FILE 1: GLASSED-OVER FUSELAGES & FINS (June 8, '09)

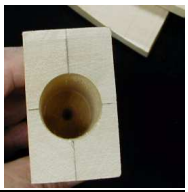
By harley Michaelis, LSF 023

Wind tunnel tests have confirmed that the droop snoot, bowed boom configuration significantly reduces overall airframe drag. See http://www.nesail.com/detail.php?productID=69 for discussion. I started using it on the ATRIX design 22 years ago. Likely after a lot of testing to confirm the drag-reducing merits, a similar profile has recently been adopted by Samba in the Pike Perfect.

See http://www.vintagesailplaner.com/SmoothGeniePro.html. If you're building with a laser cut fuse kit, it includes parts you'd need to make if scratch-building from raw materials. In assembling laser cut parts, just generally stick to the order described for scratch building.

Having scratch-built some 100 or so fuselages of this type & most thoroughly documented the steps to follow in text, drawings & pictures, I contend that most anyone can make one to look like a work of art the first time. Just stick to the script to get anticipated results. You'll learn as you go & can control every step of the process.

This is the longer, slimmer, Smooth Genie Pro/Big Smoothie fuse.



The fuses have removable, single tooth nose skids of 1/8" aluminum and single piece nose blocks to drill out for a lead shot/resin mix. This puts the weight well forward for balancing out.

This is an LT/S tail end. Small cross section in this critical area includes CF laminate between ply doublers to minimize chance of breaking ahead of the fin. Light tail helps keep stress low on fuselage in hard landings.

In an extreme enough nose first landing, the fin to fuselage glue joints can release to further prevent damage to the fuselage ahead of the fin. This happened with the fuse in the first picture. The fin was glued back in, again filleted-in with light spackle, lightly brushed with epoxy & repainted.

Rudder is also a lightweight built-up structure. The LE is rounded to fit into the concaved TE of the solid, very lightweight "contest" balsa fin. Snug pull-pull cable system cleanly operates the rudder. Built-up stab pair weighs 1 to 1.2 oz. Unique, internal rubber gripper system detailed in File 2 keeps stabs snug to the fin.

The internal part of the tow hook blocking glues to an internal 1/16" ply plate. ½" triangular stock is placed where sides meet the bottom. The wing saddle is widened with 3/8" triangular stock & capped over with 1/64" ply. The solid CF pushrod passes through an internal supporting tube installed before the fuselage bottom is closed up.

Fin of solid, light 5/16" balsa houses the bellcrank assembly. It's glued directly between the slab sides and filleted in with light spackle. Dorsal and tailskid are separate items added before glassing-over is done. Barely visible here, ply doublers over CF laminate are added in the area of the front of the fin to help prevent breakage where the cross section is small. Skid helps avoid damage to the rudder when the tail whips around in a dorky landing. Skid can be shaped to suit the builder. See File 4 for a more recent configuration.

Rear end of the canopy is contoured to the actual mounted wing & ends up shaped as in the foreground. This rear end fitting is done in increments so it nicely fits around the LE. A "stop block" is glued to the inside of the fuselage to prevent the canopy from gouging the wing.

All the fuselages are identically made from the same materials. You just have a little more wood left over when building a smaller one. See the document "Costs, Materials & Tools" about what's needed & where to get it. See the "What's Available?" file to see what's available to help.

The best order of doing things is down rather pat. There is no need for anyone to be intimidated. I've made enough blunders for all of us put together & figured out how to avoid them in the future. I still read & follow my own instructions to get it right, not trusting memory to do so.

Think in terms of doing a leisurely build over several weeks. Savor doing each part as nicely as you can. Experience the pride & satisfaction of doing things for yourself & doing them well.

The longer, lower profile fuselage for the 130" span Genie Pro wing is a recent innovation. I call it the Smooth Genie Pro fuse. The performance & handing, compared to the original Genie/Genie

Pro fuse, are just plain better & it's prettier. The original Big Genie fuse (glassed-over or composite) now looks bulky & antiquated to me. The SGP fuse/Big Genie wing combination, called the "Big Smoothie" is the new standard for the largest ship in the line. I consider a slim, low profile, small cross section composite SGP fuse to be impractical, so none is in the works.

I now favor using only the SGP fuse on the larger wings. I'm not discrediting Keith Smith's composite work. We collaborated on it. (File 8) It is excellent, but by nature & with careful engineering, the Genie line glassed-over fuselages are slimmer, more durable, more readily repairable, cost much less & can be made elegant enough to be assumed to be molded.

Having built one LT/S with Keith's composite fuse with its longer tail moment arm I prefer its handling, so am recommending that the slab sides (SS's) for a glassed-over LT/S fuse be made longer than what can be cut in one piece from 48" ply. The Supplementary LT/S file details how by extending the 48" LT/S SS pattern on the plans & using a well-placed splice as on the SGP fuse.

