STAGGERING AROUND MAUI

An EEE-Z-FLI Oldie

BY AL WHEELER

We present here a tribute to a Golden Age airplane, a nostalgic trip to visit with a beautiful aircraft, one built when biplanes were king, engines were big, round and strong, and the little wheel was in the back. And no one had heard of ARFs! The Beechcraft Staggercraft was one of the most luxurious and aesthetically appealing aircraft of that wonderful age, admired and sought after today by restorers, antique buffs and modelers alike.

Presented here is an inexpensive, easily built model of that fabulous aircraft, one that looks great in the air and on the ground, flies well and has that certain appeal that turns heads at any flying site.

In the "recognizable" scale category, the EEE-Z-FLI version is a basic fun-fly aircraft that may be detailed to suit the builder's taste. So, if your choice runs to sleek biplanes with big round engines and good looks, shake the termites out of your balsa pile, sharpen your hobby knife and start cuttin'.

Development of the model Staggerwing has followed the basic EEE-Z-FLI criteria of ease of construction without requiring hard-to-get materials; reasonable scale appearance and good flight characteristics. As always, ease of repair was a basic consideration. The size of the model and the use of a .25 size engine keep the Staggerwing in the affordable range for the novice scratch builder.

Extensive flight testing (and just plain fun flying) has indicated good performance without any of the peculiar quirks sometimes associated with semi-scale models. Ground handling is good, tracking is well within the ability of the rudder to keep it straight, and general flight characteristics are normal, loops and rolls and their various combinations precise, and approaches and landings are routine. Slow flight is normal with docile stall performance.

The Staggerwing is not considered a difficult building project, however, some prior experience would be helpful. Initial flights should be accomplished with the help of an experienced airplane driver.

GENERAL NOTES

1. It is easier to cut out all the parts prior to the start of construction; then, like a kit, it goes faster.

2. It is important that the wings be built flat, as this type of construction resists corrective warping!

3. Numerous choices are for the builder, engine brand, fuel tank make, covering material and general hardware selection. Equipment and materials used on the prototypes arenoted on the plans and/or in the photo captions.

FUSELAGE

Select matched sheets of 1/8 medium balsa. Cut out and edge-join FS1 and FS2 on a flat surface. Cut D1, D1A and D2 and cement to the sides in the locations shown on the plans. Install the vertical 1/8x1/4 strips in the aft fuselage. Mark and cut the elevator pushrod slot in the aft fuselage left side. Install B2, B3 and B4 to one of the fuselage sides, making sure that they are vertical to the fuselage side. Join the fuselage sides by cementing B2, B3 and B4 onto the remaining side. Do this on a flat surface and use a square to align the fuselage sides at the aft end. Install B1 (firewall) using epoxy. Fit and install D3 (right and left)

Full-size Staggerwing can be found in many different colors, so just about any realistic scheme you can come up with could be considered authentic. Author's prototype is powered by an O.S. 25FP swinging a 9x5 Master Airscrew prop, the covering is Monokote, and the radio is a Futaba. The cowl and windshield both came from a two-liter plastic soft drink bottle.

and formers F2 through F6.

