A GOLDEN AGE FAVORITE: THE GREAT LAKES

BY AL WHEELER

One of the more popular Golden Age aircraft was the Great Lakes, unique in that its production, although spotted, spanned more than 50 years. Al's EEE-Z-FLI version spans 40 inches and is designed for .25 power.

In March of 1929, the Great Lakes Aircraft Company, of Cleveland, Ohio, introduced a two-place open biplane that was to become a legend. Powered by a 90-horsepower four-cylinder upright Cirrus engine, it had a span of 28 feet 6 inches, was 20 feet in length, and weighed 910 pounds empty—not a large aircraft. Although initially conceived as a trainer, later appreciation of its excellent aerobatic capabilities saw the little bipe become the favorite mount of many airshow stars.

Engine changes in the quest for more power were many, with the Menasco B-4 Pirate being a favorite. One of the best known was a "big tail" 2T-1A powered by a 150-horsepower Menasco C4-S and campaigned around the airshow circuit by the very capable Tex Rankin. Further engine changes saw the use of 175- and 200-horsepower inverted Rangers, several Kinners and the 185-horsepower Warner radial. Airshow greats Hal Krier and Bob Nance used the 185 Warner, as did the much-modified Hunt Special. The 200 Ranger was the choice of Clyde Parsons in his Gold Coast Air Show presentations. Two interesting Ranger-powered examples are currently being flown from the Sonoma County (Schellville) airport in California by Bill and Jan Ewerts—real "his and hers" aircraft popular throughout the West Coast fly-in circuit.

For our trip back to the Golden Age we have elected to model the original 2T-1 and the 2T-1A powered with the original upright Cirrus and, as a companion effort, a "round engine" special, typical of the higher powered airshow performers.

For his in-line engine model, Al duplicated the black-and-yellow color scheme and N705K registration numbers from the full-size Great Lakes 2T-1 he owned back in the 1950s. Bet he wishes he owned it now!

GENERAL

Prior to cutting wood, get familiar with the drawing and the building instructions. Both the inline and radial versions are the same from the cockpit back, and the tail surfaces and wings are the same. Differences are noted in the instructions. If unable to resolve any problems, don't hesitate to contact me in care of the magazine.

Construction is not difficult (an EEE-Z-FLI feature) and no exotic, hard-to-find materials are used. Flight characteristics of both versions are quite pleasing. They are very aerobatic and have no bad low-speed traits. Ground handling is typical narrow gear taildragger: quick but with positive rudder control.

STAB AND FIN

Tail surfaces are 3/16 medium balsa. Join the elevators with a dowel and round all edges. Mark and slot the stabilizer, elevators, fin and rudder for hinges, and install hinges in the stabilizer and fin only.