What follows here in pictures, text & drawings plus those in other specified files, provides extensive building details for any of the ships. Before cutting anything, study any SUPPLEMENTAL file for what you're building.

ABBREVIATIONS: As repeatedly used in these files, "BG" means the 12' span wing. "LT" means the 10' span light & smaller GENIE LT/S. "GP" & "SGP" refer to the 130" span GENIE PRO & the SMOOTH GENIE PRO with its longer glassed-over fuselage. "Wax" means coat with paste wax to avoid unwanted bonding. "SS" means SLAB SIDE or STAINLESS STEEL. "TS" means triangular stock. "BK" means the stab bell crank. "Fuse" means fuselage. "Pic" means picture. "&" is commonly used for "and".

Throughout these files, useful modeling tips within a paragraph are highlighted in red. Where a section is one big tip, the heading is red.

The aesthetic, curvaceous, but rugged & practical glassed-over fuses are built unlike anything else. Details are given in the order needed. STICK TO THE SCRIPT to avoid "painting yourself into a corner", so to speak. To get an overview of how these are engineered, browse this Const. File 1, Files 4 & 5 & the new Big Smoothie file. See pics & text in associated text boxes.

CUSTOM SANDING BLOCKS

These are needed for fuse, wing & tail pieces. Make or have made some straight, perfectly squared, 12" x 1-1/4" x 2" blocks of pine, etc. With 3M77 spray adhesive, attach #60, 80, 100 & 150 aluminum oxide sandpaper flat to the 2"sides. Use heat gun to easily lift away worn paper.

Building a fuse is an orderly step-by-step process. Nothing's difficult with suitable tools. I find a table top bandsaw indispensable, but others may do fine with a jig, scroll or coping saw. Major steps: Making SS's with doublers, 2 formers, nose block & fin. A ply box is made with those, TS & 1/64 ply. Add exterior woods, fit canopy & work to shape.

After the major steps are done, the BK is mounted in the fin & the fin with stab pushrod is attached. Glassing-over & painting the assembly follows as detailed in file 5.

REUSABLE PATTERNS to mark around or work over are recommended for the SS's, stab, fin & rudder. Nothing is built on the plans. Thinner Sintra, (see next pic below) a flexible, semi-rigid plastic product used by sign shops, is an ideal pattern material. It can be marked on, scissored & sanded along the edges. A 48" x 12" piece will do for about $5. Check dry goods or office suppliers for other suitable material.

SS PATTERNS on the plans show former & tow block center locations & have alphabetical references on them. Scissor 1/8" or so beyond the plan top/bottom SS lines. If SS's require

splicing, divide the plan pattern along the marked splice line. Attach to Sintra with spray adhesive. Scissor or saw almost to pattern lines & then sand to them.

To get a straight, symmetrical fuse, the SS pair(s) must match in profile. Whether spliced or not, any bow in the opposing ply pieces must bulge outward to use the simple eyeball aligning procedures later called out. Lay your SS pattern on the 48" ply sheet, saddle area high. Precisely mark along the pattern top edge. Shift the pattern down ¼". Draw along the bottom. Centered between the two lines, draw around the entire pattern.

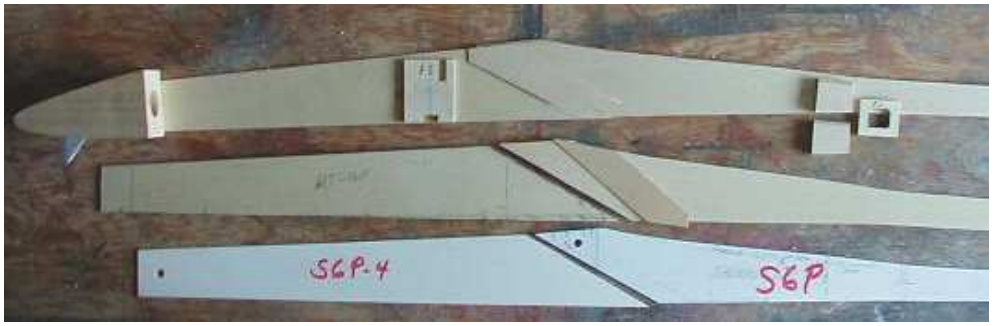
Cut along the outer lines to make a blank. Saddle area high, point it the opposite direction on the ply sheet. Mark around it. Cut out for the 2nd blank. See the next pic to see where you are heading.

With the first blank on top to see the true pattern lines, temporarily join the two inside with strips of ½" double sticky clear tape. True splice line edges simultaneously by pressing the stack laid flat to one sanding block & drawing another upright against the angled edges. Then saw close to the long pattern lines. Block sand edges to the marked lines to get matching pairs.

