

SUPPLEMENTAL EASY LT/S FILE

By Harley Michaelis

Several would-be Genie builders have asked for a scratch-buildable Genie line airframe not requiring a real carbon-skinned, vacuum-bagged wing. That got me thinking about putting a 1/16" balsa-skinned wing on the LT/S fuselage. I built a couple of them. They tow, zoom, scoot, thermal, float & land far better than expected, making another easy-handling, fine performing 6 servo ship for sport or competition.



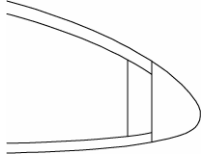
The all up, RTF weight is 61-62 oz. built as detailed on the CD. Materials cost is about \$200 including the new "universal" plans for all the Genie ships, the standard parts pack & pre-cut cores separately available. Do your own cores & save \$60 or more.

SUPPLEMENT TO CONSTRUCTION FILE #3

Except for File 3 sections related to vacuum bagging, follow it & this supplement while making the wing. The wing features (1) a wrapped CF spar system to handle high stress launches, (2) all-internal RDS for flaps & ailerons & (3) hinging by surface-mounting the unique 'individual Kevlar hinges' detailed in CONST. File # 7. Skins can be covered with film or a layer of light fiberglass cloth brushed on with epoxy resin.

After allowing for 1/16" balsa skins, the remaining SD7032 core easily accommodates common 1/2" thick servos. The wing calls for 48" balsa for the center & 36" for the tips. It can be 4", 3" or a mix of the two. 4" may not be available. Unless you hand pick it at a local shop, it is unlikely that all you get will be usable. If you order all medium, thinking that is right, you'll likely get some too hard & some too soft. You'll need to trim edges for splicing and lose material that way. Get more sheets than appear to be needed.

If doing your own cores, lighter, cheaper extruded foam, such as the common pink Foamular 150 is fine. For making templates, enter finished chord for the constant chord center as 10" & outer tip chord as 6-1/2". Setback for skins is 1/16". Cut the center from two blanks 23-1/2" long. Cut the tip sections single taper from blanks 35" long. For tip stall control, cut in washout along the tip section TE's, progressing from 0 at the tip root to 1/4" at the extreme core end. That's 2.2 degrees.



As crudely illustrated here, a 1/8" balsa sub-LE & a 1/4" balsa LE are used. Cores can be cut to allow for that or if cut with the LE airfoil intact, trim off 3/8" including blade kerf.

With the single taper cores trimmed the 3/8" along the entire LE, they are next fashioned into the triple taper planform seen in the opening picture.



Make marks 22" & 30-1/2" from the root end. At the 30-1/2" point, mark 1-1/4" behind the trimmed LE. At the extreme tip, mark 2-1/2" behind the LE. Connect the dots. Trim as shown.

MODIFYING THE AIRFOIL: Where trimmed, sand along the bottom first & then the top so the core LE matches thickness & contour at the 22" point. Mark approximately 1/3 back of the trimmed LE. With that as the high point, use a 10"-12" long sanding block to shape the upper side to a generic airfoil without compound curves so the skin will lay flush.



Don't knock this simple "TLAR" procedure. I've built some 2 dozen ships this way. It generates a fine-performing wing with gentle stall characteristics.



Using .042 or .045 CF spars, the webs (foam or balsa) will be about 3/4" high. To put the bolt head even with the top skin, 7/16" of wood goes under the 1/8" thick bolt plate & 3/16" over it. On the straight blade boxes, 5/16" goes under the uprights & 1/8" over them. Trimmed for 4 degrees dihedral no trimming on the 3/8" blade is needed.



Inboard blade box sections are wrapped between the spars, but be sure to wrap the outboard sections with Kevlar thread before securing them in the tip cores.

MAIN SPAR SIZE & LOCATION: Use 3/8" x 48" CF spars. ACP has .045". CST has .042". Locate the spar so its front edge is 2-1/4" behind the LE of the trimmed core. Mark the cores & remove a strip of core where the spar goes.