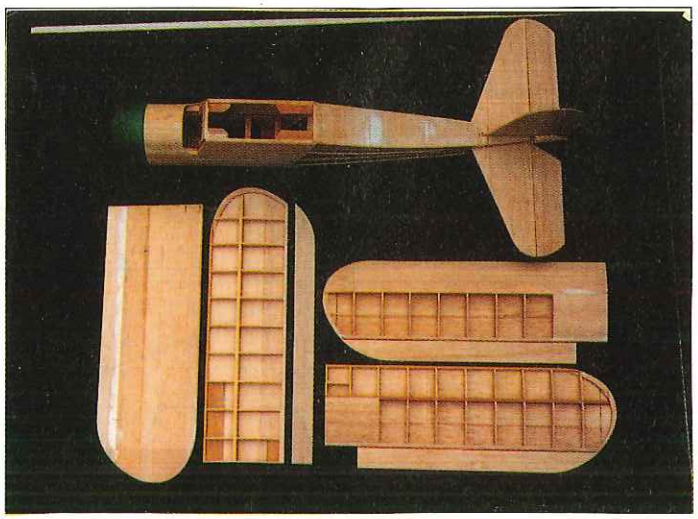
The aft ends of the fuselage sides may now be joined. Pull together, align and hold with clothespins while cementing. Install the cross braces at the rear fuselage vertical members, as well as the stabilizer support pad. The upper side supports from the firewall to F3A may now be installed and the stringer on each side from the firewall back to F2. Mark the side stringer locations and cut notches for them in F4. Taper the rear end of the stringers as shown and install. Make M1, M2, M3 and M4 and the M1 and M2 triangular supports and install with epoxy.

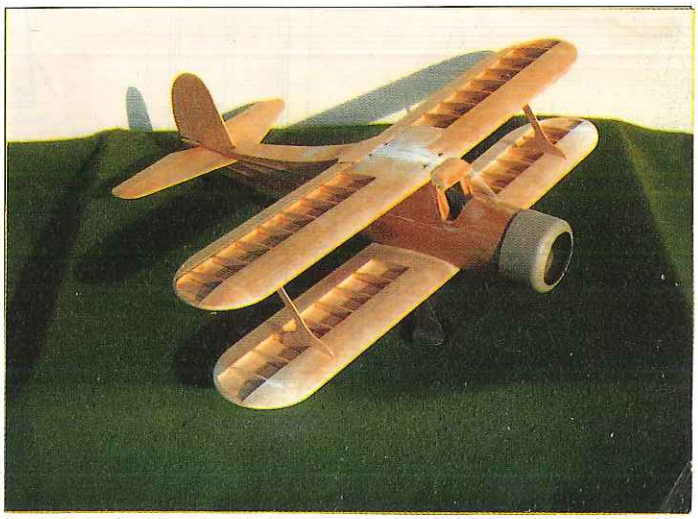
Fit and install the hardwood tail support block and the nyrod guide for the tail wheel wire. Servo rails may now be installed, the rear one as shown and the front one to accommodate the servos being used. Install the upper stringer from the firewall back to F6. Cover the top of the fuselage from the firewall back to F3A with 1/16 balsa, and continue sheeting back to B3 on both sides. The top and bottom of the fuselage can now be sheeted (cross grain) and the bottom of the nose covered with the grain running fore and aft. Using a piece of 1/8 scrap balsa to simulate the stabilizer, form the aft fuselage top block from a soft balsa block. The upper windshield block may be carved to fit, but leave the rear cut-out for the wing leading edge until the wing is completed and can be fitted.

The hardwood cowl supports may be epoxied to the firewall at this time and the engine mount holes drilled and blind nuts installed. Position your engine on the mount and locate and drill the throttle control cable hole and the fuel and vent line openings in the firewall. The fuel tank may be installed and the servos trial fitted at this time.

TAIL SURFACES

All surfaces are medium-hard 3/16 balsa. Elevators are joined with 3/16 dowel as shown. Do this on a flat surface, and be sure the leading edge is straight and trailing edges aligned. Cut the hinge slots and cement the hinges into the stabilizer and fin only. Slot the fuselage sides as required for the stabilizer to fit as shown on the plan. To fit the aft fuselage top block, mark and slot the center of the block for the fin, which fits onto the top of the stabilizer, and cement the block to the stabilizer top. Sand the edges of the block to contour with the top fuselage corners.





(Top) Construction is pretty much all sheet balsa, with just enough open structure on the fuselage and wings to retain the look of a fabric-covered aircraft. (Above) The Staggerwing is the latest in the author's series of EEE-Z-FLI model designs, several of which have been featured here in MB.

Sand all tail surfaces and put them aside for covering.