Do the same to make any separate blanks for the front pieces. After initial joining with double-sided tape in the untrimmed, over-width state, true up the front section splice line edges so a straight line is formed along the bottom toward the towhook. Then stack saw top & bottom.

Sand any irregularities flat & smooth along the long edges. Find which pieces go with each other so all will bow outward if bow is present. Butt join the pieces with CA + glue by holding the pieces flat over Saran wrap, etc. ready for the splices.

INTERNAL SPLICES: Grain crosswise, cut 1" wide strips of 1/32" ply to center inside over the splice lines & to clear adjacent TS pieces that go on F1 & along the bottom. Hold all down flat for adhesive to cure. If not using a Sintra pattern, mark around one SS to make a pattern of ply, Mylar, poster board, paper, etc. for possible future use.

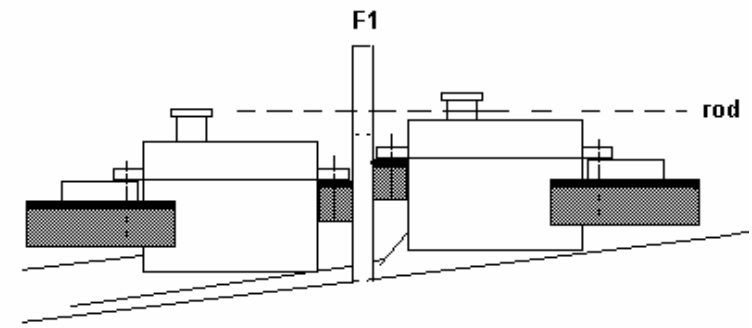


Pic shows nose block, formers, "deep rails" by rear former, SS's parts & splicing doublers. The white stuff is Sintra, about 1/32" thick. This splicing angle was steepened on subsequent fuses for reasons later mentioned.

FORMERS F1 & F2 must be perfectly rectangular. A disc sander with table set at true 90 degrees does it. Make slots in F1 with bandsaw, etc. Drill a 3/8"or ½"hole centered in F2. Open & smooth it with Dremel & smaller sanding drum accessory. Rounded inside corners are fine.

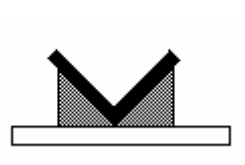
SS patterns indicate practical heights for F1's & how an F1 is to be angled relative to the SS bottom to direct the pushrod under the bolt plate & behind F2.

SERVO LOCATION: Former F1 locations shown on the SS patterns set servo locations. Standard" servos can be used in higher profile BG/GP fuses on plans. Squatter ones (JR micros, Airtronics 94761 etc.) allow lower routing of the stab pushrod & rudder cables & are required for lower profile LT & SGP fuses.



RAILS: Cap with 1/16" ply. Ordinary carpenter's wood glue works well to attach rail caps, nose block, formers, rails, tow hook blocks, etc. Use epoxy or CA when specified. Glue the stab servo rail on the front of F1 to leave 1/16" clearance under the servo for the rudder servo lead to pass. To avoid the stab brass coupler from jamming the rudder servo output arm, bevel the end & locate the rudder servo rail so the pushrod will pass between the rudder servo output arm & case. See the pic of the servo installation near document end.

See TS cutting tool below. From 5/16" sq. medium density balsa, cut TS to use ahead of F2. Glue it to both sides of F1's vertical faces, flush with the edges, ready to glue squared up to the right SS. The broad surfaces help prevent these critical joints from bursting apart in sudden stops.



Here's an end view of a tool to support a square balsa strip to cut TS in preferred sizes & densities. Mount 5-6" of aluminum angle on a base of ply & TS. Gently round a strip edge so it seats down flush without rocking. Guide the strip, not the tool, thru the band saw.

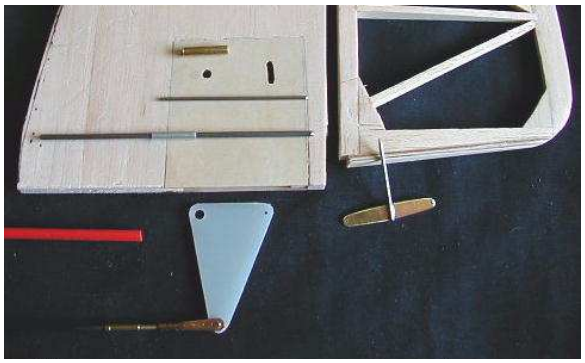
EXTERNAL DOUBLER PAIRS OF 1/16" PLY & .014" CF LAMINATE by F2 & FIN:

Shown in black above, these are at U-V & W-Y on the SS patterns. They go outside before the 1/8" balsa exterior doublers are attached. Cut 1/16"ply doublers to match the SS profiles there. CF laminate or cloth is sandwiched between these & the SS's. Cut the CF a bit oversize, epoxy inside the doublers, press flat, let cure & trim excess.

