Riley Model B - Series 18 - Fuselage Construction – Part 3

July 1, 2024

Mount Stabilizer and Fin to Fuselage

To ensure that the stabilizer and the fin are straight and square, set the fuselage with the landing gear mounts attached onto a flat surface. Alternately, you can use the rotisserie mount at F1. Raise the tail so that the fuselage is level. Any method that keeps everything square and straight will work fine for this step.

Cut away any covering material from the stabilizer hinge pocket.

Mark where the forward mounting tabs will enter the fuselage and be glued to the stringers at 9A and 3P.

Cut the openings, but don't cut away more than necessary. The flight loads on the tail are relatively light. Virtually all the load on the stabilizer and fin are carried by the 3/16" basswood spars. The tabs just hold the leading edges in place.

Check the fit. You want the tabs to be just snug –not so tight that you must force it in. If the tabs are too tight, it is best to sand between the gaps of the tabs rather than thin the stringers on the fuselage.

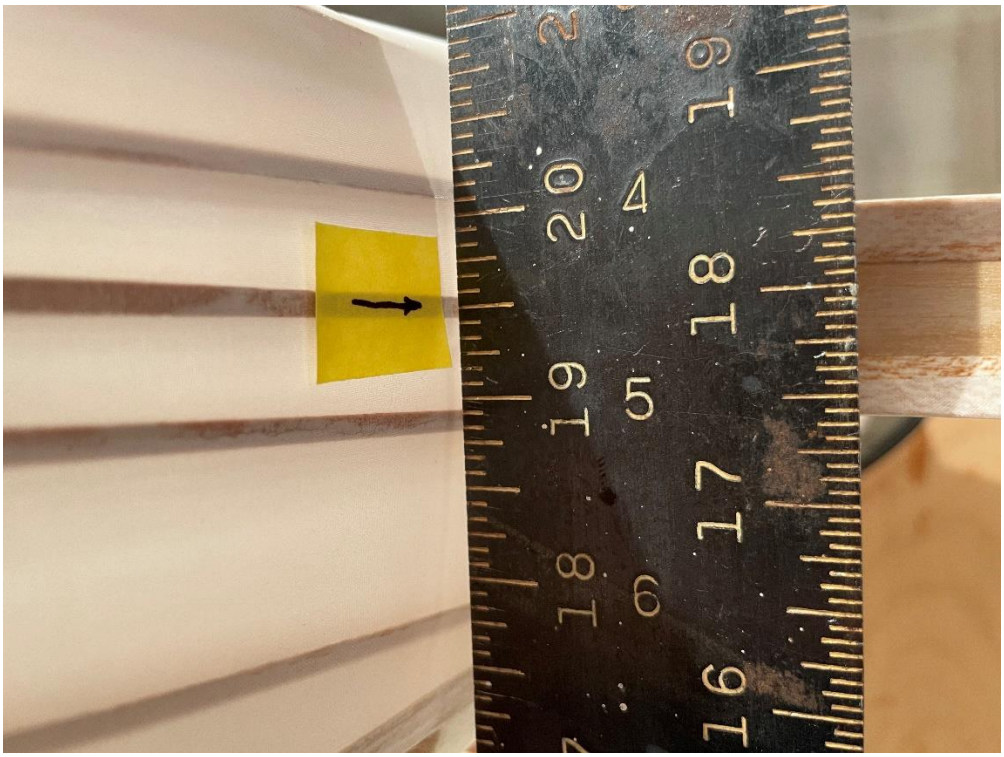
Always dry fit each part to avoid any fit problem during glue up. Titebond begins to grab after about three minutes.

Obviously, the stabilizer needs to be mounted precisely horizontal to the fuselage. The wing tube makes for a reliable reference. Rotate the fuselage until it is exactly horizontal and lock in place.

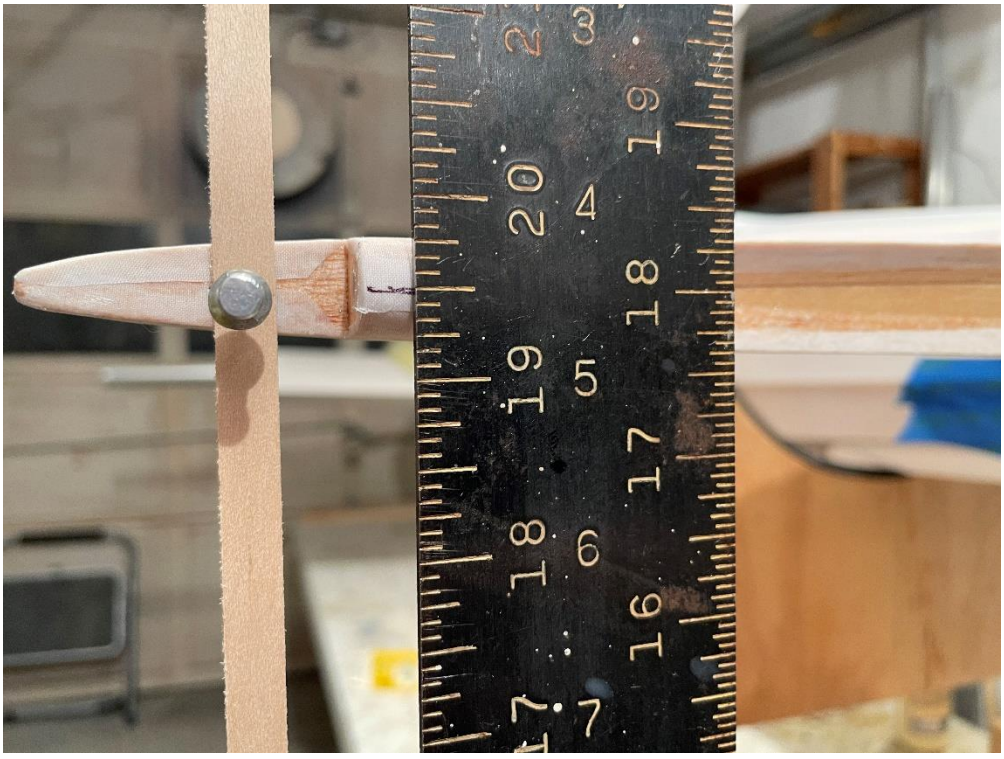
You will also need a precise horizontal reference at the tail. A flat board was used in the example below. Notice that shims were used to make the board exactly level.

Measure the distance from your tail horizontal reference to the center of the fuselage stringer that centers on the stabilizer spar pocket.

In the example below, the reference distance is 19-1/2." Therefore, the height of the stabilizer *tip* (centered on the hinge) should also be 19-1/2" on-center. Your distance will likely be slightly different.

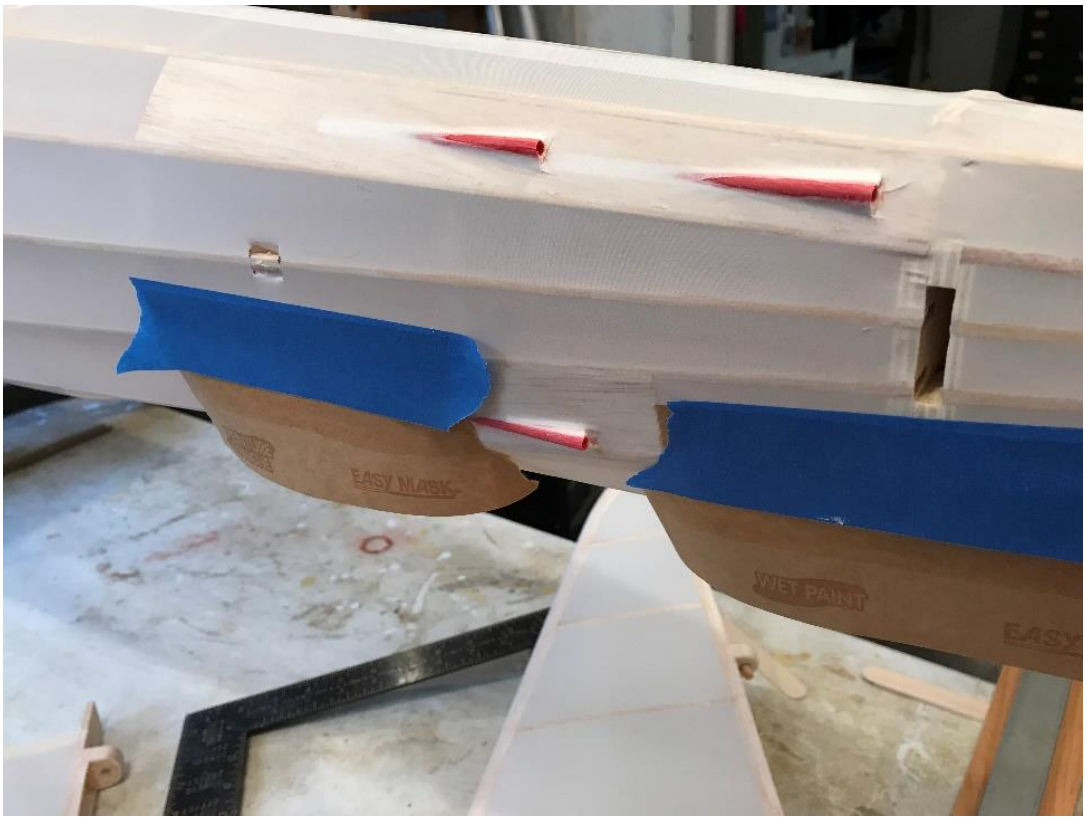


Rig up any suitable method to support the stabilizer at the tips. If you are very careful, you can simply use two pieces of basswood wing spar material and drill 1/16” holes at the calculated stabilizer height distance and pin it to the tip.



This picture shows the basic set up. Notice the wing tube is level. The reference wood board at the tail is also level. Again, if the measured distance between the reference board and the 9a or 3p spar, and if the tips of the stabilizer are the same distance, then the stabilizer will be perfectly square to the fuselage and wing.

Be sure to mask off any part of the fuselage where glue squeezed out might drip.



Gluing the stabilizer to the fuselage is straight forward once you are set up and ready. Use Titebond. Titebond glue will begin to "grab" within just a few minutes. It means you only have one chance to do it right. Dry fit to be certain the glue up will go as planned.

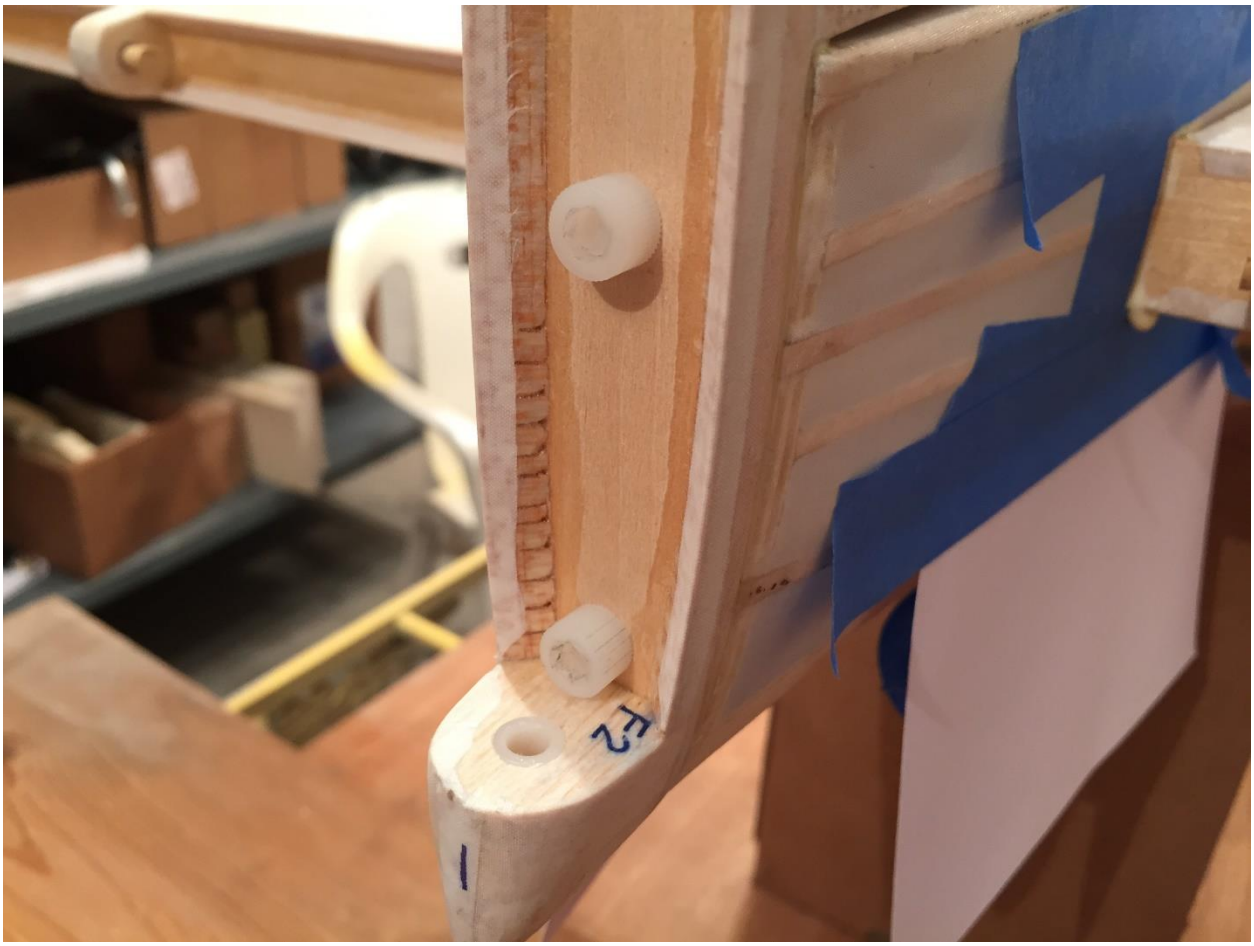
Spread a liberal coat of Titebond to the spar pockets on all sides. Use a scrap piece of wood (or a tongue depressor) to spread the glue into the pockets and apply a liberal coat of glue to the spar itself. Apply a moderate amount of glue to the tabs.