WINGS

Note that the rib requirement differs between the upper and lower wings; R1 is the same for both, but R3 and R4 for the upper wing are shorter due to the aileron spar, and are designated as 3U and 4U.

Starting with the lower wing panels, select four matching sheets of 1/16 medium balsa, cut to length and edge-join to form the bottom wing sheet. Cut the tips to shape and, working on the plans, transfer the spar and all rib locations to the bottom wingsheet with a ballpoint pen. Install the main spar, assuring that it is vertical to the bottom skin. Cut the pre-formed trailing edge material to length and cement it to the rear edge of the bottom sheet; assure that the rear sheet and the trailing edge stock are flat on the work surface and that the joint is well cemented. Install all No. 1 leading edge ribs. Note that the four inboard ribs must be notched to fit over the landing gear support pad. The vertical members between the four inboard ribs are fitted between the ribs. The landing gear support pads may be slid into position from the inboard end prior to joining the two wing halves.

Install the No. 3 and No. 4 ribs, fitting them carefully to the forward edge of the trailing edge stock to assure a positive glue joint. With the wing held flat on the building surface, use a rat-tail file and open up the leading edge ribs to accommodate the 1/4-inch leading edge dowel. Plan the cut so that the dowel rests firmly on the bottom sheeting. Cut the dowel to length, taper the tip end and install, assuring a good bond to the skin and each rib. Cut the tip pieces from 3/16 balsa, trim and install.

Make and install the two supports for the landing gear J-bolt on the outboard face of the butt ribs, also install the two plywood pads at the aft end of the inboard ribs against the front edge of the trailing edge stock. Install the upper balsa skin at the center section from the butt rib to the fourth rib outboard, extending from the spar center line to the trailing edge front edge. The leading edge may now be sheeted with 1/16 balsa from the rear face of the spar to the leading edge dowel; trim the sheet to fit the center section skin at the spar center line. Wet the sheet prior to attaching and use tape to hold it in place as the glue dries. Sand the entire wing, use filler as required, and prepare to join the two halves. Sand the butt ends to obtain a good flush fit with one tip elevated one-inch. When satisfied with the fit, puncture several holes in each butt rib for better adhesive penetration and join the halves with epoxy. Allow to dry, sand as required and apply glass tape to the center joint. Install strut mounting pads as shown. Trial fit landing gear using hardware as shown in drawing. Drill three 5/32-inch wing mounting holes at the locations shown. The 5/32-inch holes will act as guides for fitting to the fuselage and will be opened to 1/4-inch after the fuselage guide holes are drilled. Sand the entire wing in preparation for covering.

Basic construction of the upper wing is the same as the lower with the exception of the addition of the aileron spar. Cut the ailerons from 1-1/2 inch standard aileron stock, fit and cut the hinge slots and control arm holes. Cut matching hinge slots in the aileron spar and install hinges in the spar only. Slot the spar for the torque rod support, then trial fit the ailerons and torque rods. Fit and join the wing halves in the same manner as the lower wing. Drill four 3/16-inch wing mounting holes as shown on the plan. The aileron servo may be mounted with servo mounting tape or with a commercial servo mount.

Check over the entire wing and sand in preparation for covering.

COVERING

Sand all surfaces a final time—a little effort here will do much to avoid those unsightly little lumps that detract from an otherwise good covering job. Covering may be done in the builder's choice of materials, color and trim. The prototypes were covered with Top Flite Monokote, as it applies easily, provides a lasting finish and contributes considerable strength to the completed structure. Monokote is a standard with all the EEE-Z-FLI series. Mark and cut away the covering from all assembly joints to assure good wood-to-wood cement joints.