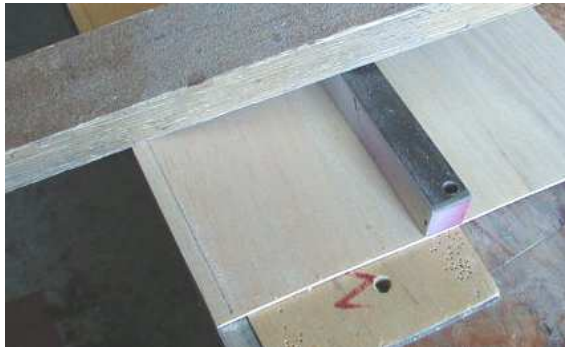
TUNNELS OR CHANNELS FOR LONG AILERON SERVO LEADS: center these 1-1/4" behind the spar. "Hot-rod" or hot wire them or use the Dremel to router a channel 1/4" or so deep in the core bottoms. The sheeting will bridge the channel.

The overall center spar, top to bottom, is to equal the height of the removed core. Make vertical webs from dense foam or light 3/8" balsa sheet. The wrapped spar is not shimmed up as when attaching it to a wing to be bagged with CF & glass skins. Using epoxy or Elmer's Ultimate, first attach the wrapped spar system to the rear core, holding parts in contact with masking tape. To center & tip, attach sub-LE's.

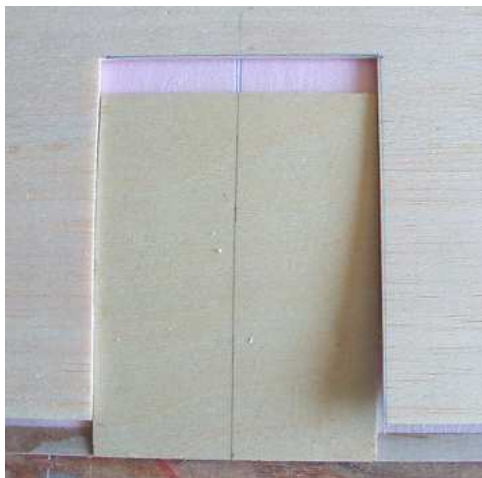
ENDCAPS: On 3/8" medium hard balsa, draw around one of the tip core root ends & cut 2 pair. Slot them for the blades. Bevel for dihedral where they butt.

SKINS PREPARATION: True the edges of balsa sheets & over waxed paper, "spot weld" them together with tiny drops of instant CA glue. Block sand smooth.

Size the bottom skins to extend from 3/8" behind the core TE's & to 1/8" beyond the core sub-LE's. Make the tops 1/8" larger in chord.



A zero thickness balsa TE is impractical. Using the setup shown, bevel skin insides close to zero. With a strip of 1/64" ply between them & a little outside sanding after skinning you get a thin, but practical TE. Trim the center section to a chord of 9-1/2" to fit the saddle with 1/2" extending beyond the high point for the canopy to fit around.



CENTER SECTION, 3" wide 1/16" PLY EXTENSION BETWEEN FLAPS: Grain running span-wise, cut a 3" x 4" plate of 1/16" ply. Center it on the top skin, even with the TE. Mark & cut around it.

Bevel the underside of the rear edge. This is to extend beyond the core TE like the bottom skin. Nicely squared up & centered, join this on top of the core with a thin coat of epoxy. When cured, it's used to key the top skin in place. Note the 1/64" ply strip along the beveled TE of the bottom skin.

If you have bagging equipment, quickly spread a very thin (almost dry looking) coat of thin bagging epoxy overall on the center bottom skin. A credit card makes a good spreader. Get this into the bag & when cured, separately attach the center top skin. 6 drams per skin is just right & convenient using West epoxy calling for a 1 to 5 mix. Lacking bagging equipment, skins can be attached by applying opposing thin coats of

such glues as aliphatic resin. Let dry & activate bonding the coats together with a hot sealing iron. Try it on scrap to see how it works. For real, just smear some on chordwise with the finger at 2"-3" spacing on both the skin & core & along the hingeline. When dry, position the skin & progressively bond it on. Work in the beds on a true flat surface so as to not build any unwanted twist into the panels. Skin & sub-LE can be wick joined with small amounts of instant CA glue. You may wish to use the foam safe formula.