Check everything carefully. Work slowly. Once the stabilizer halves and the fin are glued, their positions are permanent. If the glue sets and they are out of position, you have a big problem.

Mount the fin.

During glue up, the fin is held in place by one 1/4-20 x 1/2" nylon socket head screw. Its only purpose is to clamp (hold) the fin spar to F16 while the glue sets.

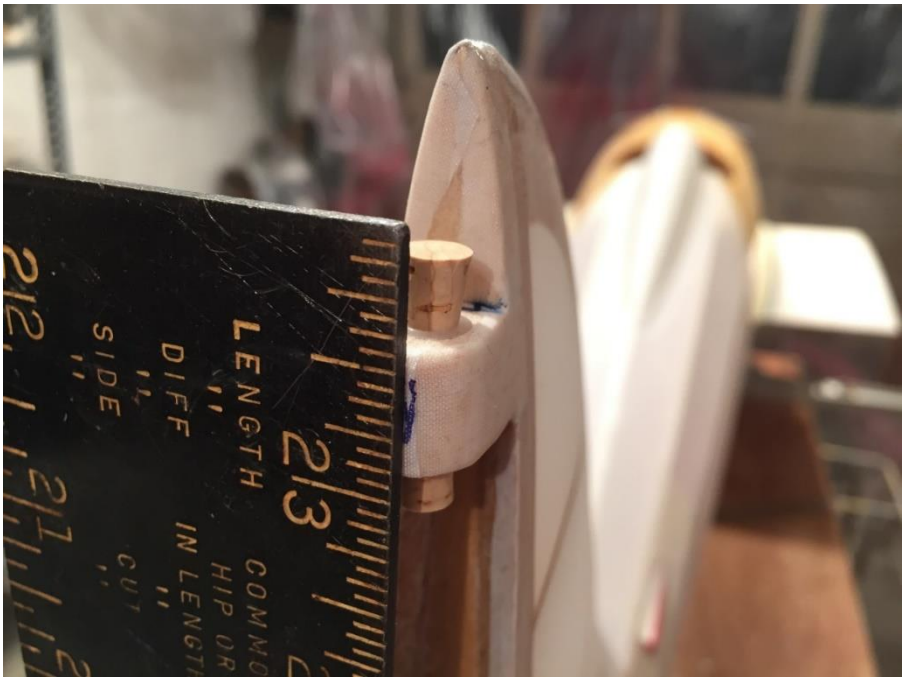
This is an older picture. The bottom screw is no longer used.



Check the fin for vertical alignment with a large carpenter's square. It is possible that the fuselage may have a slight twist and therefore does not perfectly mate with the fin. This may be caused by a warped building board; the covering may have pulled a little; or a building error. If this is the case, use a file to slightly enlarge the holes in the fin spar. The gaps between F16 and the fin spar will be filled in a later step and won't be noticeable. The point is that it is far better to have a straight vertical fin than to worry excessively about a slight mismatch at F16. After confirming a good dry fit, apply a liberal coat of Titebond to the fin spar and F16. Also apply a modest amount to the tabs. Don't over glue the tabs; you don't want excess glue dripping down inside the fuselage. No need to overtighten the screw; snug is plenty of clamping pressure. Don't allow any glue to get into the threads! It is advisable to remove the screw after about 30 minutes. Titebond will have set up by then and the clamping screw will

have served its purpose and *must* be removed; if not, the rudder won't fit. The small cork plugs are there to keep dope and paint from getting into the nylon bearings.

This is an older picture. Not shown is the fact that the carpenter square is vertical from true level. Like with the stabilizer, confirm that the fuselage is level at the wing tube.

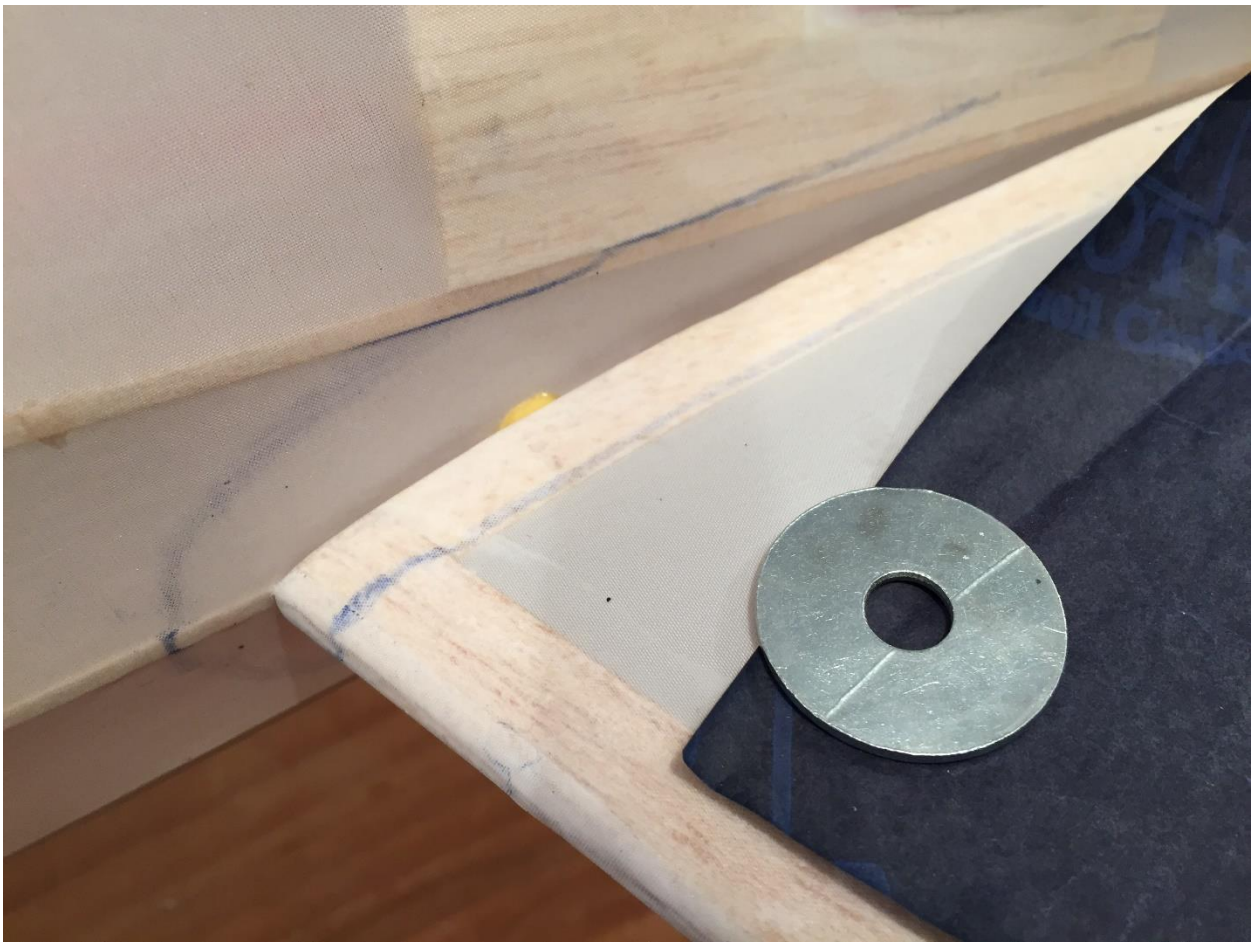


Tail Fillet

Allow about three hours to form the *basic* fillets for the stabilizers and the fin. A second coat will be needed after the first coat dries.

Use a disk approximately 1-1/4” in diameter for the fin and approximately 3/4" diameter for the stabilizer. The thinner the disk, the better it works. A thin disk will scrape, which is what you want. A thicker disk will tend to drag and pull, which makes forming a nice fillet a little more difficult. An ordinary washer works OK.

Mark the outline of the fillets by rubbing the disk over carbon paper. This is to indicate where you will want to apply masking tape to protect the covering from unwanted lite spackle.



Spread lite spackle. Scrape and shape with the forming disk. Work one section at a time. Form the “first pass” as best you can. As the spackle begins to dry, it becomes easier to scrape into the shape you want and does not so easily pull away. It is easiest to take light passes working toward the center from the edges.

Applying the spackle and forming the fillets is a long and sometimes frustrating part of the building process. *There is no fast way to do this.* There are no shortcuts. The nice result, however, is well worth the time it takes to do it right.

Your “first pass” will yield only a rough fillet. After drying overnight, go over each fillet again with a second coat. A second coat may be all you need. The second coat will take about two hours to finish.

When completed, brush on a coat of nitrate dope thinned 1:1.


INTERIOR/EXTERIOR
UGL
222
LITE
READY TO USE
READY FOR PAINTING
SPREADS SMOOTH

Tail Wheel Assembly

When completed, the tail wheel assembly should look like a casting. The steering is guided by the control arm, which is linked to the rudder, all on the right side of the aircraft. The control arm which links to the rudder is shock mounted with rubber grommets. Study the drawings at the end of this section.

Scuff both sides of each Garolite fork and the control arm with 220 sandpaper.

Glue control arm to the 11/16” x 1” x 2-1/4” basswood block. Use Titebond.

Insert the threaded #6-32 x 1/4" x 7/8” nylon axle and temporarily secure forks together with two #6-32 x 1/2” socket head screws.

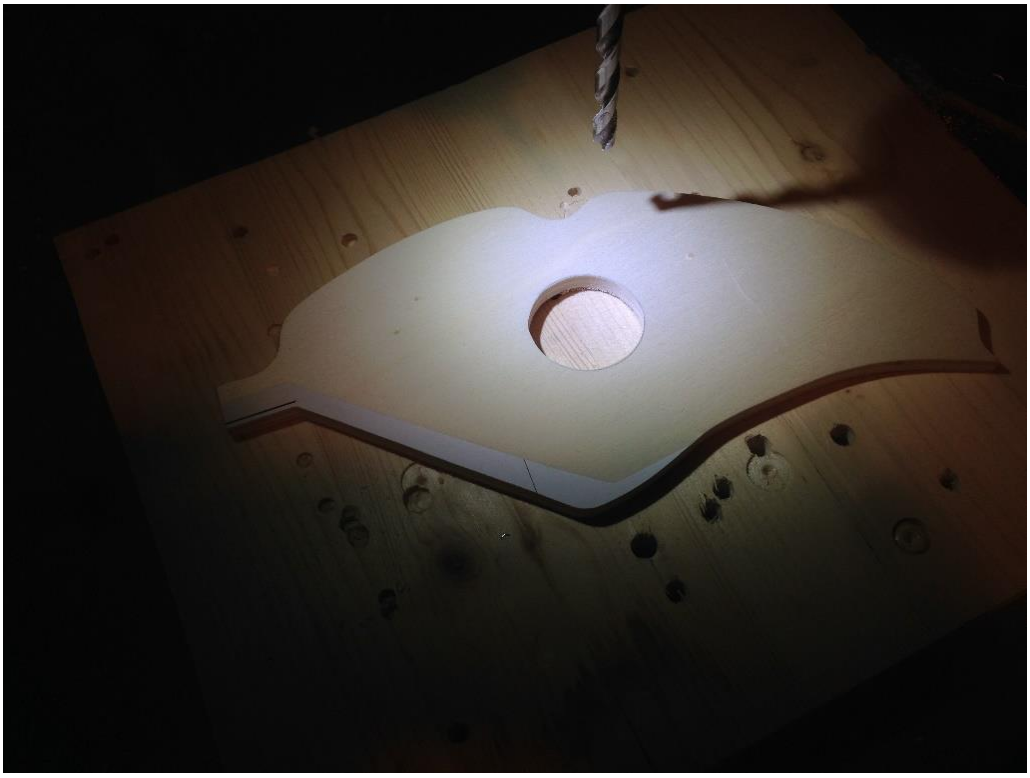
Glue forks to the plywood block. The control arm should be on the right side -the same side as the rudder control arm. Use Titebond. Clamp for about 20 minutes.

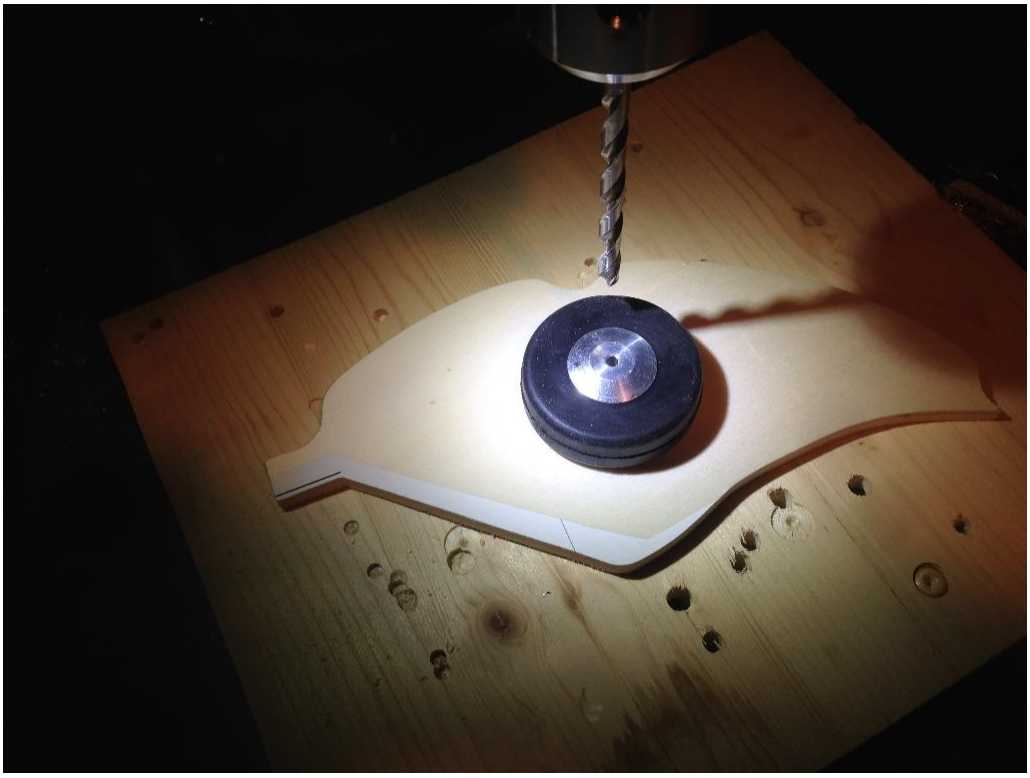
Glue 1/4” balsa sides to the forks. Also fill in the front and rear with 1/4” scrap. Shape with 60 grit and finish with 100 grit sandpaper.