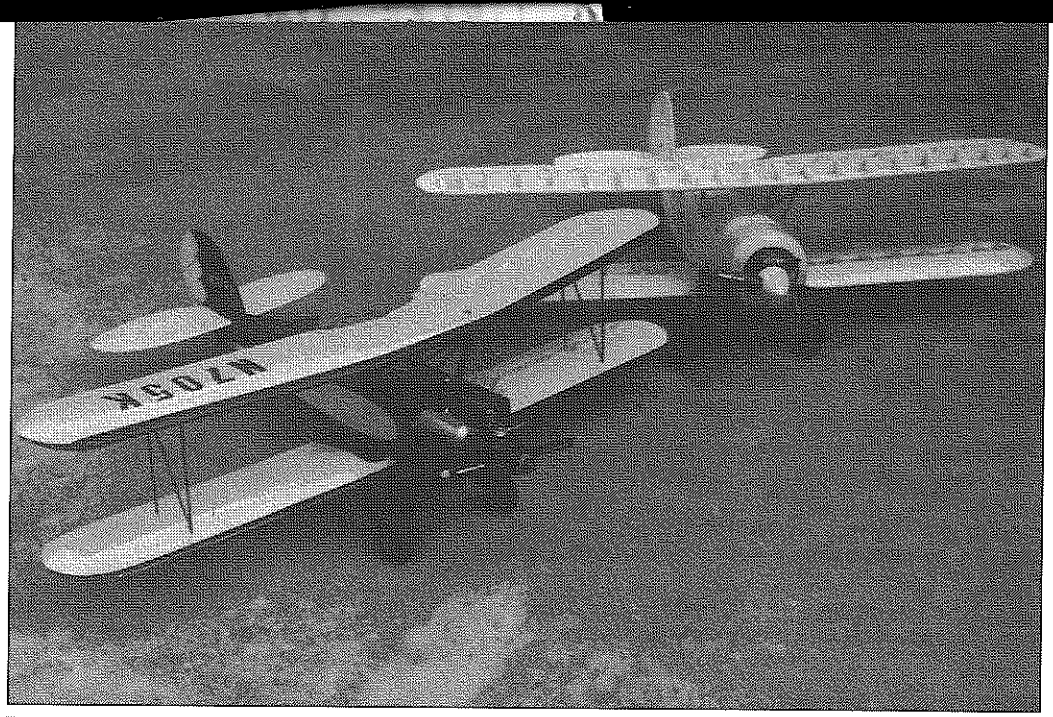
LOWER WING

Edge-join the bottom skins; note that they extend full chord and from the root to the tip. Mark the locations of the ribs and spar directly on the bottom skin so that the entire wing may be built on top of the skins.

The 1-3/4 inch trailing edge stock will later become both the ailerons and the trailing edge strip at the hinge line when the ailerons are cut loose. The R1 ribs are flush with the top of the spar and 1/16 inch below the

top of the trailing edge; the R2s are 1/16 inch above the top of the spar and flush with the top of the trailing edge. The strips between the R1 ribs at the front face of the trailing edge, flush with the top of the ribs, provide support for the rear edge of the center section skin. The R3 ribs