If using CF cloth layers, run fibers lengthwise, wet well with epoxy & roll on flat. Let cure, trim excess & attach to the SS's with epoxy. Clamp, weight or tape down to avoid sliding out of position. Press flat. Pick up any epoxy ooze. Let cure. Trim off any oozed epoxy.

Next, fit external 1/8" balsa doublers V to W & then ahead of U, splicing if needed. Attach with thin coat of quick epoxy. Press flat. Taper rear ends of the long ones to the rear ply doublers. Drill centered 1/16" holes about ½" ahead of the fin for rudder cables to exit. Angle them low so cables can exit more parallel to the fuse sides.

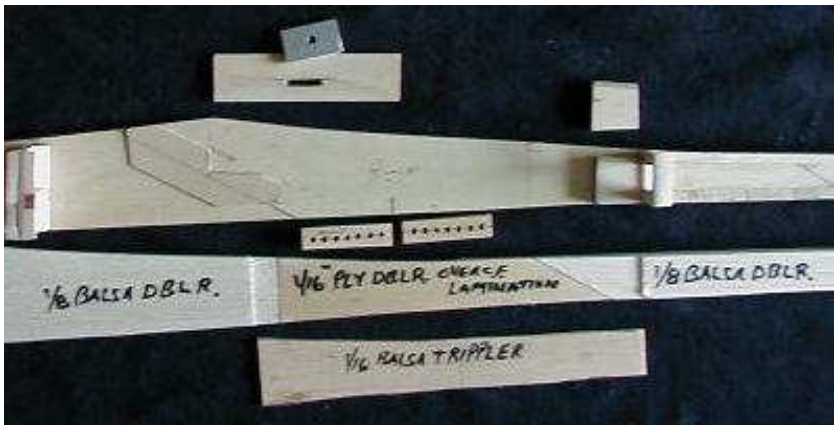
At the tail end, feather the SS's so nothing is wider than 5/16" at the hingeline. Later, after the fin is installed, add & feather light balsa behind Y.



File 2 details tail pieces. For reference, this pic shows key fin & rudder areas & what goes in them. Now cut the fin blank without the dorsal. It's used in aligning the fuse sides. Reinforce 1" of the pointed top with a centered scrap of 1/64" ply.

If 5/16" light balsa for the fin is not available, thicker light stock can be thinned with the bandsaw. For example, ¾"on edge can be cut in half & block sanded to 5/16". Neither ¼" nor 3/8" sheet is suitable for the fin.

<u>DEEP RAILS</u>: The rear bolt plate screw mounts across these deep rails. See plans by F2. Band saw ¼" thick slices from bass, spruce, pine, etc. To resist splitting, cap the tops with 1/8" ply & the inside vertical edges with 1/32" ply. These are to butt the front of F2 & extend from the SS bottoms to 3/16" from the tops. They are attached after a side is attached to F2.



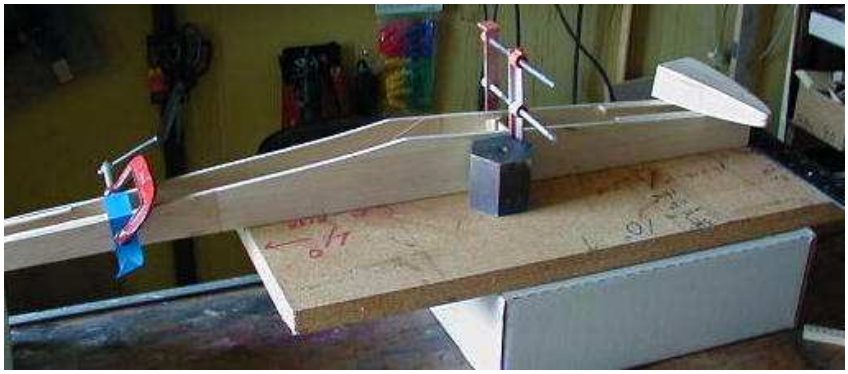
This shows the <u>inside</u> of the right SS & <u>outside</u> of the left. The splice angle required notching the splicing piece to clear the bolt unit side plate. See next pic & the REVISED SPLICE LINE ANGLE paragraph in the Supplemental SGP file. The left side displays the 1/16" ply doubler over CF laminate. After it's attached, exterior 1/8" balsa doublers are fitted <u>flush</u> to its ends. Attach them with a very thin coat of epoxy & trim for the "tripler" shown at the bottom.

In the bottom half of the above picture, the 1/8" balsa doubler ends are leveled down to the CF/ply doubler. This makes a recess to be filled with a soft balsa scrap tripler with squared up ends. (See lines S & T on the SS pattern). Sand the tripler down even with the doublers.