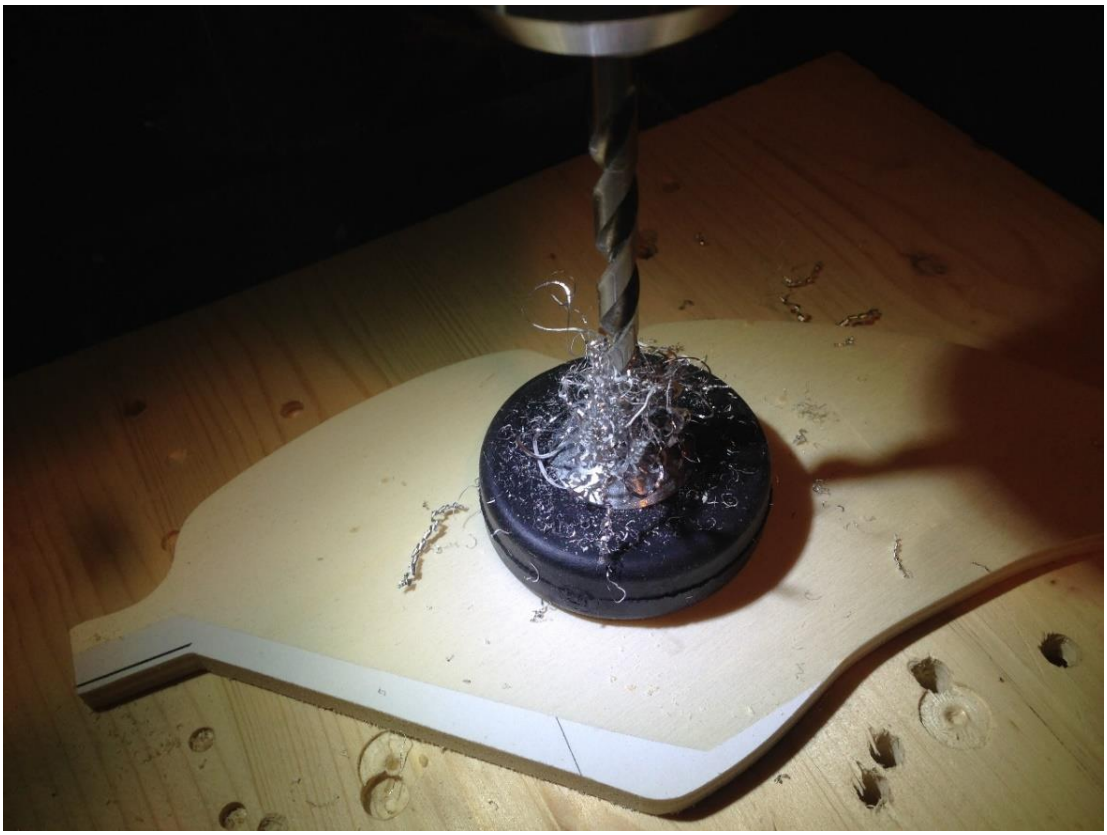
Since balsa is porous, it is best to fill the grain with lite spackle. Just rub it in with your fingers. When dry, finish with 220 sandpaper. Brush on one coat of nitrate dope thinned 1:1. Normally, the tail wheel forks will be painted the same color as the fuselage.

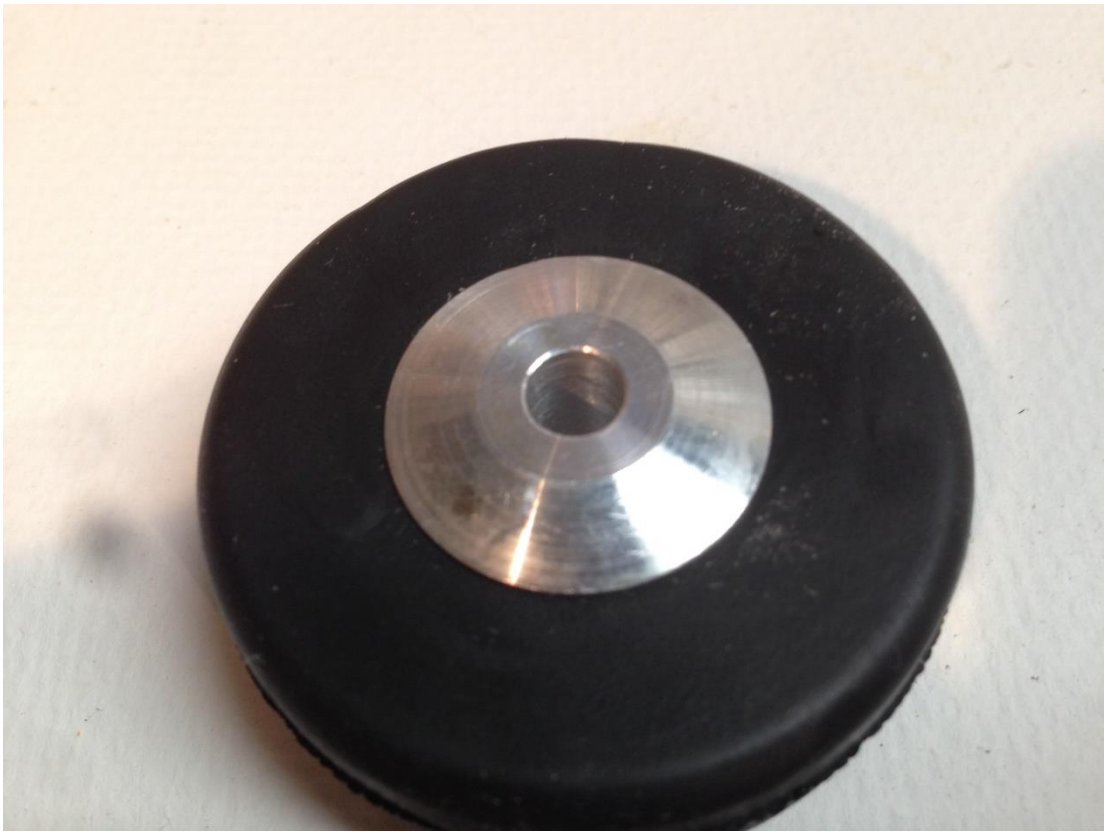
Prepare Tail Wheel

The tail wheel assembly is designed for a Dubro 200TW 2” wheel. The hole in the wheel will need to be drilled out to 1/4” so it will fit the axle. You will need to make a jig for your drill press (don’t’ try this with a hand drill) to keep the wheel flat and secure while you drill out the hole. Cut out a hole about 1-1/4” diameter from scrap piece of plywood, just a little larger than the aluminum wheel itself. Secure the wood base to the drill press. Spray 3M77 to both the rubber tire and the wood base. Use a 1/8” drill inserted upside down to guide the wheel to the wood base and hold it until the spray mount bonds. Hold firmly, and drill gently at about 500 rpm. Deburr each side of the wheel.