are all the same and are notched for the leading edge dowel only after they are installed. Use a 5/16-inch rattail file to do this, keeping the file in contact with the bottom skin so the dowel will seat on its top surface.

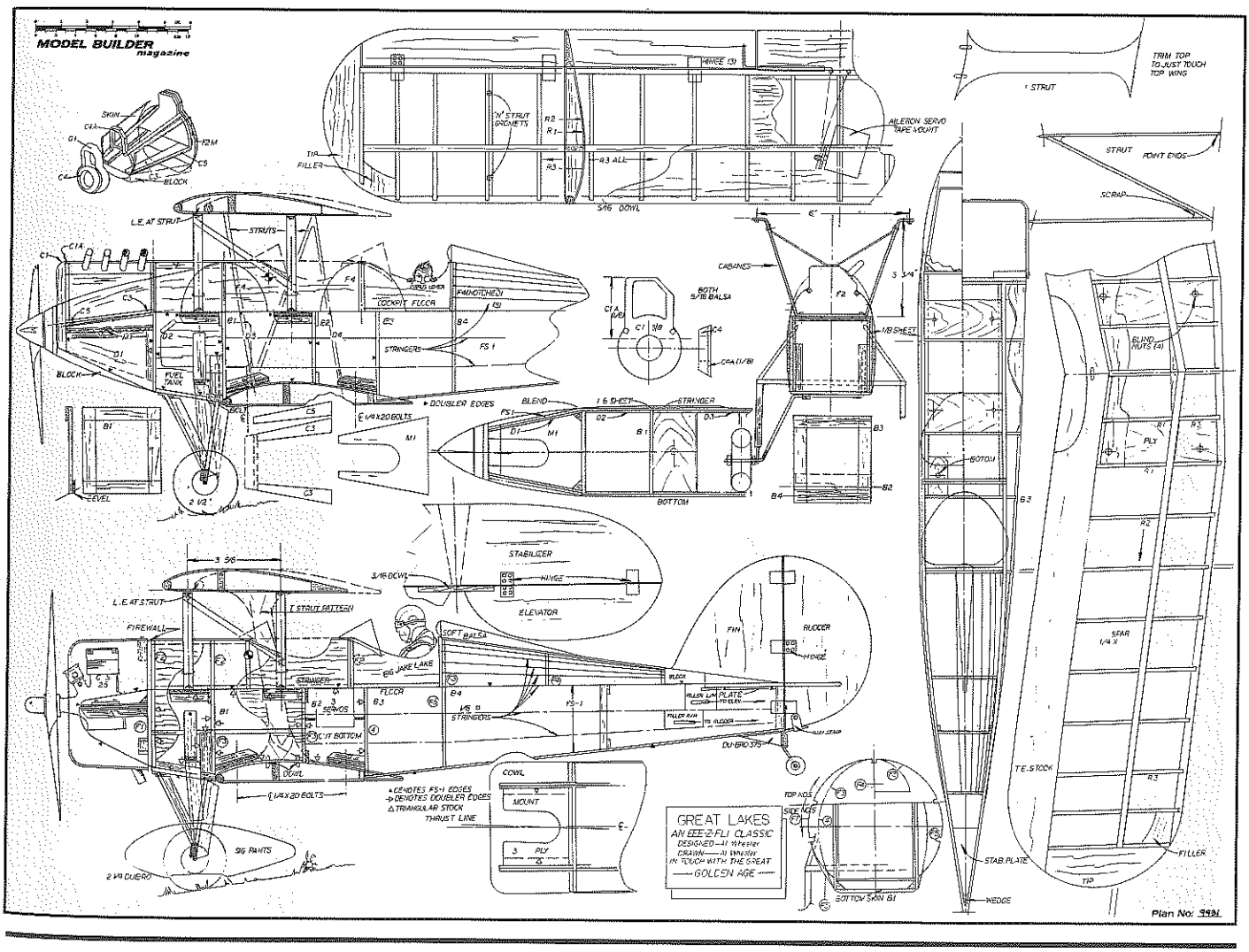
The wingtip and the filler between the leading edge of the two outboard ribs are 3/16 balsa. The upper center section skin is fitted from the face of the trailing edge to the *centerline* of the spar. The leading edge sheeting is one piece from the root to the tip rib and fits from the rear face of the spar to the leading edge dowel. You will need to cut a notch to fit the center section skin, which extends to the spar midpoint. When dry, the top and bottom skins can be blended smoothly into the leading edge dowel.