Next pic is of the first Big Smoothie fuse. Note the steeper splice line angle. F1, with rails & 5/16 TS attached, is glued <u>upright</u> to the right side where indicated on the appropriate SS pattern.

When assembled, the sides taper rearward from F1, so F2 is slightly angled to both. See plan top view to make a little triangle (red item) to get it right. Join F2 to the right side with a little CA. Then fully secure it with a deep rail. Use 3/8" TS where the closed compartment goes. Use lighter ¼" TS behind F2. Use 5/16" elsewhere ahead of F2 except where the tow blocking goes. Note spots without TS at former locations on the left side. Fill in after the left side is lastly attached.

Next 2 pics show how the left side is attached, all squared-up, too. The flat, black item at the right on the board is a carpenter's square. Apply glue to F1 & butt front ends to the square. With weights, keep sides parallel & flush to the board until glue is dry. The rear clamp in the picture is a separate step to glue the left side & the other deep rail to F2.



It's essential to butt both front ends flush to the carpenter's square to precisely align the sides to each other & to F1.

After the glue on F1 is dry, the two sides can be pulled together with a clamp to join F2 to the left side. Alignment behind F2 comes later.

The front end points left here. Machined metal block, etc. holds sides upright. Keep bottom edges flush to the board using weights. Until F2 is joined, the sides are parallel to each other & squared to F1.

The wing TE lays at the rear of F2. Finished chord at the center will typically be 10-1/8" for the BG, 10" for the SGP & 9-1/2" for the LT. 1/2" to 5/8"of wing LE will extend beyond the SS high point for the canopy to fit around & keep it from flying off when secured otherwise with just the front slider (see pg. 10) at its front end & a block across the underside of the canopy at its rear end.

INSTALLING THE NOSE BLOCK: Go to Const. File 4. Complete block & glue in place. Size the closed compartment block (CCB). Glue it on. Fit & merge canopy.

ALIGNING SIDES BEHIND F2: Near the fin, evenly sand the inside edges of the TS to just touch when the fin blank is clamped in place. Eyeball down the fuse from top & bottom. Shift sides against the fin to look straight. To hold that alignment, glue a ½" wide strip of 1/64" ply across the top of the trimmed TS just ahead of the fin.

To straighten any bulging out sides, make a frame from ¼" x ½" balsa to fit at F2 & the fin. Clamp a loose balsa piece at the center to get sides straight. On top, over F2 & to the fin, grain cross-wise, mark & scissor 1/64 ply sub-decking pieces to extend precisely to the outside edge of the 1/16 SS's. Attach these with a bead of CA+. IMPORTANT! The edges form a visual reference line to sand down to when working the fuse to shape.

TUBE SUPPORT FOR CF PUSHROD: Below is a bottom view. Plastic straws, such as provided by McDonalds, joined with pieces of HS tubing, make a light but sturdy tube. Heat gently or straws will collapse. CA glue bonds HS to the fuse. Clamp the fin blank in place. Size the tube to extend 3/8" from lower right corner (facing) of F2 & back to butt the fin. Run the CF pushrod or a 1/8" dowel down the fuse. Slip straw tube over it to establish the tube path.

Bond tube to F2 with CA & silicone sealer. Skip bonding the next HS tubing piece until others are bonded to adjacent TS with CA glue. As needed, shim under it to make close to a straight line from servo to fin. Do not bond the rear end of the tube to the fuse.

BOTTOM 1/64" PLY SUBDECKING FROM NOSE TO F2: Apply cross grain, extending to the outer SS edges. Omit adhesive where the internal tow plate of 1/16" ply goes. Then fit that plate, cut cross grain & firmly glue it to the interior of the sub-decking without making a bulge under it. Firmly secure the 1/16" plate to the sides with ½" TS & glue.

GETTING THE FIN UPRIGHT: Clamp the fin blank in place. As needed, twist the fuse & apply pieces of 1/64 ply bottom sub-decking to get & hold it upright. Remove the fin. Finish the bottom sub-decking back to the front of the fin.

FIN BLANK, BK & INLAYS: Acceptable weights for the three fin blank sizes are on the order of .5, .6 & .7 oz. About 1/3 is removed in tapering one to a nice shape. Shape & wax the nylon BK. Drill holes indicated. #21 avoids bind with the 5/32" x 11/16" brass pivot tube. #53 grips the drive wire. If 1/16" binds with clevis pin, use #51.

From 1/16" ply, make a duplicate of the BK with same hole spacing, but with the #53 one opened to 3/32". Store it for later use.

INLAYS, aka "BK housing sides": See 2X detail on plans. From 1/32" ply, stack cut a matched pair. Make snug cutout in the fin for them. Glue on the interior 1/16" ply doublers & coat them with paste wax. Fit the ¼"sq. frame pieces sized to nicely recess the inlays flush. Glue these centered at ends & top of the cutout. Tape the right inlay to the frame. Over Saran wrap, etc. wick join the two. Find where the BK needs to pivot to allow ample up & down deflection. Be sure its bottom will clear the fuse bottom.