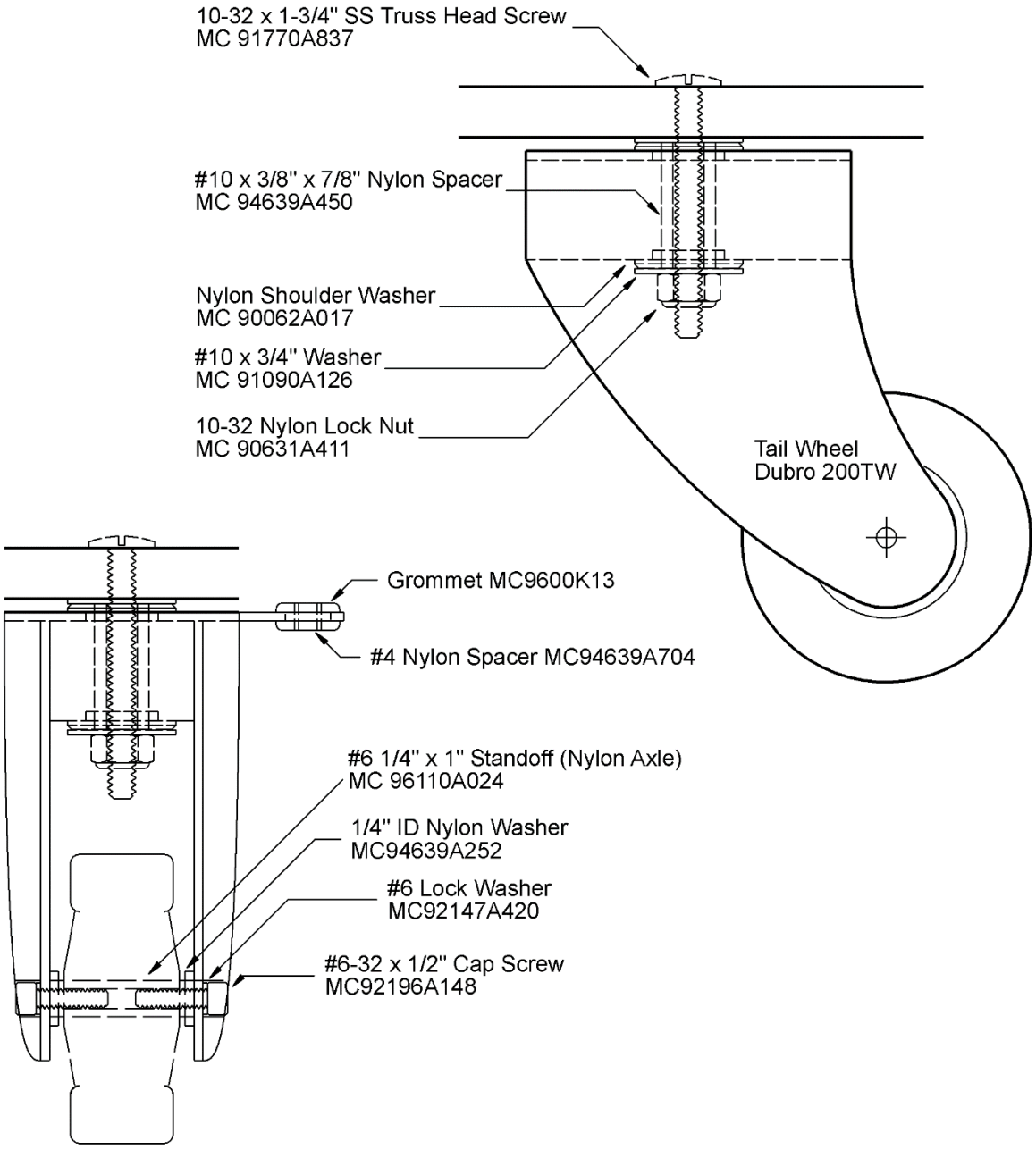


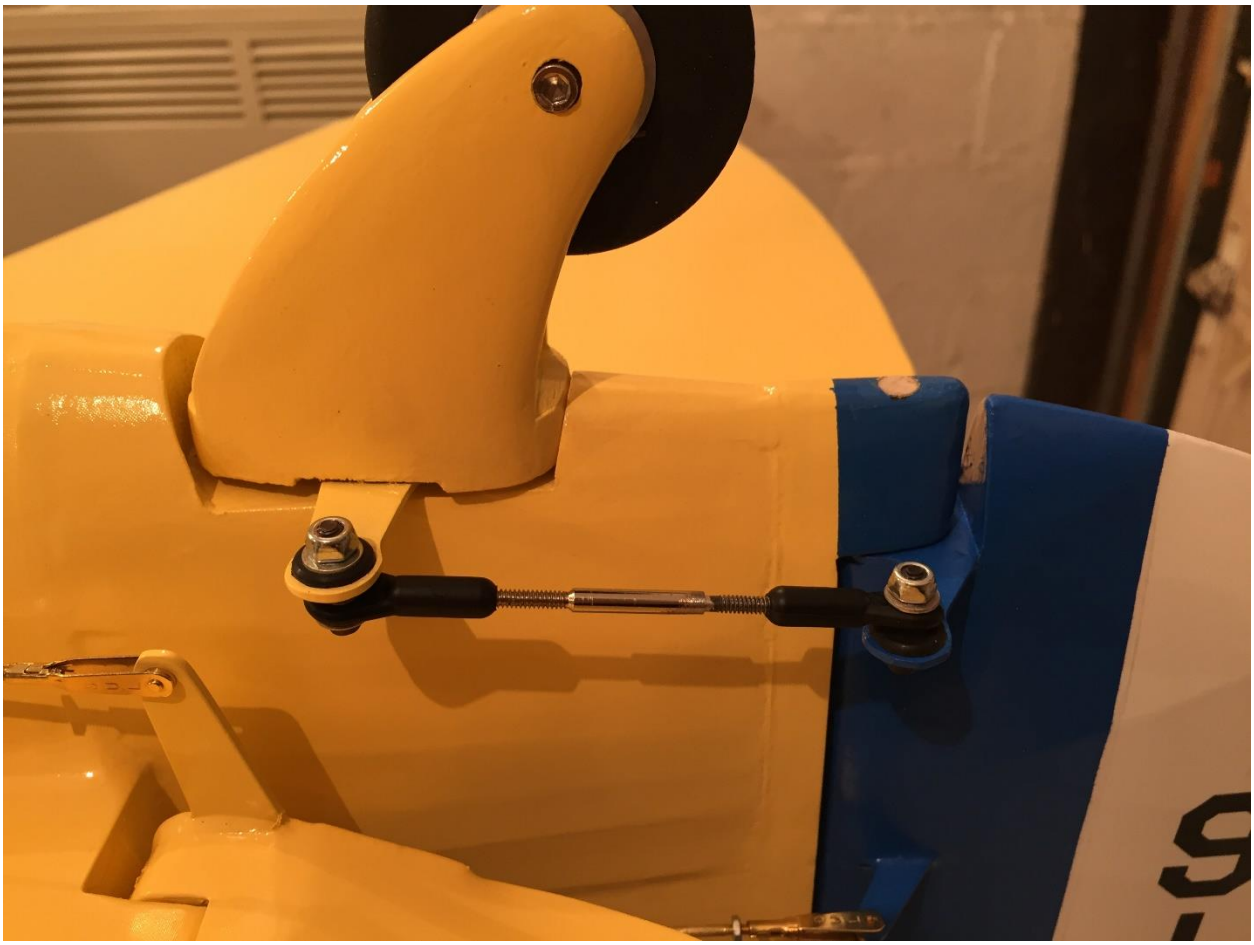




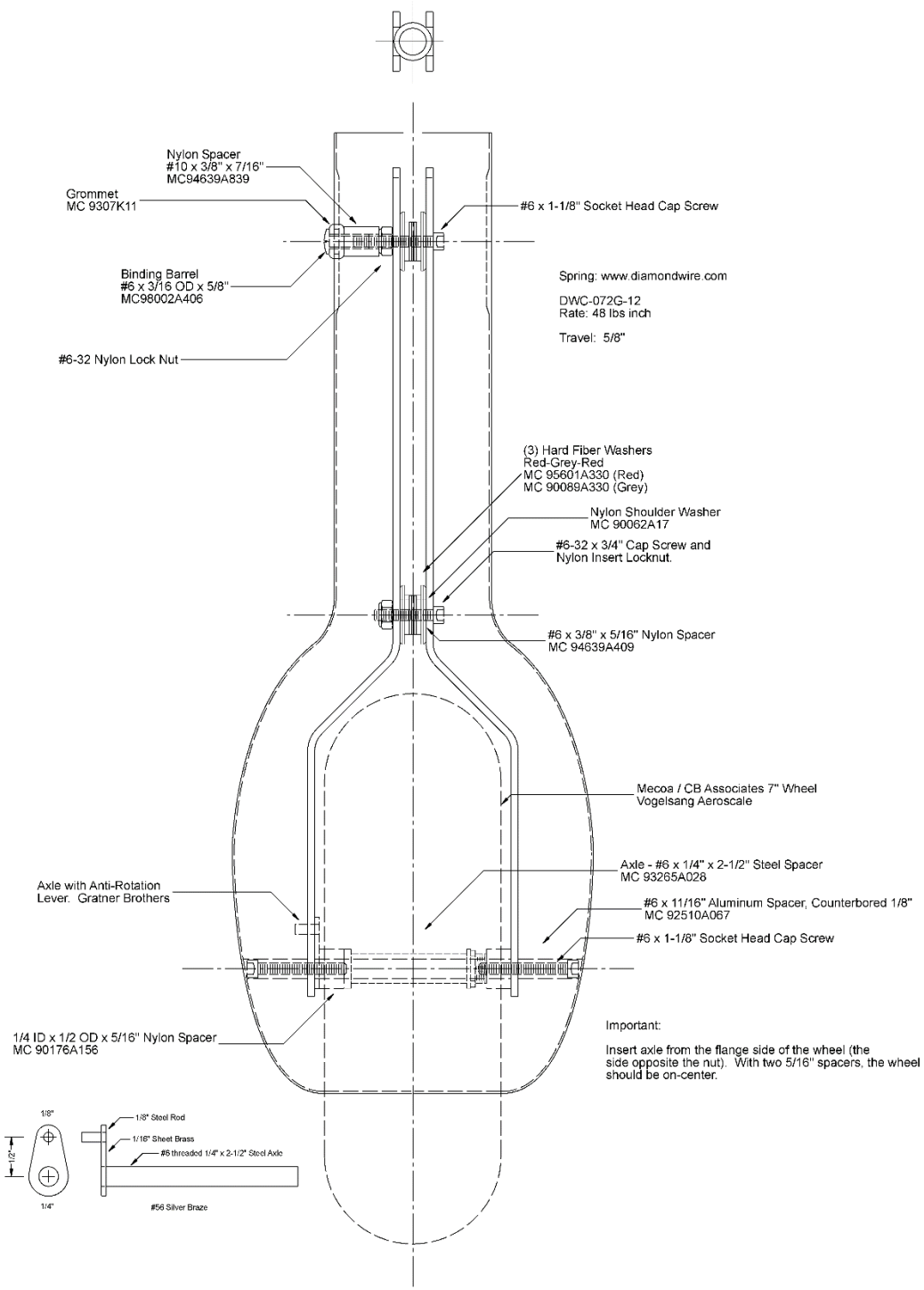
Upon final assembly (after painting), the tail wheel is attached as shown on the fuselage drawing using the parts shown in this picture. The tail wheel will be supported and turn freely on a nylon axle.

MC part numbers are from McMaster-Carr Supply. www.mcmaster.com





Landing Gear and Wheel Pants



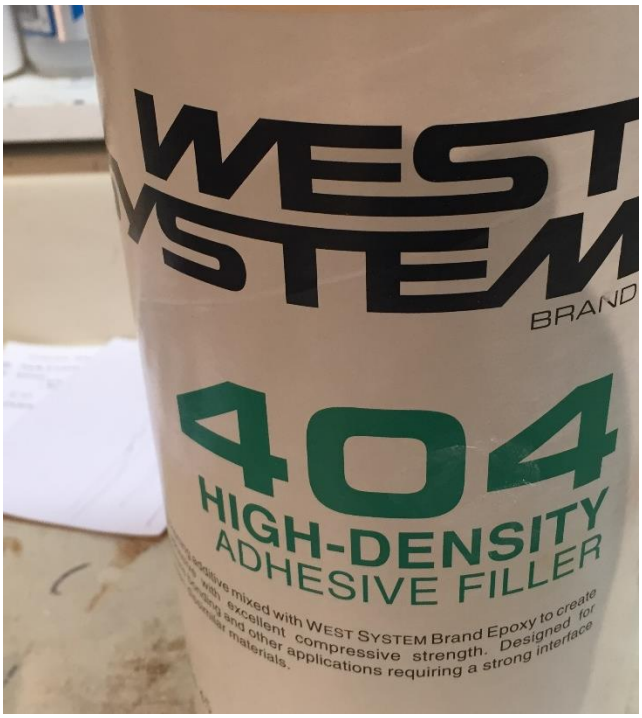
Mount Fiberglass Cowl to Cowl Ring

Note: The following pictures show the installation for the Valach 140 twin. The steps to mount the Moki 250 radial are essentially the same.

So that the cowl will center perfectly around the propeller hub of the engine, it is necessary to glue the cowl to the cowl ring while the engine is mounted in position -- except that the cowl and ring are mounted exactly 1/2" forward. Use 1/2" nylon spacers. After trimming, the cowl will bolt flush with F1 and perfectly center on the engine's propeller hub.

This picture shows the cowl ring in position 1/2" forward of F1. The clamps were not used in the actual assembly as they will not clear the engine. Instead, use masking tape which can be easily cut away. See next picture.

Lightly sand the inside lip of the fiberglass cowl with 100 grit. Mix a small, one ounce batch of epoxy and mix in some filler – enough so it won't run. Apply to the ring only and press the cowl onto the ring. Rotate just a little to spread the epoxy mix. Make sure that the cowl is aligned exactly where you want it.



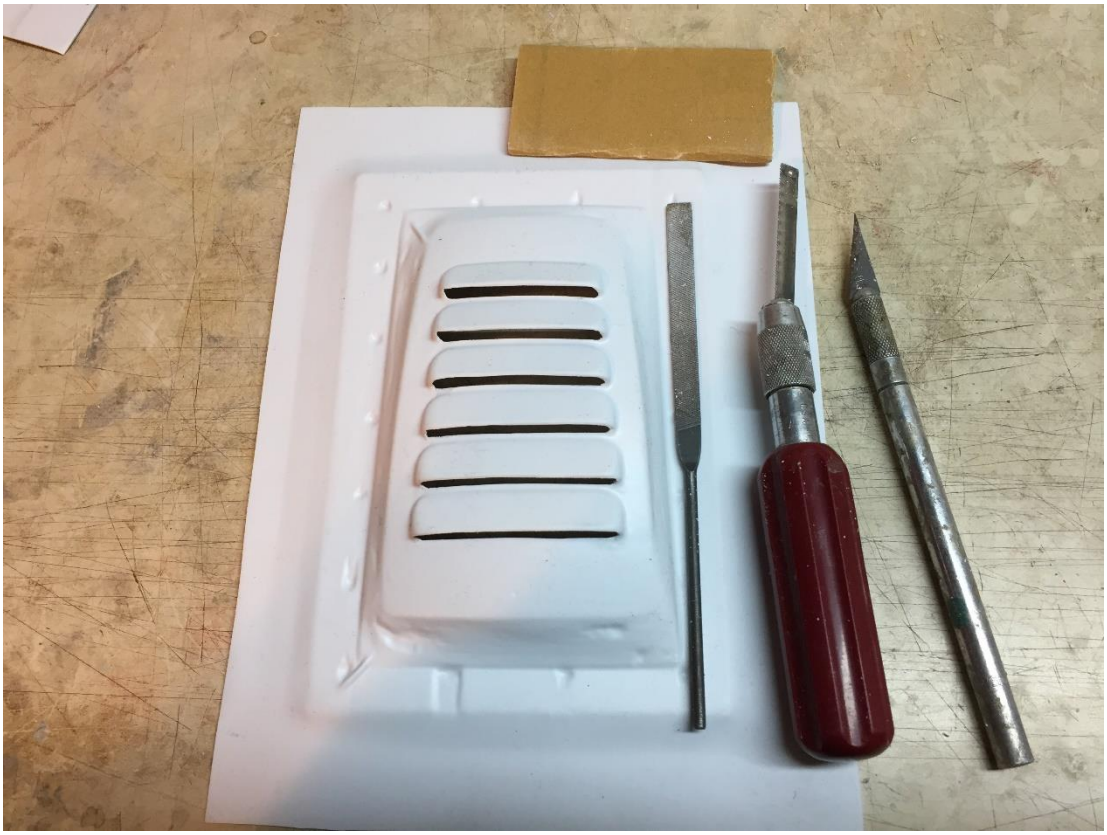
Insert the cowl / propeller hub alignment ring onto the engine hub flush with the face. The ring is made of any material 3/8” thick. Position the cowl onto the ring on-center – 3/16” back from the face of the hub.

The cowl has now been trimmed and mounted to F1 with four ¼-20 X 5/8” nylon cap screws. You will need a long hex driver to mount and remove the cowl.

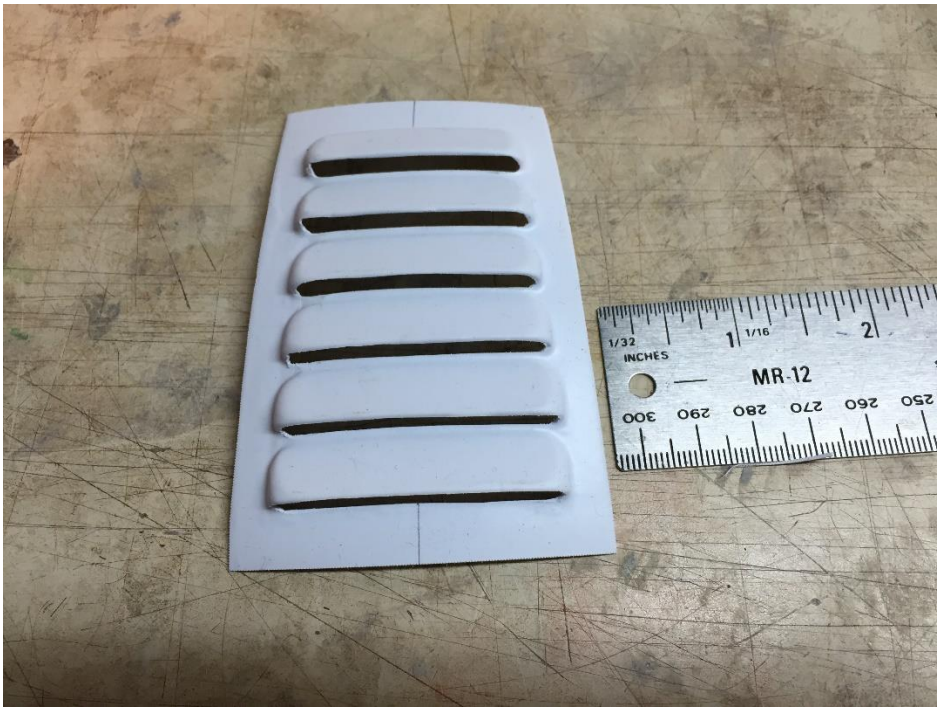
Mount Louvers to Cowl

The addition of louvers to the cowl is optional, but certainly adds interest, and if opened, will help with engine cooling. The louvers are made from vacuum formed white styrene. To open the louvers requires a lot of care and patience. Since styrene plastic has no grain, it will tend to cut in almost any direction and may cut in a direction you don’t want! So be careful.

