

BUILD AN ULTIMATE, EEE-Z-FLI STYLE!

One of the world's premier competition aerobatic aircraft, the Ultimate has become by far the most-modeled biplane of the past few years. Here's an affordable .40 size sport version in the author's unique EEE-Z-FLI style of construction.

BY AL WHEELER

Considering the Ultimate Biplane's numerous achievements in the TOC and other aerobatic competitions, the fact that it has become a popular modeling subject is understandable. Most of the current model offerings, however, are big airplanes—so big that the initial cost is high, the engines required run into megabucks, and transportation to and from the flying site requires assembly before you can fly and disassembly before you can go home.

For those who prefer a smaller Ultimate, the EEE-Z-FLI .40 size model is ideal. Cost is low, the engine is affordable, and transportation is simple (fully assembled, it will fit easily into most compacts, even in the trunk!). Also, little is lost in performance; the .40 powered EEE-Z Ultimate, with its 660 square inches of wing and an all-up weight of 5.25 pounds, gives

an excellent account of itself when flown next to .60 and .80 powered kit models.

In keeping with the EEE-Z-FLI tradition, construction is basic, the parts count is low, no exotic materials are used, and the flight performance and ground handling are outstanding. Initial flights indicated straight tracking on takeoff, the tail coming up by itself with neutral elevator trim and the aircraft lifting off as it attained sufficient speed. It was found early on that the ailerons are *quick*, a characteristic that your writer likes, however, one that may be changed to suit your taste.

Rudder also has considerable authority—great for knife-edge flight. The aircraft has neutral stability and will stay in the attitude you leave it in. Loop and roll combinations are lots of fun, as are all aerobatic ma-

The prototype EEE-Z-FLI Ultimate on the tarmac at the author's home field in Hawaii. An exceptionally good looking ship, we think. Engine is an O.S. .40 FP swinging a 10x6 Master Airscrew and fitted with a Tatone Pitts type muffler, cowl is from a Sig Skybolt, the wheelpants are from a Goldberg Ultimate (a bigger model, which is why the pants look a little big here), and the radio is a four-channel Futaba.





The canopy (in this case, "borrowed" from an EZ Christen Eagle) is secured simply with a couple of small screws. Overall covering is MonoKote, Al's favorite for all of his EEE-Z-FLI projects. Cowl and other small parts are sprayed with Pactra's Formula-U polyurethane.

nevers. The glide is normal and the aircraft is hard to slow down for a biplane—must be a clean machine! Once slowed down, flare and landing, either

three-point or on the mains, is straightforward with an easily controlled rollout (that big rudder again). To sum up, the flight characteristics are most pleas-

ing and the EEE-Z Ultimate will do anything you ask of it.

CONSTRUCTION

Work the instructions and the

plans as a unit; an item that may be unclear in one may be more understandable in the other. If all else fails, get in touch with "Ol' Al" at 525 Kumulani Dr., Kihei, HI 96753; (808) 879-3086.

EMPENNAGE

The tail surfaces are all sheet balsa. Note the 1/16 plywood doublers on both sides of the rudder. Slot the stabilizer, elevator, fin and rudder for hinges, and install hinges in the stab and fin only. Round all edges and you're done.

FUSELAGE

Doublers D-1, D-2 and D-3 are glued to the FS-1 fuselage sides with spaces in between for the firewall and bulkheads. Install bulkheads B-1 and B-2 on one FS-1, then place the remaining FS-1 on the building board (doublers up) and cement the bulkheads into the slots. Make sure everything is square and in proper alignment.

Epoxy the plywood firewall

With those four barn-door ailerons and correspondingly large elevator and rudder, the Ultimate is one responsive bird! There's a lot of fun in store for those who build one of these agile models.





Ready for covering and paint, this view shows off the Ultimate's straight lines and simple construction. Note also the experimental short landing gear, which probably improves the ground handling a bit but doesn't look as good as the longer gear.

and cabane strut mounts in place; add triangle stock (not shown on the plans) between the bottom surface of the strut mounts and the inside of the fuselage. Add top formers F-1 through F-4.

