheet ribs for sides and pieces for cross-members. Cement plywood and $\frac{1}{4}$ " ribs together drill $\frac{1}{4}$ " rib using plywood rib as guide. Run length of $\frac{1}{4}$ " dowel through both ribs for alignment and cement to cabin top, put in cross members and trailing edge stock. Gusset corners. This assembly must be square and flat—work carefully.

Cut balsa wing ribs; the thin tip rib is a regular rib with bottom cut off. Notch various ribs as required for front key spar and strut mount blocks. Two ribs at root have $\frac{1}{16}$ " cut off bottom edge to allow for $\frac{1}{16}$ " sheet bottom planking. Cement one balsa rib to each full outline plywood rib. Each wing panel is built using these root ribs as basis for proper alignment. Make up four wing key dowels, bend U shaped wire keys and bind to dowel with strong thread and double cement. Dowels should be $\frac{3}{4}$ " long to extend outboard three rib stations. Note rear spar to receive dowel key. Check fit by passing dowel through root rib hole with rib and spar on flat surface. Repeat process for front key spar. When alignment of spars and root rib is correct build rest of wing structure. Dowels should project $\frac{1}{16}$ " from root rib to seat properly in center section holes. Block root rib over plan with 4° slant outboard. Pin down rear spar trailing edge and $\frac{1}{4}$ " x 1" leading edge. Put other ribs on $\frac{1}{4}$ " x $\frac{3}{4}$ " front spar and pin and cement in place over plan. Leading edge of $\frac{3}{8}$ " x $\frac{1}{2}$ " is cemented down. Add $\frac{1}{4}$ " sheet gusset at root trailing edge and build up rear spar tip. Cut tip bow outlines and cement in place. Bottom edges will have to be cut off at an angle where tip pieces meet leading and trailing edges. Add $\frac{1}{16}$ " sheet leading edge covering and plank back to trailing edge at inboard end. All ribs are capped with $\frac{1}{16}$ " x $\frac{1}{4}$ " cap strips. Other wing panel is built in same manner. When thoroughly dry, wing panel can be taken up from workboard. Plank bottom at inboard end, add pine strut attach blocks, carve leading edge and tips and sand entire structure preparatory to covering.

Wing struts are made directly over plan. Use hard wood such as maple or birch since struts take a beating and must be strong. It would be a good idea to make up a spare set to have on hand for replacement.

This about completes woodwork on model so entire structure should be sanded smooth and given two coats of clear dope to seal wood. Cover open structure with nylon. Block areas, fuselage sides and bottom were covered with light weight tissue. Original model was given three coats of clear and three coats of colored fuel-proof dope. Since yellow doesn't cover well, additional coats of colored dope could be used. Color scheme is Aeronca yellow, fuselage trim and numerals red.

Numerous scale details such as exhaust stacks, door handles, step, cowling air exit can be omitted or added as the individual builder desires; their addition does dress up the model.