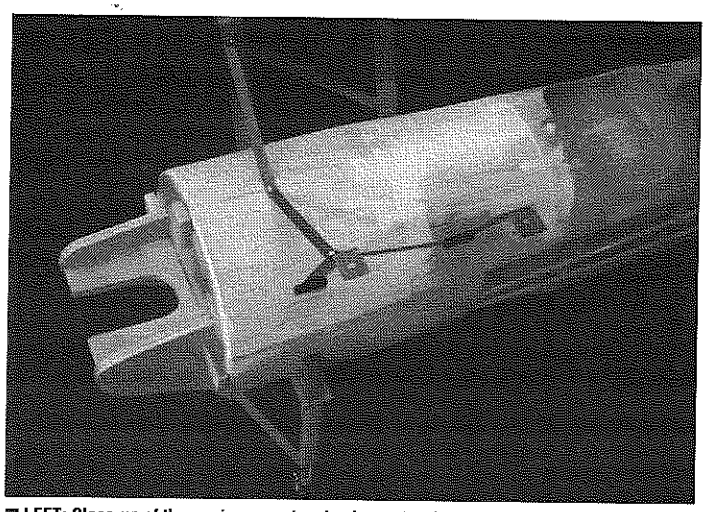


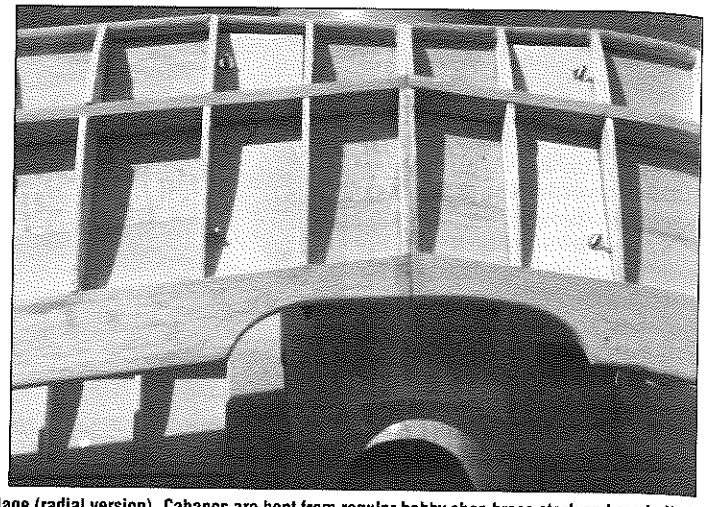
The plans show both the in-line (90-horsepower Cirrus) fuselage and a fatter "round engine" fuselage typical of the higher-powered radial engine aircraft. The rest of the airplane is the same.

Sand the root ribs to form a good joint with a straight leading edge and with both tips elevated 1/2 inch. Mark the outboard ends of the ailerons and mark the line for the aileron cutoff 1-1/2 inches in from the trailing edge. Starting at the root end, cut off the entire aileron section and the inboard aileron ends.

The two wing halves can now be joined with both tips el-







■ LEFT: Close-up of the engine mount and cabane strut installation on the Great Lakes fuselage (radial version). Cabanes are bent from regular hobby shop brass stock and are bolted to plywood plates in the fuselage. Top sheeting is put on after the cabanes are in place. ■ RIGHT: Upper wing bolts to the cabane via four bolts. Blind mounting nuts are set into plywood plates glued to the top of the bottom sheeting.

evated 1/2 inch. Also join the center trailing edge so that it has the same dihedral angle as the wing, but *do not* attach it to the wing at this time; it must first be grooved to accept the housing for the aileron control rods, which I bent out of coathanger wire. With the finished aileron controls in place, carefully align the trailing edge section with the wing and cement in place. Make sure the bottom is parallel with the bottom wing skin. Install a 2-inch band of glass tape around the wing at the center section.

UPPER WING

Construction of the top wing is the same as the lower, with the exceptions that there are no ailerons and the wing can be built in one piece flat on the board, as there is no dihedral. Prior to skinning the center section and the leading edges, install 4-40 blind nuts in the cabane strut attachment holes on the bottom surface. For extra strength, skin the center section with one piece of wood between the outboard R1 ribs.

FUSELAGE

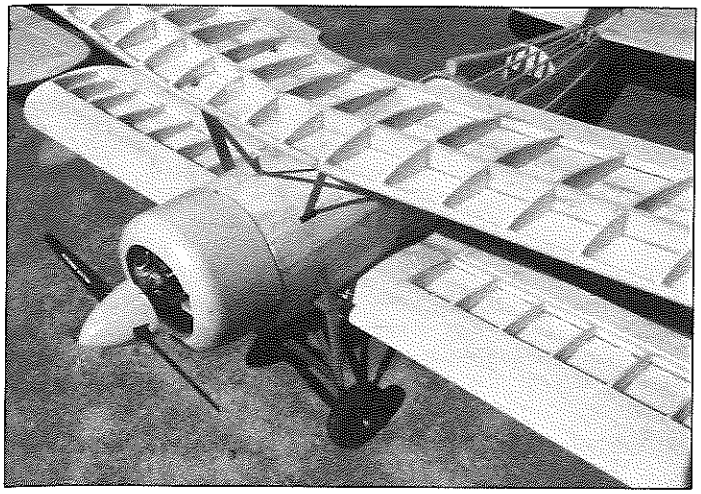
The basic "box" is the same for both versions with the exception that the sides (FS1) extend farther forward on the Cirrus version and are scored and bent inward at the firewall to form the "pointy" nose, this to be done prior to installing doubler D1. Doublers D1 through D4 (D2 through D4 on the Cirrus version) are glued to one FS1 with spaces in between to accommodate the bulkheads. Install the firewall and bulkheads B1 through B4 on one FS1, then place the remaining FS1 on the building table (doublers up) and cement the bulkheads into the slots. On the Cirrus version, score and bend the front ends of FS1 as shown and install D1 now.