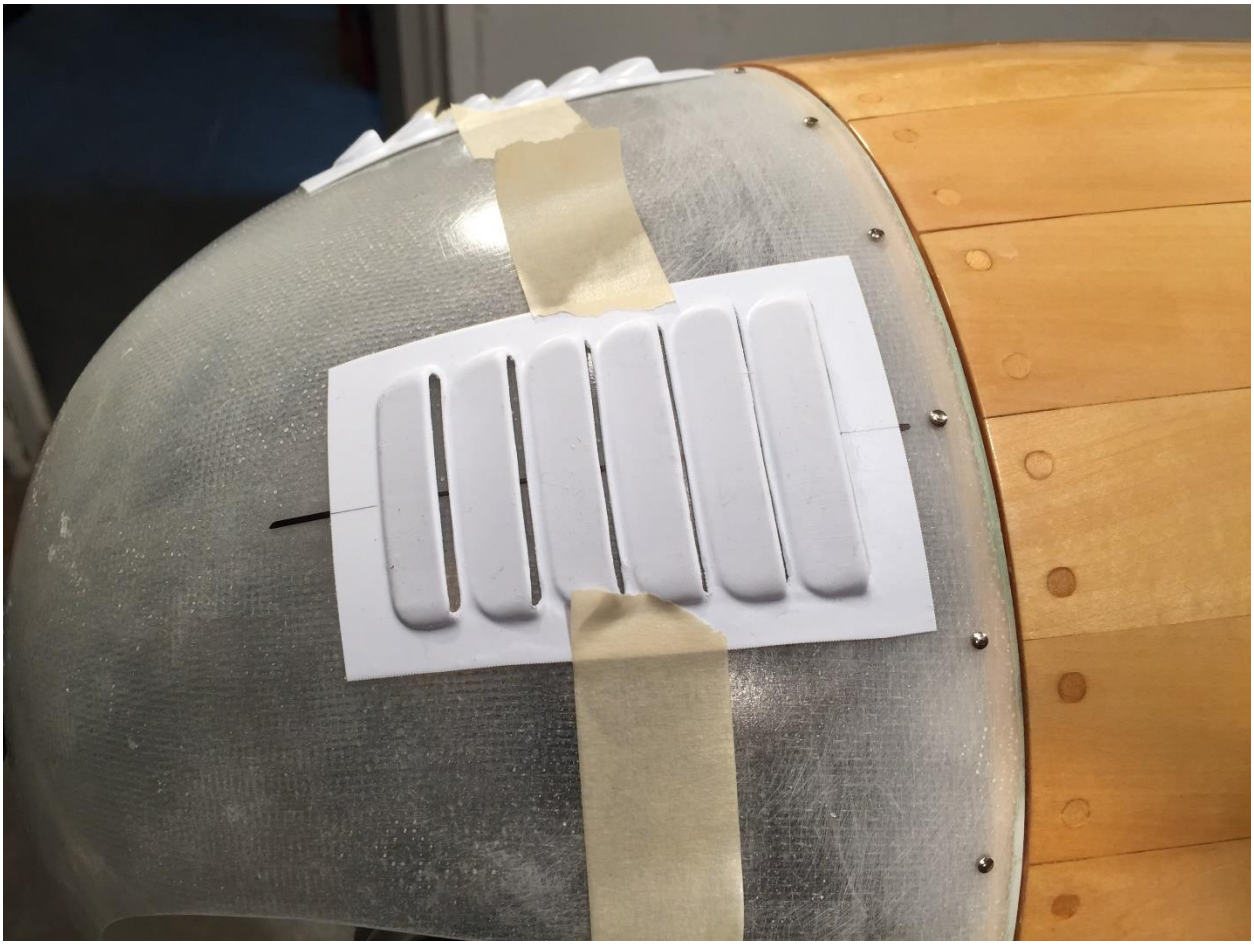
A small ignition file, a #11 hobby blade, a 32tpi x 1/4” hacksaw blade, and of course, sand paper can all be used. It is easier to make the cutouts before trimming away the sides.



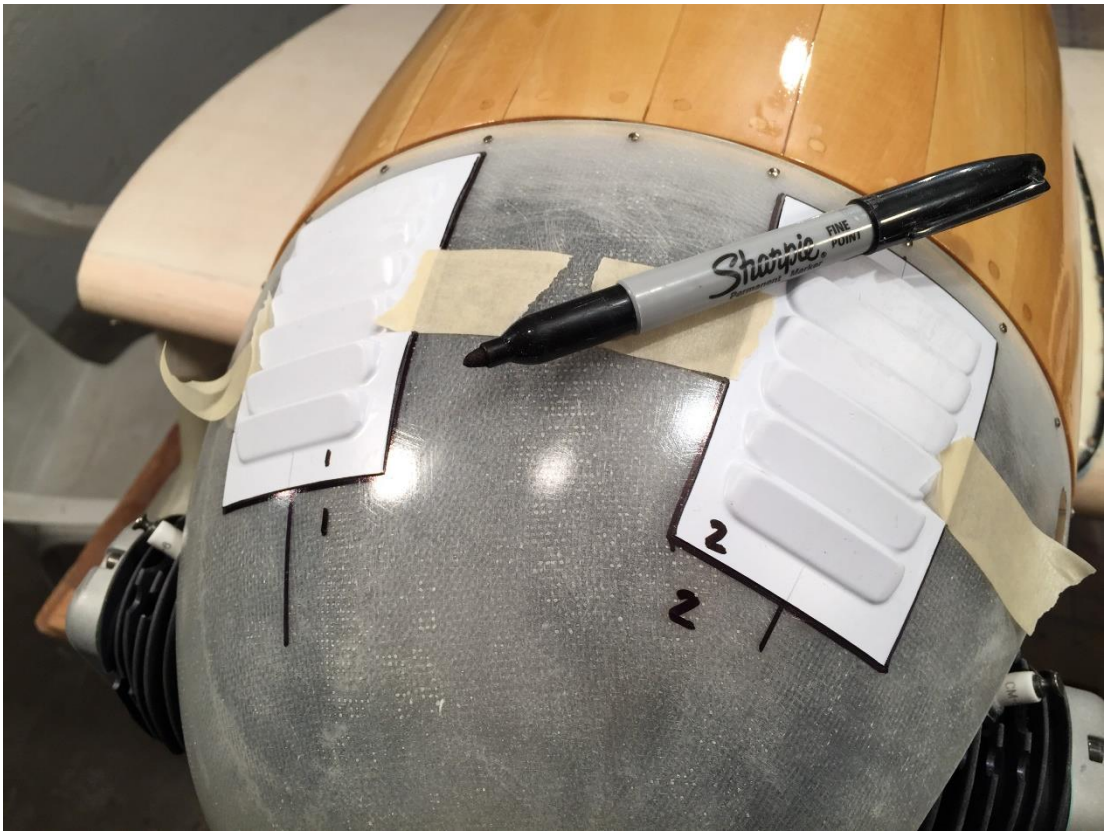
Trim the section to about 1/4" away from the louvers on all four sides.



Position the louvers on-center at the 11am and 1pm position, locating the edge of the first louver about one inch forward of F1. Secure with masking tape. Do the same at the 7a and 5p positions at the bottom.



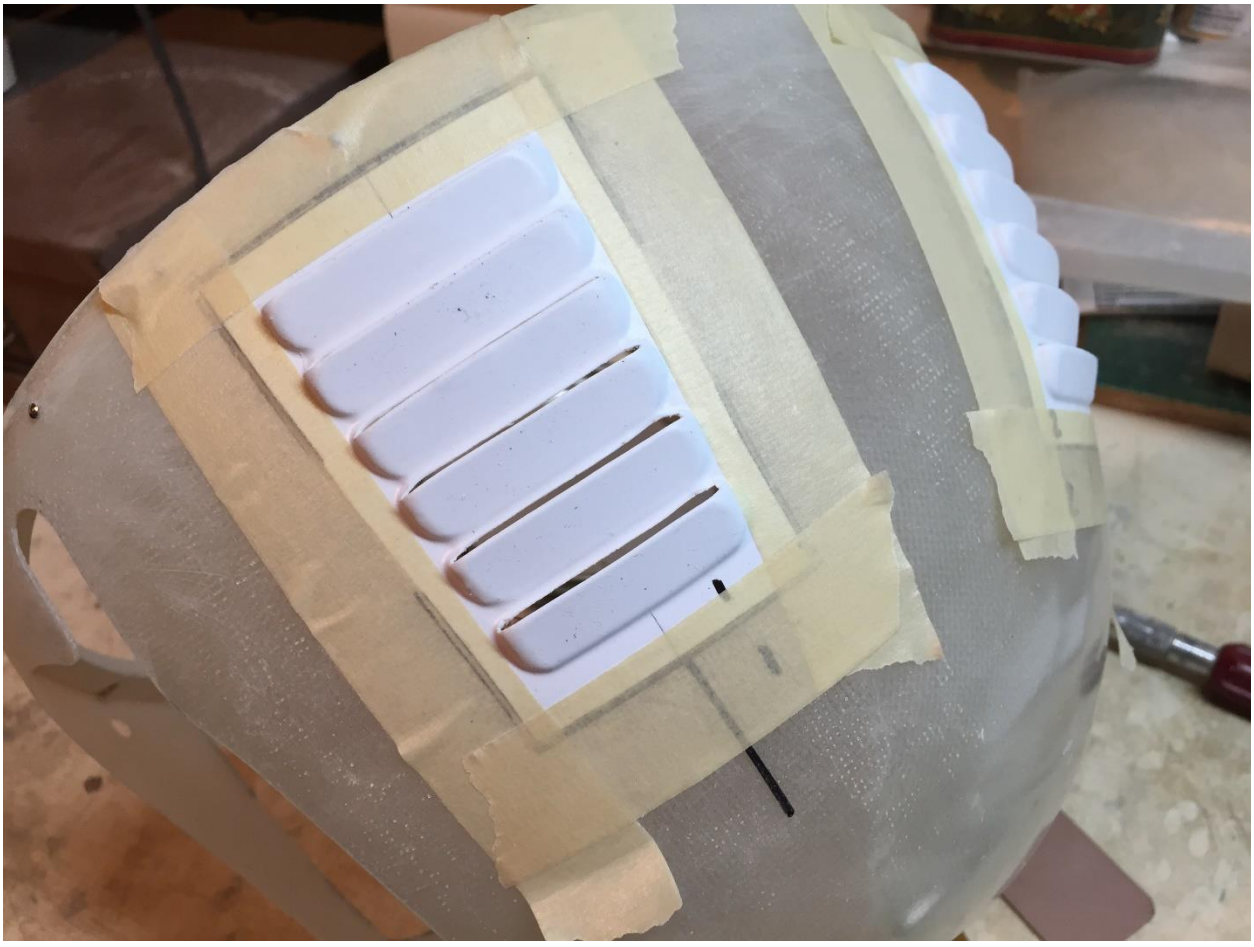
Mark the outline lines of each louvers section with a felt tipped marker. Since the outline of each louver section will be slightly different, make sure to label each section and note its location on the cowl.


Sharpie
FINE
POINT
1
1
2
2


Sharpie
Permanent Marker
POINT

Carefully cut out each section on the cowl to make as closely as possible the outline of the louver section. The reason you do this is so the louvers will appear flush with the surface of the cowl and not look “glued on.”

Tape each louver section to the cowl with masking tape. The idea is to tape each section so that the exposed surface is the same as the cowl. Done this way, there should be a minimum amount of filling and sanding necessary. When done properly, the louvers will look like they are part of the cowl –not something that was added. Very realistic



Secure the louver sections from inside the cowl with one inch fiberglass tape and epoxy resin. It is usually advisable to mix in some #404 high density filler to make the resin thicker and prevent the resin from running.

After the resin has cured, fill the seams with auto body filler as needed and sand to a smooth finish.

In the picture below the, the louvers have been epoxied in place (you can see the fiberglass tape on the inside). The edges have been filled with polyester body putty where needed and then sanded. And although you can't tell from the picture, the seams (edges) are "seamless." When primed and painted, all you will see is a cowl with louvers.

Mounting the Wheel Pant Cuffs

The cuffs are mounted using (5) #4 x 3/8" button head sheet metal screws and 1/4” x 1/2" x 1/2" lite ply blocks glued to the inside of the wing skins.

Drill five 7/64” holes in the cuffs.

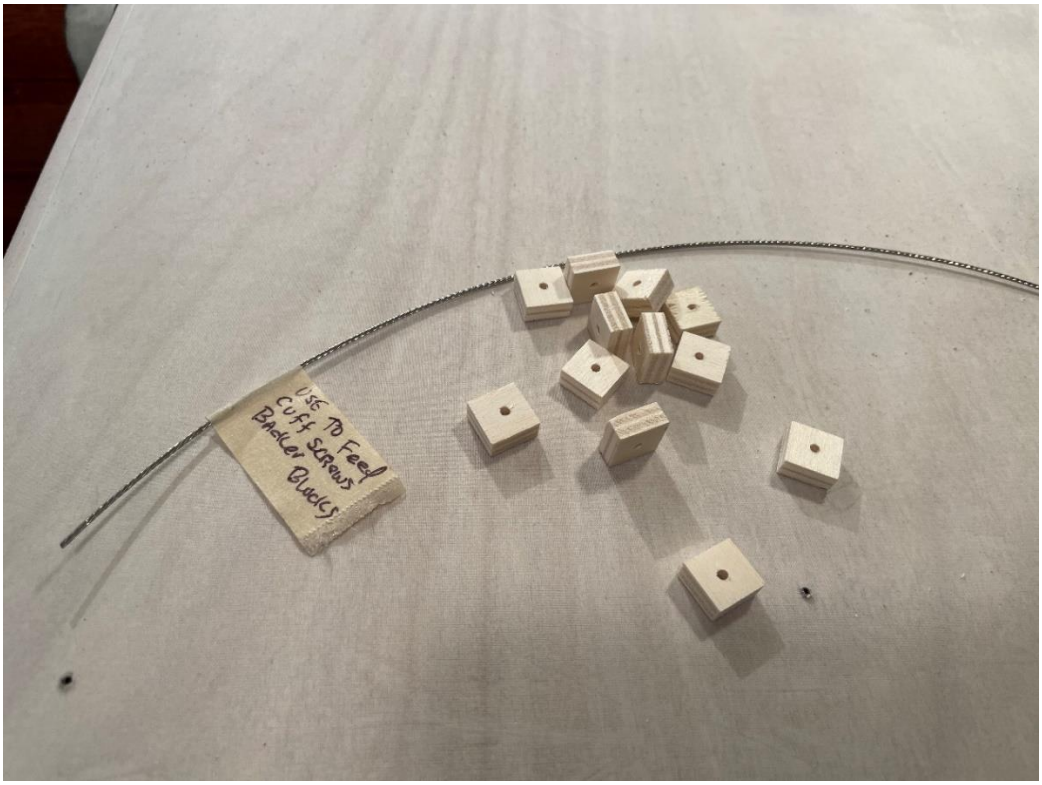
Place cuff on wing and attach the landing gear and pant assembly. Adjust cuff position. Secure cuff in position with masking tape. Mark the cuff hole locations in the stub wing with a fine tip Sharpie pen.