Install the three hardwood landing gear support blocks with epoxy. (The horizontal piece is slotted for the landing gear wires; don't drill the vertical blocks yet.) Add the

3/16 balsa bottom section aft of the firewall. Add the triangle stock gussets at each side of the firewall.

Install the front and rear wing support h a r d w o o d blocks and triangular blocks. (Use epoxy for all wing attach-

ment structure.) The rear ends of the fuselage may now be pulled together and B-3 and B-4 installed. Be sure the rear fuselage joint is vertical; this is where bananas are born and bananas we don't need! Fit and install the filler block at the rear joint and install the cockpit floor.

Add F-5, F-6 and an extended F-5 from the front face of the vertical F-5 at an angle down to the cockpit floor; this becomes the

rear support for the canopy. Install the 1/4 square top stringer. Plank the bottom from B-2 aft to the rear end with soft 1/8 balsa (cross grain); the section forward of B-2 will be fitted following wing installation.

Form the four cabane struts from brass or aluminum; the prototype used K&S brass strips from the local hobby shop. Align them carefully, and

when satisfied, drill the plywood supports and install 4-40 blind nuts on the bottom of the supports. Minor rebending can be done as required.

Being sure to maintain the 3-5/8 inch dimension shown on the plan, install the diagonal braces with #3 self-tapping screws. Recheck the strut attachment hardware for tightness—this is your last chance, so get it right!

Install the forward 1/4 square top stringer. The top 1/16 skin is now added in pieces, working from the top edge of FS-1 to the center of the top stringer. Plan a joint at a point about midway between the struts and work to that point from the front and rear. Slot the skin for strut clearance as required.

Sheet the turtledeck, going all the way back to the tail post. Slot the sides and top for the stab and fin. Install the cowl supports and the engine mount. With the engine installed, cut the required cowl openings and fit the cowl. A Tatone Pitts type muffler adapts well to the area below the fuselage section inside the cowl. The chrome extensions are neat and give a more mellow sound.

WINGS

The upper and lower wings are identical with the following exceptions:

1. The lower wing incorporates the aileron torque rods and the aileron servo.

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EEE-Z-FLI ULTIMATE BIPE

Designed by Al Wheeler

WINGSPAN 44 in.

TOTAL WING AREA 660 sq. in.

FLYING WEIGHT 5-1/4 lbs.

WING LOADING 18 oz./sq. ft.

OVERALL LENGTH 44-5/8 in.

POWER O.S. .40 FP

used in prototype.

RADIO ... Four channels required.

2. The lower wing has three ribs at the centerline; the upper wing omits the center rib to allow for the plywood mounting plate.

3. Upper and lower wings are shown in the same plan; the right side depicts the lower wing and the left side the upper.

4. Both wings are flat (no dihedral) and may be assembled in one piece.

Edge-join the bottom sheets; note that they extend full chord and from the root to the tip. Pin the bottom sheet on the plan and mark the locations of the spars and all ribs.

Install the spars on one side. Slide a sheet of waxed paper under the centerline and pin down the opposite bottom wing skin. Be sure the centerline joint of the bottom sheets is true and at the correct angle. Once satisfied with the joint, apply cement and weight it down until dry. When dry, install the spars on the other side. With the bottom skin held down firmly, use a strip of aileron or T.E. stock to raise the bottom skin at the leading edge to match the curve of the R-1 ribs and install them, along with the R-2 and R-3 ribs.

Using a rattail file or other suitable tool, make the cutouts for the leading edge in the ribs; a file may be worked through several ribs at once, giving a straight line. The slots must allow the dowel to seat against the bottom skin. Once fitted, carefully cut the dowel to length with the proper bevel on each end. Install the leading edge, assuring a good glue joint against the bottom skins and at each rib. Sand the rib/leading edge joint and ribs back to the

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spar to the same contour.

Install the skin supports between the R-2 ribs at the rear spar. Fit and cement the trailing edge stock to the rear face of the rear spar and to the bottom skin. Cut out the bottom skin at the aileron and cement it to another piece of trailing edge stock to form the ailerons. Bevel the front edges and make the hinge slots in the ailerons and the rear spar. Install hinges in the rear spar only.