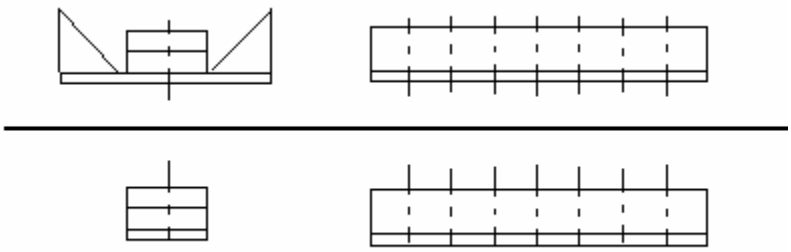
Over wood backing, drill a clean 5/32" pilot hole at the pivot point, Attach other inlay with CA+. Shim between the doublers. Over wood backing use a drill press to make a clean, perfectly squared-up 5/32" hole through both inlays. In the fin bottom make a groove just wide enough to accommodate a thin-walled 2-56 threaded brass coupler made for 1/16" wire. Trim the frame so the clevis doesn't jam in it.

Sand .07" CF pushrod to slip into the coupler. Apply CA glue. This alone will likely secure the rod, but to pin it, do this: Join 3 to 4 telescoping bits of brass or aluminum tubing so the inner one snugly fits the coupler. Off the coupler drill a squared up 1/32" hole through one side of the telescoped pieces. Slip this over the coupler to guide a 1/32" bit through the coupler, rod & out the other side. Attach coupler with CA glue & a pin or at least crimp the coupler with pliers, etc. for extra security. Smooth the pin ends to the coupler.

Cut the 11/16” piece of 5/32” brass tube. Taper an end to more easily get it started through. Place the duplicate with 3/32” hole on the outside. Run in a ¼” shim there between the inlays. Over wood backing, use the drill press to make a series of holes to start an arced slot for the drive wire. Clean up the slot. Attach clevis to the BK. Slip BK in place. Work the tube through it, while guiding the tube on a piece of 1/8” wire. Get the tube centered. Secure the ends with tiny drops of instant CA glue. See that the BK moves freely.

Along its TE, from 2” from the top, taper the fin to 1/8” by block sanding upwards. Along the LE, leave it flat where the dorsal goes. Taper from the hingeline up above the inlays.

TOW HOOK BLOCKING: The bold line represents the bottom sub-decking. The inside & outside blocks are laminations of birch ply to at least ¼” thick. Preferably use 1/8” birch ply plus 1/16” ply to equal the finished thickness of the balsa bottom.



Plans show BG thickness, but it can be less for lower profile LT or SGP fuses. A 1/8” steel “L” makes a fine towhook. Cut off the bend. Clamp in a vise to rebend with hammer.

2” long blocks are easily made starting with scrap pieces approximately ¾” x 3”. Separately glue pieces for bottom & top stacks together. Let dry. With a dot of glue at each end, join stacks. Even up along one long edge with a disc sander, etc. Parallel to that edge, draw a line ¼” from it. Mark a series of pilot holes on ¼” centers.

Clamp a board to a drill press table as a guide to drill holes part way through in a straight line. Finish over wood backing. Trim to ½” width & then into 2” pieces. ID a common end with a diagonal mark. Glue in the interior block. Over wood backing, drill through inside plate & sub-decking. Use nails, etc. to align the bottom stack as it’s glued to the outside.

EXTERIOR SHEETING: Use harder balsa on bottom ahead of F1. Then go to light stuff. Cut pieces to width. Support them straight & on edge to draw taper lines. Cut taper line with bandsaw. Cut long pieces at an angle in a few places to splice against the ply box in sections. Spray balsa with accelerator. Put beads of CA+ on the ply. Press & hold.

Eyeball to shape using razor plane, tiny Stanley Finishing Plane & sanding blocks. Work down to sub-decking edges. Get rid of bulk. Make like Michelangelo, not Fred Flintstone.

BEWARE: Fin installation using instant CA glue is quick & easy but risks unwanted bonding. Carefully wax surfaces as instructed below.

Detach pushrod from BK clevis. Wax pushrod rear end, rear coupler, BK & clevis. Wax the groove in the fin. From the front, run the pushrod through the straw tube. Twirl to thread into the BK. In the fin groove, seat a strip of Monokote backing, plastic bag, etc. so it protects the pushrod, coupler & clevis from migrating CA glue.

Using thin, flat spring clamps with ends waxed, clamp fin in place along one side to make good contact with the inlays & be even with the side along the bottom. Run the drive wire through. Move it to the top of the arced slot. Liberally wick CA glue along the outside of the one fin/side joint. Allow a few minutes to penetrate & cure. If there's unwanted bonding, push the drive wire down to break it.