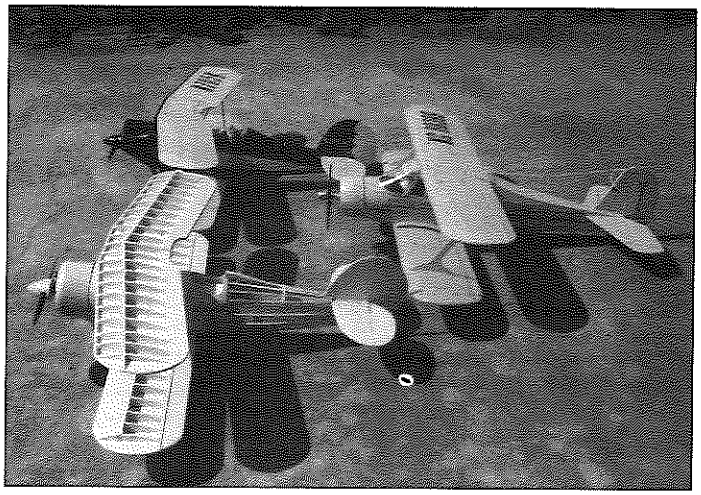
Glue the fuselage sides together at the tail post and install the verticals and cross members in the aft fuselage. Install the upper formers (note the differences between the two versions) as well as the plywood cabane strut supports and the triangular reinforcements. Install 4-40 blind nuts on the bottom side.

Bend the cabane struts from 1/16x1/2-inch brass or aluminum according to the drawing. Note that the round engine model has side formers, is sheeted with 1/16 balsa back to B2 and has stringers from there aft. It's better to install the stringers later, as handling may crack them. There are no side formers on the Cirrus version, just 1/8 sheet back to B1 and stringers, flat on FS1, from there back. The aft bottom of the fuselage is skinned with 1/16 cross grain balsa.

Install the cabanes with 4-40 hex socket screws. Install them *tight*, as this is your last shot shot at it! It might be wise to put a drop of CA on the bottom where the screw comes through.

Because the upper fuselage skin is done in two pieces, joined at the top stringer, getting it on with the cabanes in place is no problem. Make the slots a little longer than the strut





■ **LEFT: Here the powerful Great Lakes is almost ready to cover. Note the wing construction—fully sheeted on the bottom, sheeted from the spar forward on the top. This is typical of all of Al's EEE-Z-FLI efforts.** ■ **RIGHT:Three EEE-Z-FLI oldies but goodies: the two versions of the Great Lakes being followed in close formation by Al's Staggerwing Beech (*MB* plan #2921, $14). Al has still more semi-scale projects coming—watch for 'em!**

width and about 1/4 inch wide with rounded ends. Assure a good bond on all edges. On the Cirrus version, note that the top skin breaks at B1 and tapers forward to F2.

The engine support and triangle braces are installed with epoxy. On the Cirrus version, install the C1 nose block assembly, assuring that the hole centers around the shaft of your engine. Install the side blocks and the bottom block. Trial fit the engine so the rear prop flange protrudes far enough ahead of C4 to leave room for a spinner. Install both lower wing supports with epoxy.

LANDING GEAR

The main gear legs fit side by side in the slotted cross support in the fuselage. With them in place, check the axles for toe-in or toe-out and bend them as required. The front brace and the bend for the solder joint is a trial-and-error job, best done with soft wire to establish a pattern.

Measure from the firewall back and the bottom of FS1 to establish the location of the 3/16 dowel that goes through the fuselage. Start with a small drill and drill each side carefully. Gradually open up the holes to accommodate the dowel. Recheck alignment and install the dowel. Add a soft balsa fairing to the rear side and sand to shape. The upper brace is of medium hardwood sanded to an oval shape.

On the round fuselage cut a short slot so the end of the brace fits into the skins and cement in place. On the Cirrus version it attaches to the outside of the 1/8 sheet. Make the shocks from

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soft balsa. Drill them to accommodate the wire guide and make the "wire" strut. The bottom end that fits over the axle is an electrical terminal crimped onto the wire with the upper end free sliding up into the "shock." These will be installed with the rest of the gear after covering.