Sand all ribs to the same contour using a long sanding block. Sheet the center section with 1/16 balsa to the outboard R-2 ribs. Start at the face of the rear spar and cover forward to the *mid-point* of the front spar. Cut 1/16 sheet to cover the entire leading edge from the center to each tip. Notch it at the center so it will come to the rear edge of the main spar and extend just past the leading edge dowel. If necessary, wet the top surface for easier bending. Assure good glue joints at all points of contact. Use tape to hold the leading edge down.

Trim both the bottom skin and the top sheeting as required and sand to blend smoothly with the leading edge dowel. Glue on the tip caps and sand to blend with the wing contour. Do the same for the ailerons.

The lower wing construction is the same as the upper with the following exceptions:

1. The center section uses three ribs at the centerline.

2. The inboard trailing edge bottom skin is cut loose at the rear spar, the trailing edge and bottom skin are cemented together and notched to accept the aileron torque rod/tube assembly. Assure that the tube is flush at the front face of the trailing edge and cement the assembly to the rear face of the rear spar. Do not get glue on the rod! Drill the lower ailerons to accept the control rod.

ASSEMBLY

Cement the vertical fin squarely to the top of the stabilizer and insert this assembly into the slots in the fuselage. Trim the slots for as close a fit as possible and assure that the assembly is centered fore and aft and level with the leading edge elevated approximately 1/16 inch; this will provide the +1-1/2 degrees positive incidence.

In the upper wing, epoxy the plywood mounting plate between the two center ribs. A firm joint is important here as it will tend to keep the upper wing with the rest of the airplane during frisky flight sessions. Install the interplane strut mounts in the same manner.

Measure and mark the bolt hole positions on the bottom of the lower wing, position the wing squarely in its saddle and drill the four holes with a #7 bit. Tap the holes in the mounting blocks to 1/4-20 and open the holes in the wing to 1/4 inch.

Install the upper wing with 4-40 bolts and

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nuts. Looking down on the model, the leading and trailing edges should be parallel. The addition of washers between the plate and the inside of the strut on one side will shift the alignment. Now install the interplane struts outboard of the attachment fittings, trimming the top end as necessary.

RIGGING

Install the landing gear. Level the aircraft with the top of the horizontal stab at +1-1/2 degrees. The lower wing should be at +1 degree (correctable by cutting or shimming the seat). The upper wing should be at +2 degrees (correctable by elongating the front hole in the plywood mounting plate as required).

With both the upper and lower wings set properly, check for washin/washout. If there is none, position the interplane struts for the best fit. If there is a slight twist, attach the strut at the bottom wing with #3 self-tapping screws and, by rocking the strut fore and aft at the top end, the correct incidence can be established. Clamp the strut in place and attach it at the top end. Once "locked in," you'll find this rigging to be pretty solid. Take the aircraft apart and give all components a final sanding.

FINISHING

All that remains now is covering, final assembly and installation of the radio and engine systems. The prototype model was covered and trimmed with Super MonoKote, as are all EEE-Z-FLI efforts. The fuselage is more easily covered if the stabilizer and fin are done first, then the sides of the fuselage, then the top and bottom. Added effort will be required between the center section struts. This difficult area on the prototype was done in MonoKote trim sheet, as attempts at ironing on MonoKote, even with a trim iron, were difficult.

FLYING

Initial control travels should be as follows: Rudder, 1 inch right and left; Elevators, 1/2 inch up and down; Ailerons, 3/16 inch up and down. Make sure the model balances as shown. Push the model on the ground and check the tailwheel for straight tracking with the rudder centered.

Taxi around enough to become comfortable with the ground handling, line up, ease the throttle on and go. You can expect good tracking and positive rudder control. The tail should come up by itself and the bird will lift off as soon as it has enough air wrapped around the wings. Expect the ailerons to be pretty quick and the aircraft to be stable in both pitch and yaw. With the throttle pulled back, expect the approach to be a little nose down. Once slowed, flare and landing are routine and the rudder has ample bite to control the rollout. Happy flying with your affordable Ultimate, by EEE-Z-FLI! **MB**