ASSEMBLY

Trial fit and attach the stabilizer to the fuselage, checking for proper alignment. Position the vertical fin with the rudder attached into the slot on the top of the stabilizer. Check for fit and clearance under the rudder for the tail wheel steering arm and related U-clamp. Install and bend the tail wheel wire at this time (rudder removed), and reinstall the rudder for a final check. Install the elevators, cementing in place, then install the fin and the rudder. Position the lower wing on the fuselage and check for alignment by measuring from a set point on the tail to the same point on each wing tip. When satisfied with the alignment, drill the three 5/32-inch holes through the fuselage mount pads.

Tap the bottom fuselage holes 1/4-20 and open the holes in the lower wings to 1/4-inch. Using the same alignment method, position the upper wing and mark through the four 3/16-inch mounting holes onto the fuselage supports, remove the wing, and drill and tap the four holes 8-32. All servos, the fuel tank and engine may now be installed and hooked up. Prior to remounting the wings, the landing gear may be installed on the lower wing complete with wheels and "doors." Cut a two-liter soda bottle bottom to form a cowl. Provide openings for the cylinder head, exhaust and needle valve, then drill mounting holes through the cowl into the cowl mounting blocks to accommodate #3 screws.

Install the lower wings with three 1/4-20 nylon screws. Mark and provide holes for the struts, then install the struts for a trial fit and trim the tops so that they just touch the bottom surface of the top wing as it is installed on the fuselage. Allow for wing seating tape if you intend to use it. Once satisfied with the fits, cement the strut pins into the lower wings. The soft aluminum wing fairings may be fitted; roll them around a piece of PVC tubing until they give a satisfactory fit, then attach with #3 screws. The top fuselage fairing at the wing trailing edge may be cemented to the wing with a single #3 screw holding it to the fuselage top. Location of the antenna outlet, switch and charge plug are up to the builder. Before you throw away the rest of that two-liter soda bottle, make a cardboard template and cut out a windshield (The green looks good in the more sunny climes).

RIGGING

Starting with the throttle, it should be rigged to provide full throttle with the trim advanced and cut off with the throttle closed and the trim all the way back. Idle should be determined by the trim setting. The ailerons should have 3/16-inch travel up and down, the elevators 3/8-inch up and down, and the rudder 1/2-inch right and left. These are good starting points and may be changed later to suit individual taste. The tail wheel should be adjusted to provide straight tracking with the rudder at neutral—a little wire bending may be needed here. With the aircraft leveled so that the stabilizer top is at 0 degrees, the upper wing should read 1 degree positive incidence and the bottom wing 1-1/2 degrees positive. Three degrees down thrust is good for the engine, with no right thrust.

FLYING

A few minutes taken to check things out and make required corrections will help assure that your new airplane makes it past the first flight! Check all control movements for proper amount of throw and in the correction direction! Reversed ailerons will really give you a case of the staggers. If your engine is new, run at least two tanks of fuel through it prior to flying and run it a bit rich. The writer, sometimes known as "Chicken Al," dislikes the combination of a new airplane and a new engine. If possible, the first flight is better made with a well-used, good-running engine of the same type; that way you can concentrate on flying the airplane and not worry about sudden engine stoppage and the resulting sudden lesson in how your new airplane glides and lands dead-stick. (Not to worry, the prototype quit on the initial flight and the glide and landing were without incident.) So, if everything checks out in the green, go fly!

Check rudder (tail wheel) response and check neutral rudder position for straight tracking. Add power slowly and anticipate the need for right rudder. The tail will lift with neutral elevator and once speed is attained, a little up elevator will produce a gentle liftoff. The prototype required only minor nosedown trim and flew with good stability in pitch, roll and yaw. There is very little nose drop in turns and aileron control is positive. In a nose-high, reduced power stall attitude the nose will drop straight forward and recovery is quick. Power-off glides are stable with a nose-down attitude and the flare and landing are straightforward. So is the rollout as long as you keep an active rudder thumb.

As you get used to your Staggerwing you will find that rolls, loops and any of their combinations are easily accomplished. The airplane is an attention getter in Cuban and reverse Cuban 8s. Somehow, biplanes just look better staggering around the sky! **MB**