COVERING

For ease of application, excellent shrinking properties and lasting color, the writer recommends Super MonoKote for all EEE-Z-FLI covering applications. Following covering, trim the MonoKote from any joint areas to assure good wood-to-wood contact.

ASSEMBLY

Install the stabilizer and fin, assuring they are both level and square with the fuselage centerline. The landing gear may be installed and the wood fairing strips added to the wires. Solder the lower joint. These may be filled and painted the required color. A short piece of fuel tube between the shock strut and the inside of the wheel acts as a good cushion.

Fuel proof the engine compartment and install the engine and throttle control cable. The servos may now be installed, three abreast—rudder, elevator and throttle. Stuff the fuel tank in place and connect the fuel lines.

Drill and tap the holes for the 1/4-20 lower wing mounting bolts and bolt the wing in place. Prior to drilling, check from a common point on each wingtip to the tail post to assure the wing is square with the fuselage centerline. Bend and install the V-brace between the forward cabane struts. It should touch the fuselage top and maintain the 6-inch dimension between the wing mounting holes. Place the top wing upside down on a padded surface and bolt it to the cabanes with 4-40 bolts. Note that the fuselage can be rocked sideways at this point.

Support the model so that the measurement between the top and bottom wings at the tips is the same on both sides. Install a screw through the hole in the V-brace into the fuselage top. Install the diagonal braces between the front and rear cabanes, maintaining the fore and aft dimension of 3-5/8 inches.

Insert servo mounting grommets in the wings at the N-strut locations after making the struts, which are pointed at the four ends and seat in the grommets. The wings may be sprung apart slightly to install them. On the radial engine version the I-struts may be attached to the lower wing with dowels and the top end trimmed to just touch the bottom surface of the upper wing. They are left on for flying and remain attached to the lower wings.

The headrest and rear fuselage fairing blocks between the stab and fin can now be fitted, covered and installed. Cabane struts and landing gear legs may be painted. Install the tail wheel assembly and connect the control arm to the bottom of the rudder with an aluminum strap and self-tapping #3 screw. The aileron servo on both prototypes was mounted on the top of the lower wing with double-sided servo tape. With the MonoKote cut away, adhesion to the wing surface appears adequate, even for some pretty serious aerobatics.

RIGGING

Level the airplane so the top of the horizontal tail is at 0 degrees. The lower wing should also be at 0 degrees and the upper wing at 1 to 1-1/2 degrees positive. Inserting washers between the top of the cabane struts and the lower surface of the wing will correct this angle as required.

For starters, control surface movement can be set at 1/4 inch up and down for the ailerons, 1/2 inch up and down for the elevators and 5/8 inch each way on the rudder. Neither of the prototypes have required more than one or two clicks of trim in any direction. The throttle servo should be rigged to give full throttle with both the throttle and the trim forward; throttle closed with full trim back should give engine cutoff. With the rudder at neutral, roll the aircraft and tweak the tailwheel alignment as required to attain a straight track.

PREFLIGHT AND FLYING

At a point "one finger's width" forward of the rear cabane strut, the model should balance slightly nose down with the fuel tank empty. Minor changes in the battery location have accomplished the proper balance on both prototypes—a little farther forward on the round engine versions due to the shorter nose.

Give a tug on all moving surfaces to make sure the hinges are not going to pull out—it's best to come back with all the surfaces you departed with! Do a range check appropriate to your radio and also a control check.

Either version will accelerate quite rapidly, so line up and add throttle slowly, keeping the tail wheel on the ground until you are tracking straight, easily apply full throttle, keep your rudder finger ready for slight corrections and up you go. You will find the model tracks well and is stable in pitch and roll. Even at the initial setting you will find the ailerons to be quite quick—adjust them as you like. Rudder and elevator alone will produce excellent snap rolls and spins.

Check the glide characteristics prior to landing. A slight nose-down attitude produces a good glide and the flare and landing are routine. The rollout will require a bit of rudder waggling but is easily controlled.

Enjoy your Golden Age creation and send the old modeler a picture! You might win an EEE-Z-FLI T-shirt! ***MB***