TIPS: After wetting out a skin or smearing the aliphatic resin, place a 2" x 4" patch of CF cloth, fibers running chordwise, across the tip blade box area, top & bottom.

The patches help prevent the tip blade box from breaking out on a hard launch or tip landing. As shown, strips of CF cloth may be used to further strengthen the tips. A good CF item is ACP Uni-Web Graphite, item UP-06, a soft, all-CF unidirectional cloth sold by the foot in 12" width. Go for 4 feet. It cuts with scissors & is very handy to have around.

Skin all bottoms first. If using CF strips, wet out well with epoxy, preferably with thinner, slower bagging epoxy. It's really nice to have a vacuum bagging setup to stick the work into after spreading epoxy overall on a skin & wetting out any CF cloth pieces.

At this stage, the center section is covered top & bottom. Tips have the outer blade box installed, are bottom skinned with sub-LE & endcap attached. Final trim the flap TE's & then cut them away for a chord of 1-7/8". Aileron root hingeline is to be the same as the flap. The aileron will later be cut to taper to 1-1/4" at its end.

HARD SLOT UNIT IN THE AILERON ENDS: Please go to separate CONST. File 10 for details.

See CONST. File #3, Part 2 about well patterns to draw around on the bottom skin & about the simple, dedicated HEMS servo mounts for the RDS. Mark & cut the aileron servo wells. Work a tunnel to them.



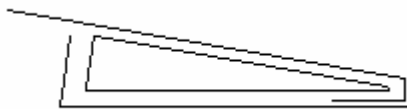
Here's a routed out aileron servo well reinforced with a plate of 1/32" ply & then lined with balsa to stick the film covering to. The black line represents the rear edge of the spar. The channel for the long servo lead is centered 1-1/4" behind the spar. Aileron servo wells can be made 1/4" shorter than flap servo wells by jamming a 1/4" shim inside the template (File 3) wide end & shifting the template back along the shaft path.

Line well edges with soft 1/32" A-grain balsa that bends. Cut pieces an inch or so high across the grain, run a little aliphatic resin about at the middle, press in place & tack top & bottom to the skin edges with instant CA glue. Trim excess. When covering, slit the film over the well openings to wrap & seal inside to the balsa.

If flap servo wells are located 2" apart & just behind the spar, the shafts cross the hingeline at practical points at which to center the "pockets" the shafts slip into. Flap pockets are installed after flaps are cut loose. When it's time to put in the wiring harness, Remove a strip of bottom skin between the wells to position & exit the servo leads. Fill back as needed before film covering. After covering, 2" clear or colored duct tape makes easy covers for the wells.



To tip sections add top skin, LE & tip block. A small block of bass, etc. can be shaped & flush glued to the squared-up extreme tip. Cut the aileron loose. Note the 1/64" ply between the skins at the TE.



If using film, it's easiest to cover with two pieces, as illustrated here on a flap. Invert a panel over the top piece to first fold & attach it along the TE of the bottom skin. Next apply the bottom piece, sealing it to the face of the flap & then to the bottom along the TE. Trim excess at the TE. Place the panel upright to come down & around the face with the top piece. Trim excess.

HINGING: The "individual Kevlar hinges" detailed in File 7 work especially well surface-mounted to flaps & ailerons. Here's how:

Be sure the covering is sealed well either side of the hingeline. Make 1" x 1-1/2" hinges, creased & flexed, ready to apply. Flaps will be hinged on the bottom & ailerons on top. Position the surface by the wing, temporarily holding it in position with pieces of masking tape across the hingeline.

Holding a hinge with tweezers, spray one surface with 3M77. When tacky, apply it so the crease is at the hingeline. Use 5 hinges per flap & 7 per aileron. Apply a hinge near each end & space others equally between.

The pic below displays a finished tip area with surface-mounted, individual Kevlar hinges & contrasting film trim.



To hide the ugly Kevlar & make a decorative pattern, the hinges can be sealed over with either matching or contrasting 3/4" x 2" pieces of film ironed separately either side of the hingeline. The thin line of Kevlar showing can be hidden with a colored pen if you like. If a hinge lifts, reactivate the adhesive with a sealing iron or heat to peel off and replace.