Remove pant and cuff. Drill 7/64” holes in wing skin.

Using the #4 x 1/2" button head screws to hold in position, glue the plywood blocks to the inside with Titebond. After allowing about 10 minutes for the glue to grab, remove the screws. If you wait too long, the screws may be difficult to remove.

Set the cuff in place and mount with the button head screws.

Ideally, the cuffs and wing skins should be drilled before painting.



Install Elevator and Rudder Hinges

Always dry fit hinges *before* you cut to make sure they insert all the way and there is full movement. Insertion is easier if the tip is slightly rounded. A little stiffness is to be expected, but the elevator should have enough free movement to drop down on its own.

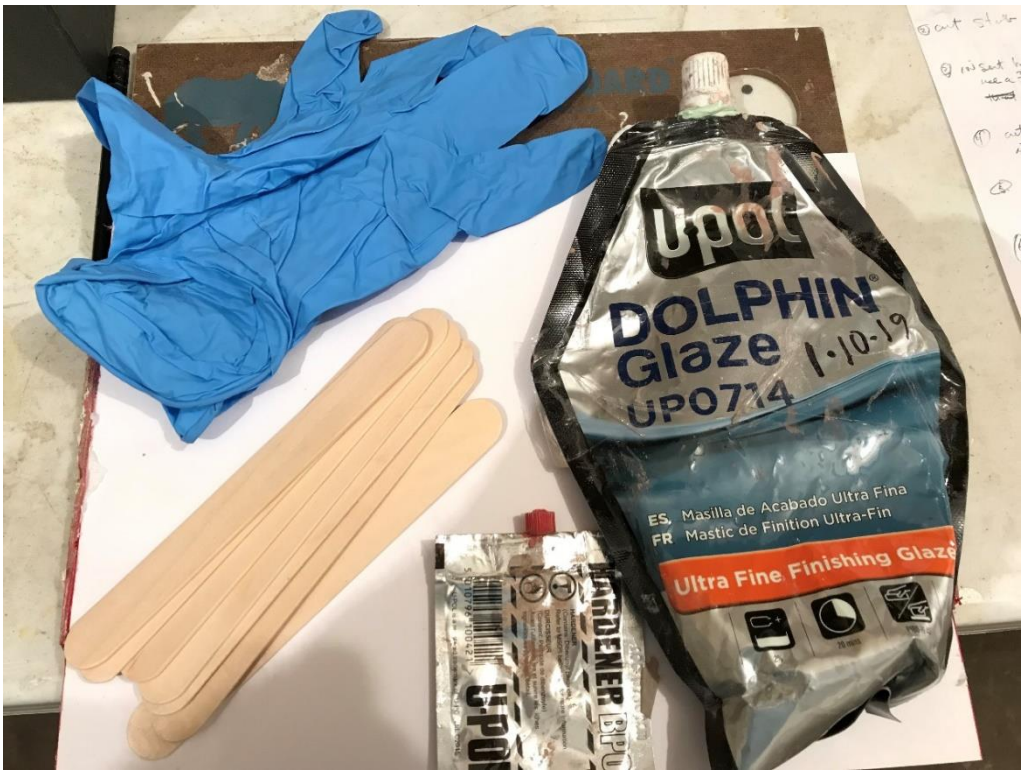
Cut stabilizer hinge to a length of 17 inches.

Insert hinge all the way. Use a 3/16" Delrin rod to ensure that the hinge butts against the control horn.

Mix up some body putty. Coat the dowel about halfway and insert. The dowel does not need to be tight against the hinge, a little float is OK.

When the body putty hardens (in about 5 minutes), mix a new batch of putty, and fill in around the tip.

The rudder hinge is secured in the same manner as the elevator. Hinge length should be 13-3/4".


upol
DOLPHIN
Glaze
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1-10-19
ES, Masilla de Acabado Ultra Fina
FR Mastic de Finition Ultra-Fin
Ultra Fine Finishing Glaze

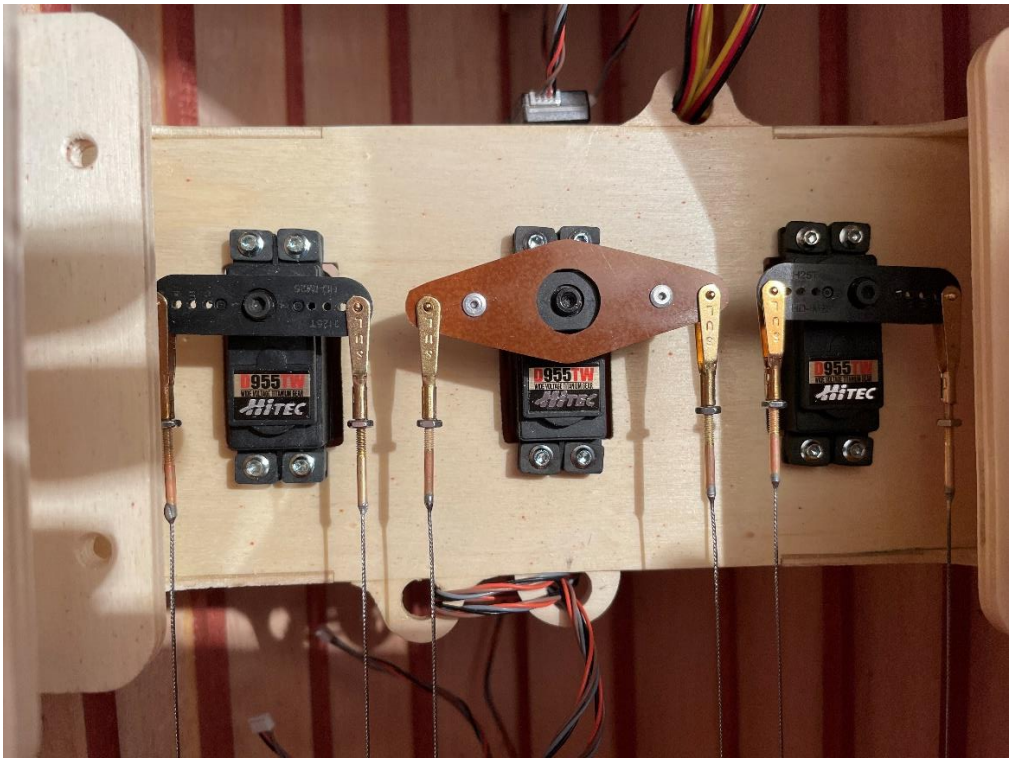
Rudder and Elevator Pull-Pull Control Cables

There is one rudder servo and two elevator servos, one for each half.

Use .031” stainless steel cable and Sullivan #512 couplers. Solder the couplers with Stay Brite silver solder. The clevises are standard Sullivan 2-56 size.

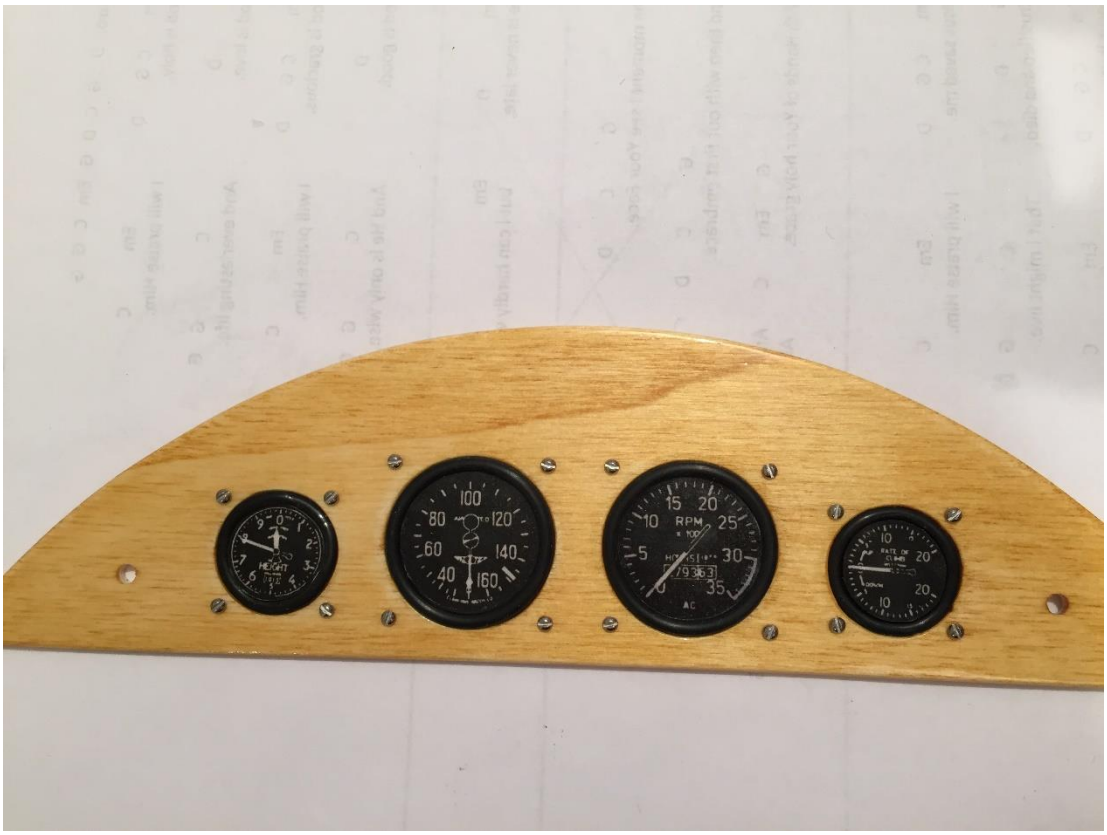
	Tiller Bar	Pin-to-Pin	Coupler-to-Coupler*
Rudder	2-1/4”	54-5/8”	53-1/2”
Elevators	1-1/2”	49-3/4”	48-5/8”

* Meaning threaded tip of coupler to threaded tip of coupler, which is 1-1/8” shorter than pin-to-pin.



Instrument Panel

The instrument panel design is a matter of personal preference. Mount instrument panel to F5 tabs with high strength Velcro.



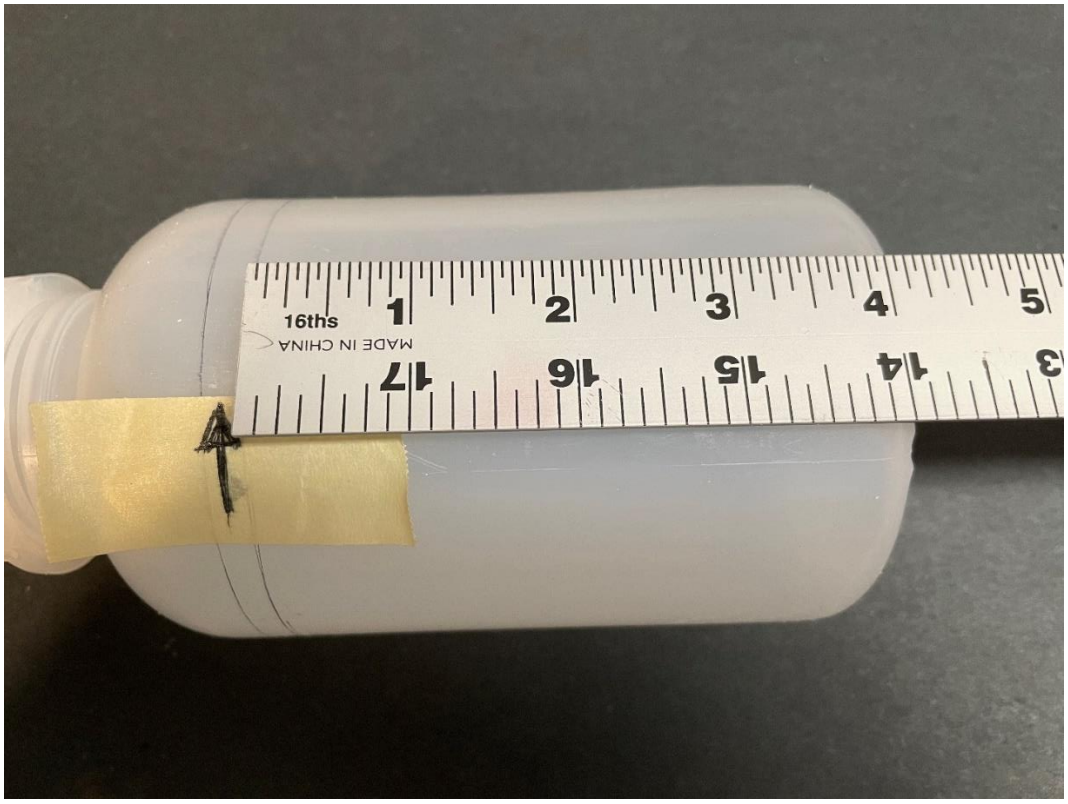
Fuel and Smoke Tanks

The capacity of the fuel and smoke tanks are different for the Fiala 140 and the Moki 250 engines. The Moki 250 fuselage at F3 and F4 is designed for 750ml tanks. The Fiala 140 fuselage at F3 and F4 is designed for 500ml tanks. These capacities are sufficient for a normal 10 minute flight with about half a tank to spare.