GETTING NO BUILT-IN TURN: As needed, shift & clamp the fin along the other side. Wick it in place. Check for unwanted bonding. Remove the plastic bag piece. Add 1/16" balsa aft of Y. Make the 2-piece dorsal in profile to nicely merge with the fin. Attach it with a light coat of sandable glue. Shape it & the fin along the LE to look one-piece.

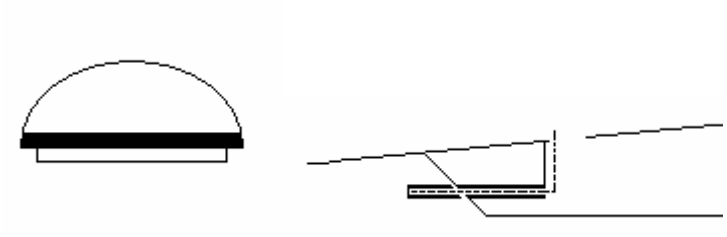
To close up the fuse under the fin, sand the area even. Wick join a ¾" wide strip of light 1/8" balsa from either side, checking for unwanted bonding. Trim the strip even with the sides & merge it to adjacent fuse bottom.

LIGHT TAIL SKID (sub-fin): See File 4. Make & glue it on. With light spackle, fillet dorsal, fin & skid to look integral with the fuse sides. Glassing-over adds great strength to the as yet delicate areas.

Spackle dings & cracks. Plan to make another pushrod support in the form of a slotted piece of ¼" balsa glued upright at the front end of the tow block. Extend up as needed, Cap over the slot.

SADDLE WIDENING: See plans, top view & at cross section C-C front view. From 3/8" light balsa make TS pieces. With ½" sanding drum in the Dremel, roughly concave it. Easy does it. Wrap sandpaper around a ¾"dowel to make it smooth.

As needed, make slits to bend to saddle contour. From the top, protecting fingers with Saran Wrap, etc. & using small drops of instant CA glue, attach outside along the saddle. Block sand to saddle top edges. Using epoxy, cap with strips of 1/64" ply, grain cross-wise. Smooth the edges. Use light spackle underneath to feather the edges.



STABILIZING THE CANOPY: Near the canopy rear end, fit a 1/8" x 3/8"brace (black) between the canopy edges. Secure it with liberal fillets of silicone sealer, Goop, etc. at the inside corners. When cured, fit another brace between the fuse sides. Glue it to the secured brace to center the canopy.

Up front, a simple slider completes the canopy attach system. Make a 3/8" x ½" x 1" block from spruce, bass, pine, etc. Stand it on end to drill a hole for 1/16" wire. Bevel at the front. Slot the canopy to slide the wire in & out. Bond assembly to the canopy. Position canopy & push the slider into the closed compartment rear end. Enlarge hole to install a tube there. See pic on page 12.

Along one fuse side by the rear brace, glue a block for canopy brace to butt to prevent gouging the wing. See the next 3 pics & those in the supplemental SGP file for more fuse construction details.

Go to CONST. FILE # 5. Do GLASSING & PAINTING. Then return here.

MOUNTING RUDDER & STAB SERVOS: Screw mount these to rails on F1. From ¼" x 3/8" spruce or bass, capped with 1/16" ply, make four side rails. Wax the tops. For the crosspieces, cut ½" wide strips of 1/8" ply to jam fit between the sides at the front of the stab servo & the rear of the rudder servo. Treat the ends of the crosspieces with thin CA glue to reinforce for later drilling. Wax the bottom of the crosspieces.

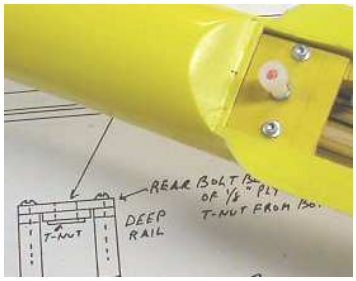
Make & use this tool to jam the crosspieces level & in place under the servo lugs.

Stab your Exacto into a waxed rail. Add glue. Position it under the end of the waxed crosspiece. Remove Exacto. Lay fuse inverted so the rail(s) stay put as the glue cures. Drill 1/16" pilot holes for screws into crosspieces & rails. Remove crosspieces. Treat holes with instant CA. Enlarge holes for the mounting screws. Finish servo mounting.

CABLE OPERATED RUDDER: **This is a parallelogram-like configuration from rudder output arms to the rudder "T". Operating radii front & rear must match. The "T" slides into a capped slot on the rudder's bottom. A drop of CA glue keeps rudder snug to it. Simple knots secure cables in the brass part.**

Up front, use metal clevises on the Du-Bro 2-56 rigging couplers, running clevises on only a few threads. Cut bits of 3/32"aluminum tubing as crimps. Slip these on the cables, then loop cables through the couplers, take up slack, crimp & snip excess cable. Cables stretch during first flights. Keep taut or the rudder will buzz at higher speed.