The fuel and smoke tanks are 3W products and are available in the USA from Aircraft International. http://www.aircraftinternational.com/

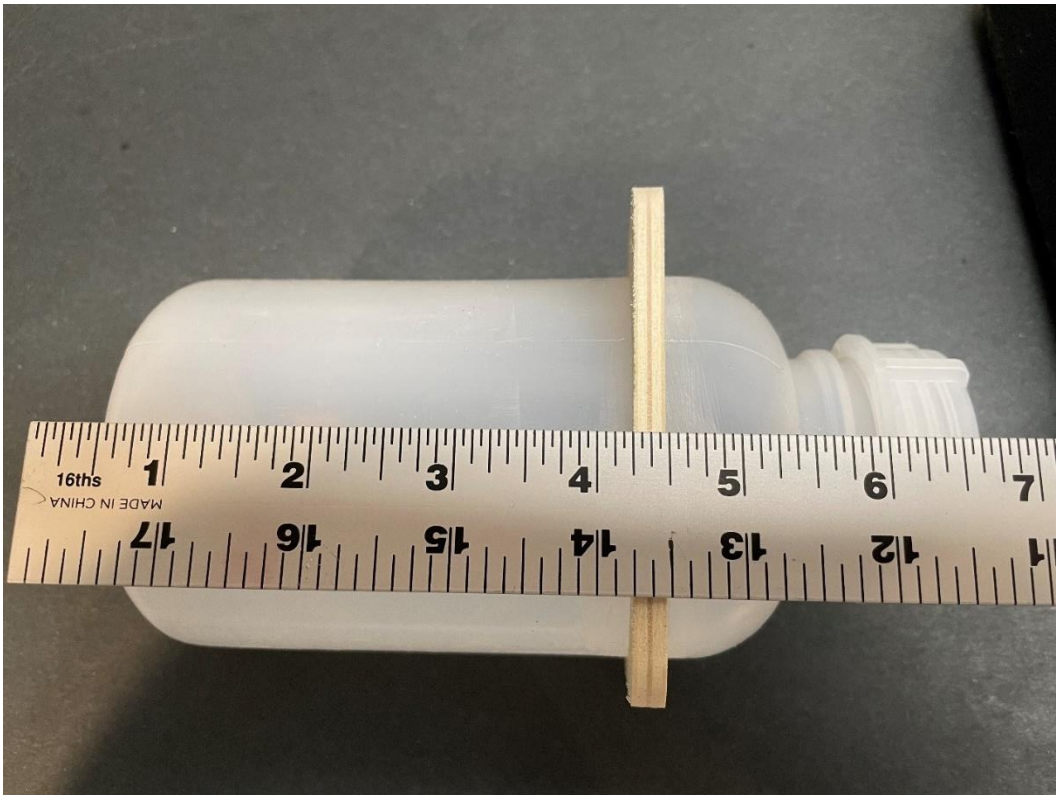
The pictures below show the procedure to glue the tank mount to the 750ml tank that is correct for the Moki 250. If you are building the Fiala 140 version, use the dimensions in brackets. Otherwise, the procedure is the same.

Using 80 grit sandpaper, abrade the tank surface approximately 4-1/8" to 4-5/8" from the bottom. (Fiala 140: 3-5/8" to 4")



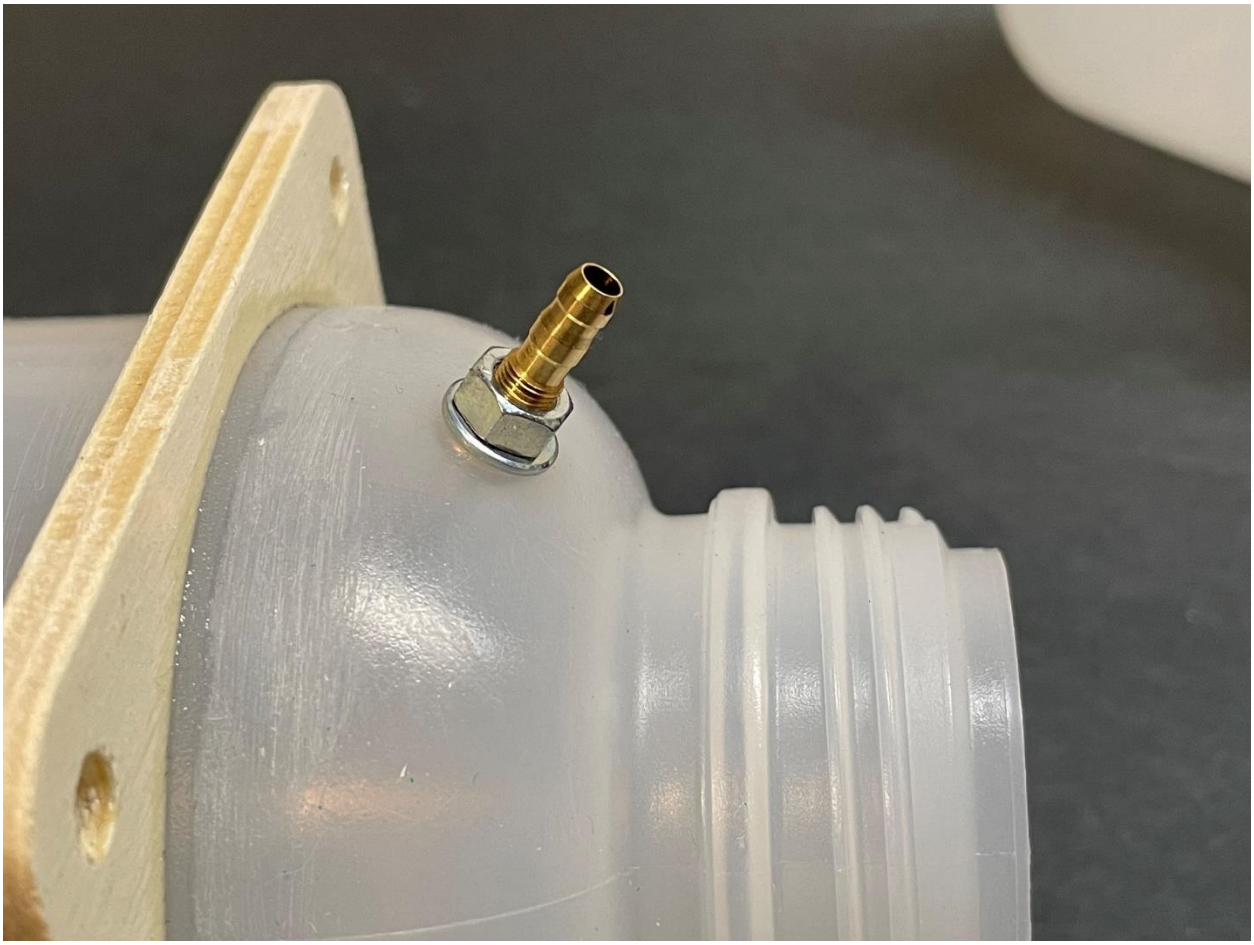
Swab a little CA accelerator to the inside of the lite ply mounting bracket.

Align the bracket so that the rear side is 4-1/4” from the bottom of the tank. Make sure it is square, then apply thin CA to glue permanently in place. (Fiala 140: 3-11/16”)



Locate the overflow nipple about 45° and on center. Drill a 3/16” hole. Make sure that no debris remains inside the tank.

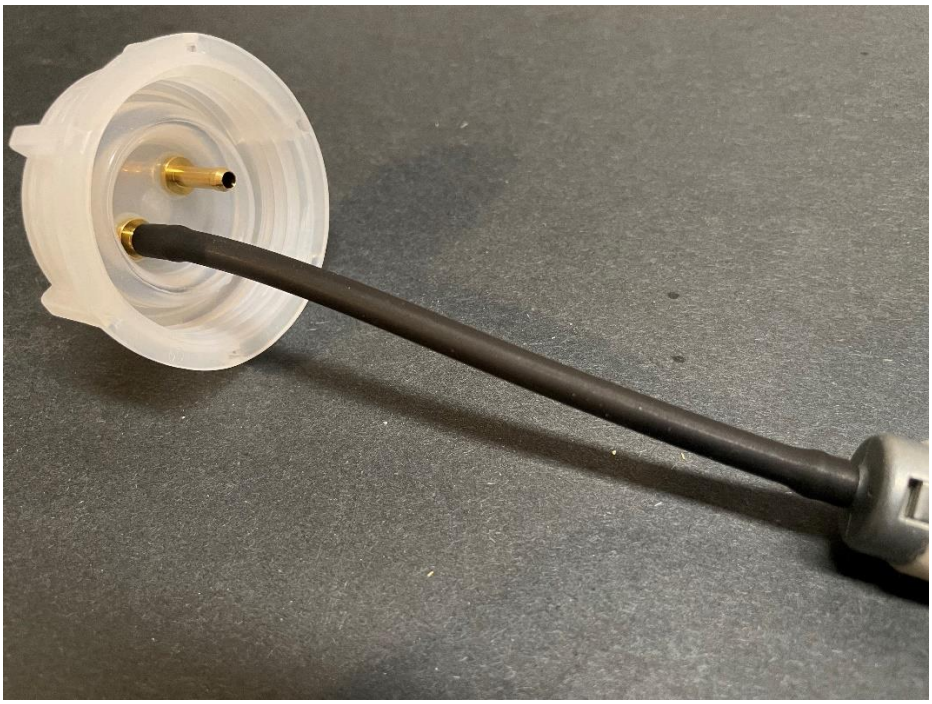
Insert nipple fitting from inside and push out through the hole. It is better to push from the inside to avoid any damage to the threads or the nipple. Hold the fitting in place with long nose pliers, add washer and nut, and tighten securely.



Drill (2) 3/16” holes from inside the cap. Install brass nipples as before.

There is no need to use Loctite on the threads. Gas and smoke oil will swell the plastic and create a tight seal.

Cut the Viton tubing included with the tanks as shown below.



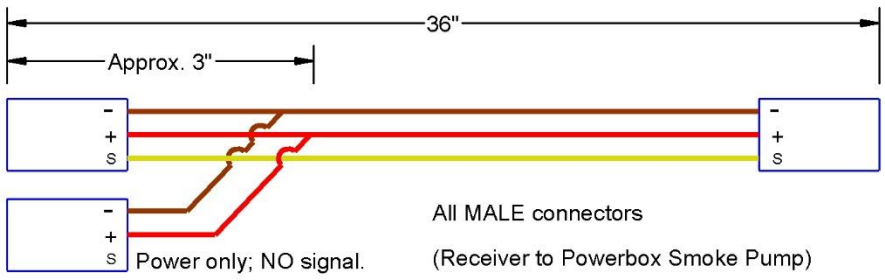
Mount the fuel tank on the right and the smoke on the left as seen from the cockpit. Complete all internal tank plumbing and screw the caps on tightly. Mark the location of each nipple on the caps so you can orient the tanks correctly during installation. For example: I for in, and O for out.

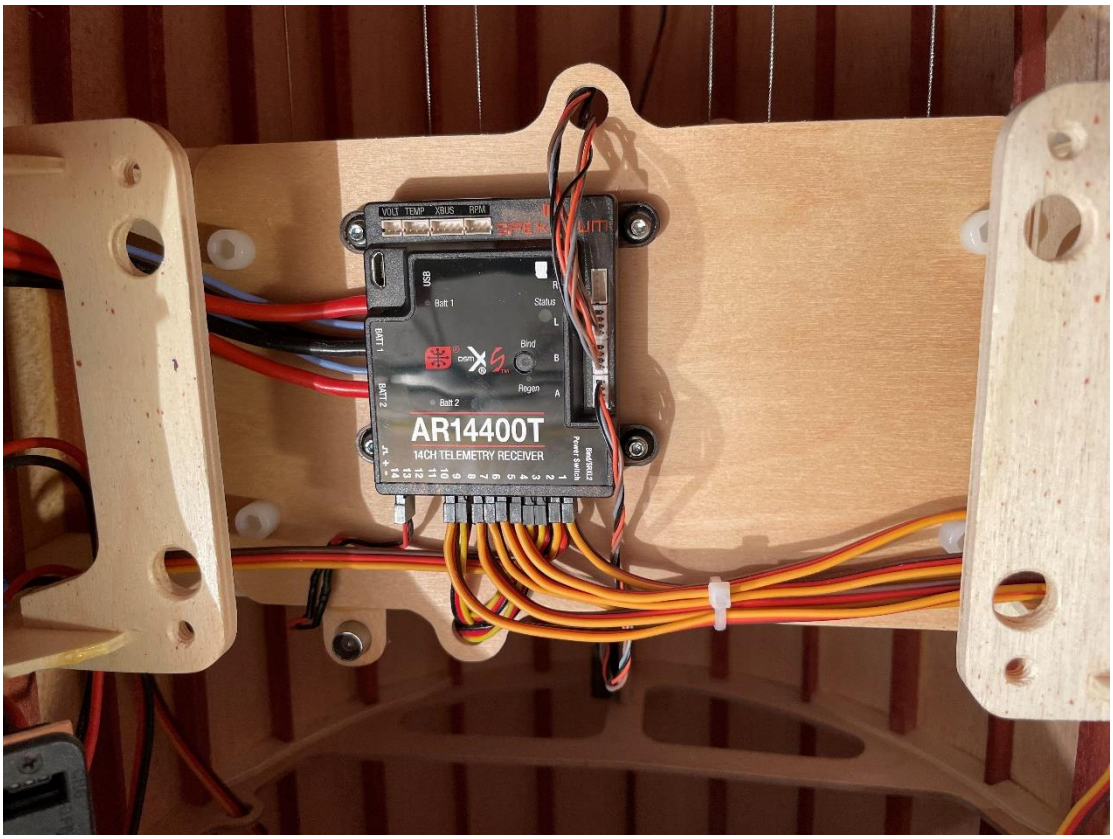
Receiver, Batteries and Servos

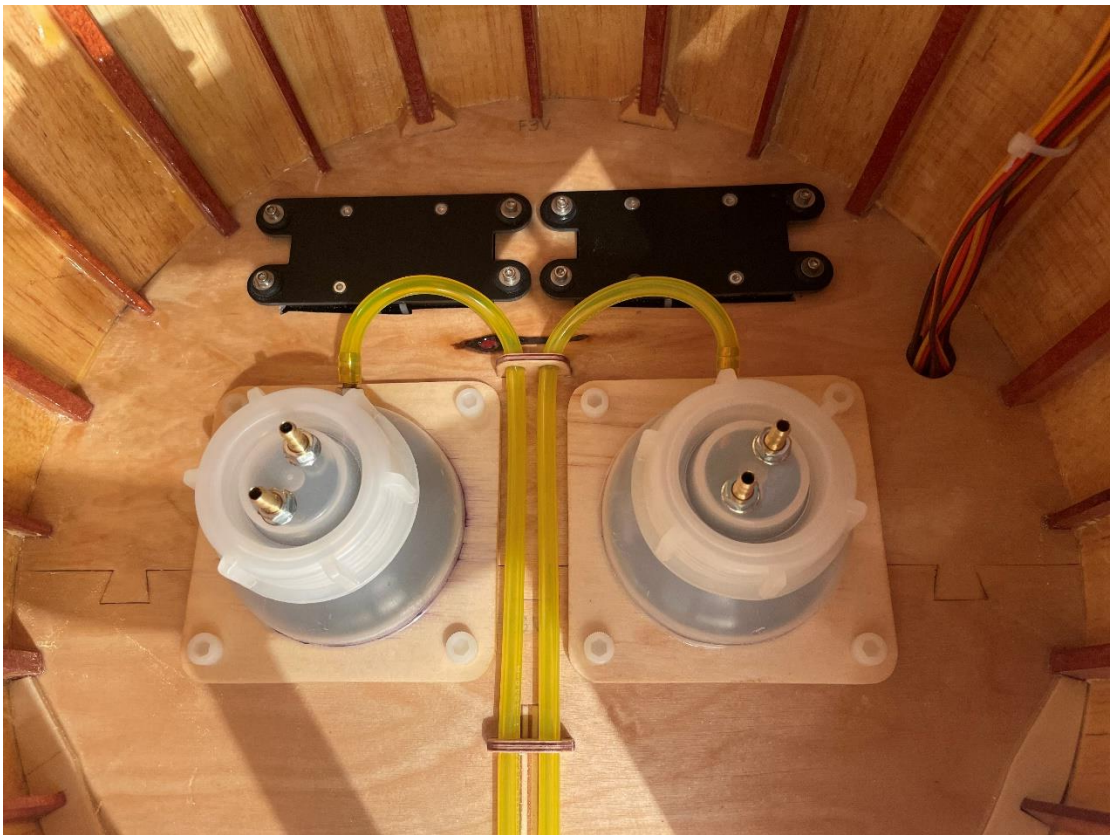
The table of wire lengths and the wiring diagram below assumes that all the receiver wiring (except right aileron) is routed along the left side of the fuselage. The battery switch mounts on the right side of the fuselage. The receiver battery mounts on the receiver tray or on F3 if it helps with balance.