When final fitting the CF pushrod length up front, use a heavier .072 threaded brass coupler & taper the open end so it won't jam the output arm on the rudder servo. Carefully determine the rod length with the BK drive pin at the fin in neutral. As done at the rear, glue & pin & crimp the coupler to the rod.



REAR BOLT; See plans by F2. This metal or nylon bolt can thread into a blind nut set into a 2-layer plate of 1/8" ply that screw mounts across the deep rails. The bolt is to angle back about 12 degrees so the head seats to the ply bottom of the rear fairing that butts the turtle deck. See the picture & text box at the end of this file about supporting the plate at 12 degrees for drilling. The plate can also be tapped 1/8" alum. or tapped carbon plate layers, etc.

A block can be used to support a plate at 12 degrees. The bolt head then seats to the ply bottom of the fairing that rests flat between the flaps. The top of the deep rails on which the plate rests is to extend uniformly to 3/16" below the edge of the saddle. This allows the wing bottom to clear the screw heads securing the plate.

The next pic shows details common to the glassed-over wood fuselages. It may take a little time to display if you are on dial-up. Servos mount to rails on F1 & to ply pieces screwed to side rails. The stab servo on the left almost touches the fuse bottom. The rudder servo is raised so the pushrod coupler clears its output arm & clevis.

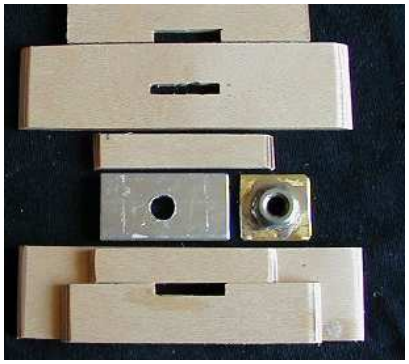
You may want to bevel the unthreaded end of the coupler to avoid jamming the rudder output arm. An output arm with an operating radius of at least 7/16" is needed to allow extra down stab with stab-compensated, full down flaps. If using a regular antenna, it can be attached to a balsa stick & extended rearward down the fuse. Up front, the stick is inserted into a plugged piece of plastic straw covered with HS tubing to glue to the side. Cables are attached to Dubro 2-56 rigging couplers with bits of 3/32" aluminum tubing used as crimps. Note the pushrod guide attached at the front of the tow hook block.

Not shown, the wing harness simply drapes over F1 & the servos. Not visible, leads from the receiver & the battery extend enough to plug together in lieu of mounting a switch. Battery & Rx are covered with foam rubber to jam in & stay put. Twine is taped around them to grab to pull out.

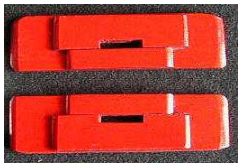
Extreme right, the front hole of the towhook block is visible. To its front edge a slotted block of ¼" balsa is glued upright & capped over as another pushrod guide & support. Front end of the stick enters a piece of straw with its forward end plugged. The brass tube in the closed compartment receives the slider to key & secure the canopy.

NEW MAIN BOLT UNIT IN THE FUSELAGE

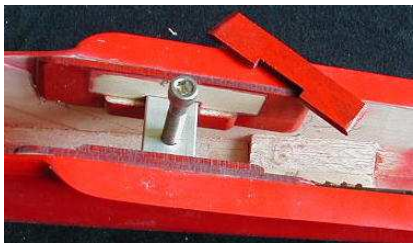
Compared to what plans show, the unit below is easier to make, install & gives a much needed additional 3/8" clearance for pushrod & cables.



Drill a centered hole in the aluminum plate. If uncertain about tapped thread strength, solder a nut to a plate of thin brass. Secure it to the aluminum plate bottom with adhesive or screws. Cut 1" x 4" side plates from 5 ply, 1/8" ply. Use 1/8" drill bit & flat file to make snug slots ½" down from the top. Glue 2" x 3/8" bottom strips in place for snug fit to the aluminum plate, so unit will be squared-up & stand alone, nut pointing down.



To paint parts, position as shown so bare wood is left where parts are to be glued together. When spraying the fuse, put masking tape on the inside to keep free of paint. Run straws over the CF pushrod.



MOUNTING THE UNIT: Less the notched pieces, bolt the unit to the wing. Position the wing on the saddle. Squeeze fuselage & remove the wing. Mark unit's location. Use a strong wood glue such as Elmer's Ultimate to glue it to the sides. From 1/8" ply, size pieces to jam fit front & rear between the 4" pieces to press them snugly to the sides. Let dry, then glue on the notched pieces to complete ¼" deep recesses for the plate ends.