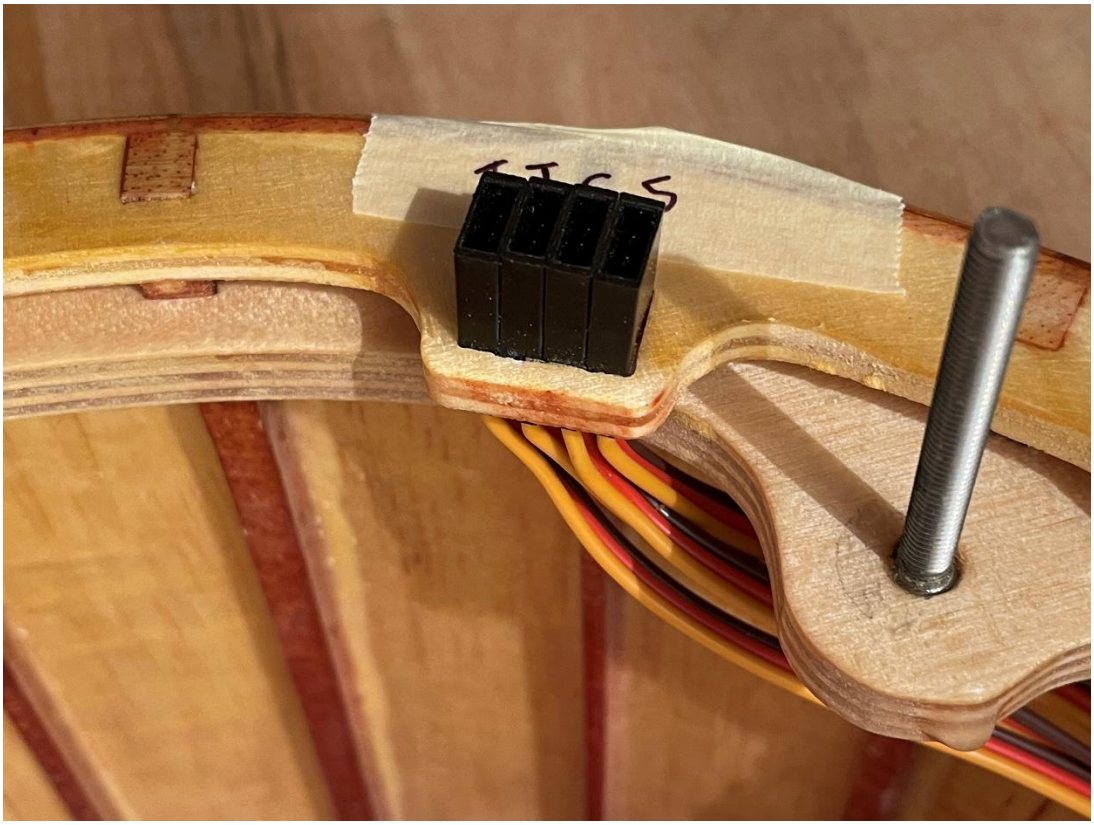
The Jeti 3,100 mah receiver battery has a Multiplex connector. You can custom order a switch (EDR 77 HD -R2) with Multiplex connector from Electrodynamics. www.electrodynam.com

Ch 1	Throttle Servo	36”
Ch 2	Right Aileron SW1 to Receiver	36”
Ch 3	Elevator Servos	Servo leads are long enough.
Ch 4	Rudder Servo	Servo lead is long enough.
Ch 5	PowerBox Smoke Pump	36” Custom: See drawing below.
Ch 6	Left Aileron SW1 to Receiver	36”
Ch 7	Receiver to Ignition	36”
Ch 8	Starter Controller (ESC)	36”
Ch 9	Choke Servo	36”
Wing servo extension to W-1		12” (2) needed.



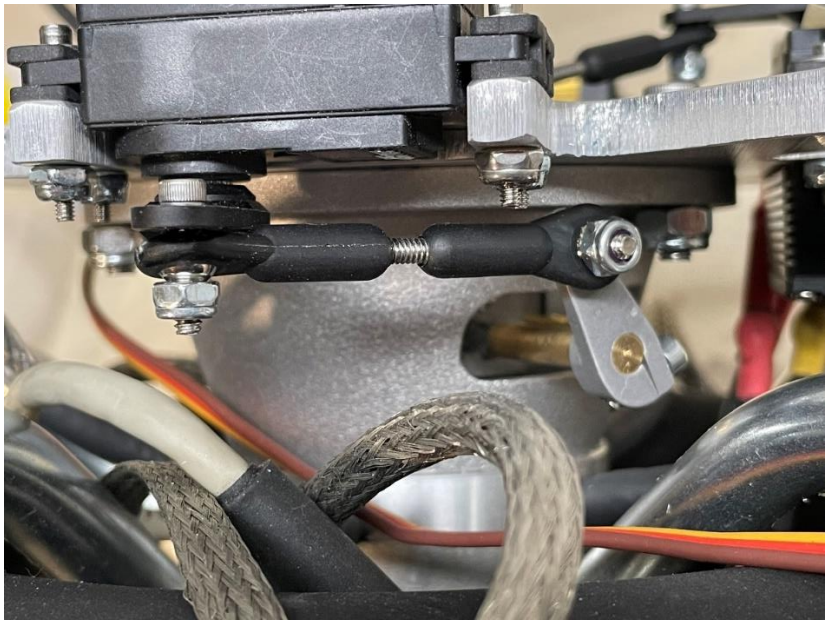

VOLT TEMP XBUS RPM
USB
Batt 1
Status
Bind
Regen
Batt 2
BATT 1
BATT 2
AR14400T
14CH TELEMETRY RECEIVER
Power Switch

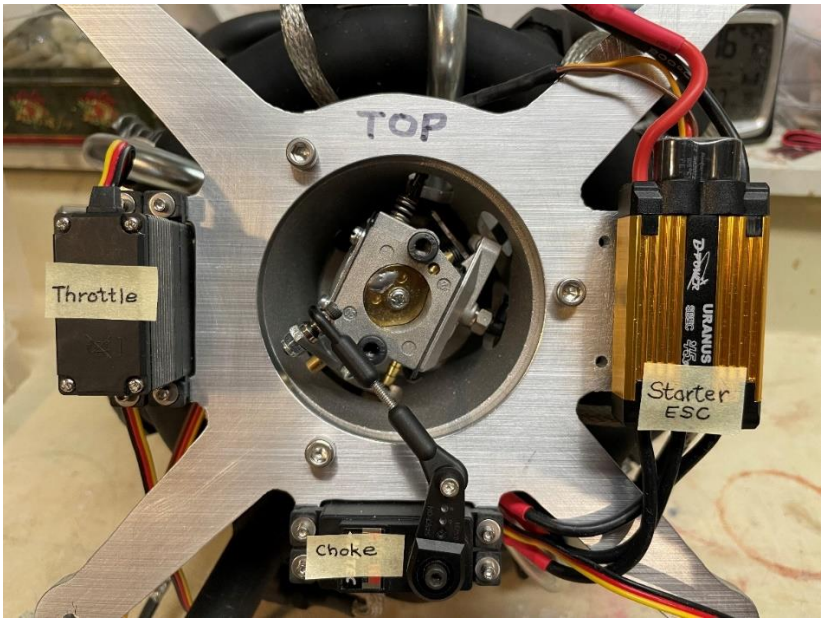




Moki 250 Radial with Starter Motor Mount, Choke and Throttle Servos

Prepare throttle and choke arms as shown below. You will need to remove the carburetor to remove the choke arm from the shaft. Servos mount with 2-56 x 3/4" socket head screws and nylon lock nuts. The Dubro heavy duty ball socket clevises and 4-40 x 3/4" threaded studs are used to connect the arms.



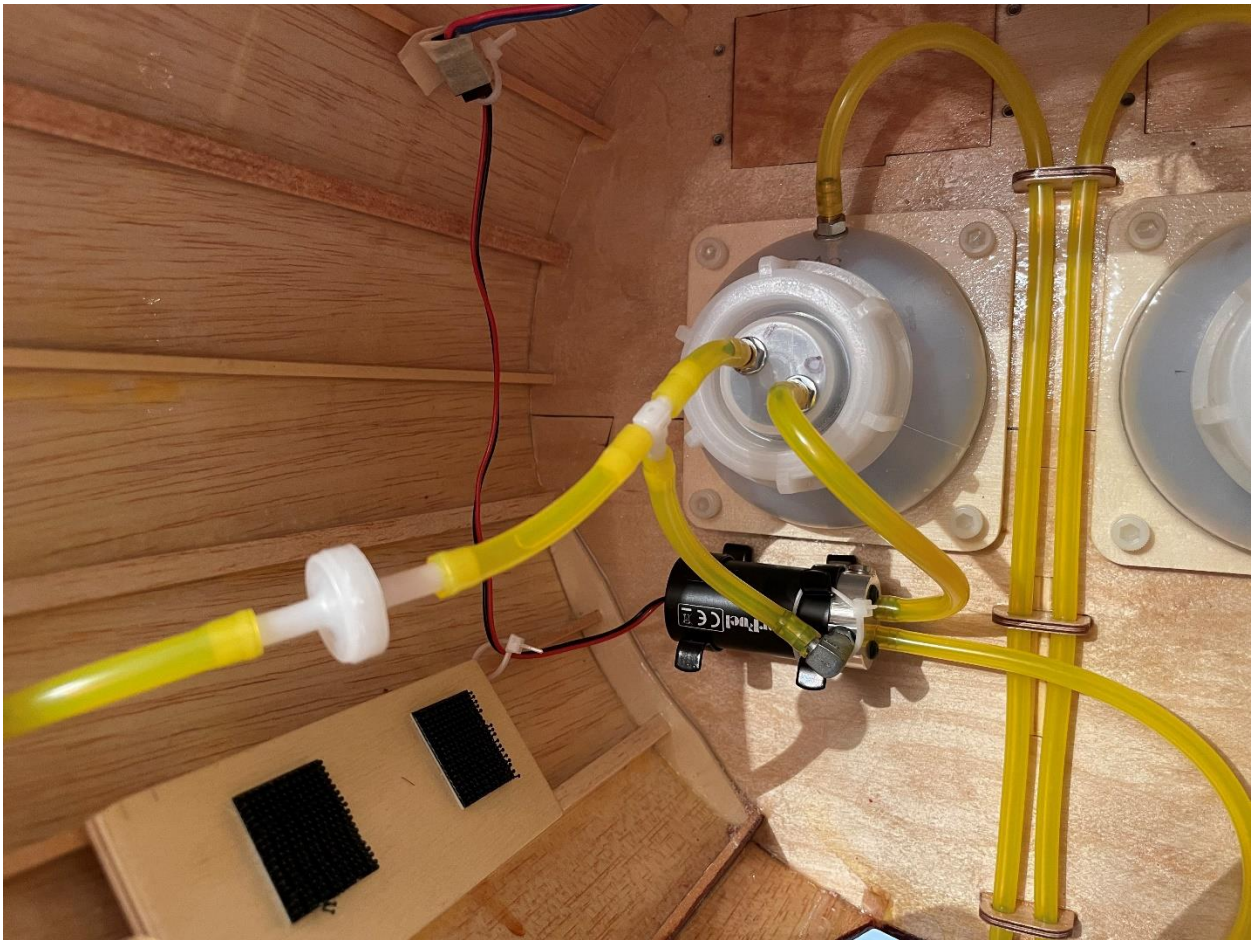


Moki 250 Ignition Module

The Moki ignition module mounts onto the 1/4” five ply base and secured with (4) 6-32 x 5/8” socket head screws that have been epoxied to the mount. The mount itself should be epoxied to the top two balsa stringers and flush with F2. The Sparkswitch can be mounted to the ignition module with 3M hook and loop.

Moki 250 Pump Installation

To have predictable tuning, an APS fuel pump is advised. Mount the two U-clips with #6 x 1/2” sheet metal screws. To prevent the pump from sliding out, secure with cable tie.



Moki 250 Electric Starter Battery Installation

The starter motor requires a 3 cell Lipo battery. Use epoxy to mount the 1/4" lite ply battery mount as shown. Attach the battery with 3M Dual Lock (heavy duty) hook and loop. The battery can be easily removed from below for charging.

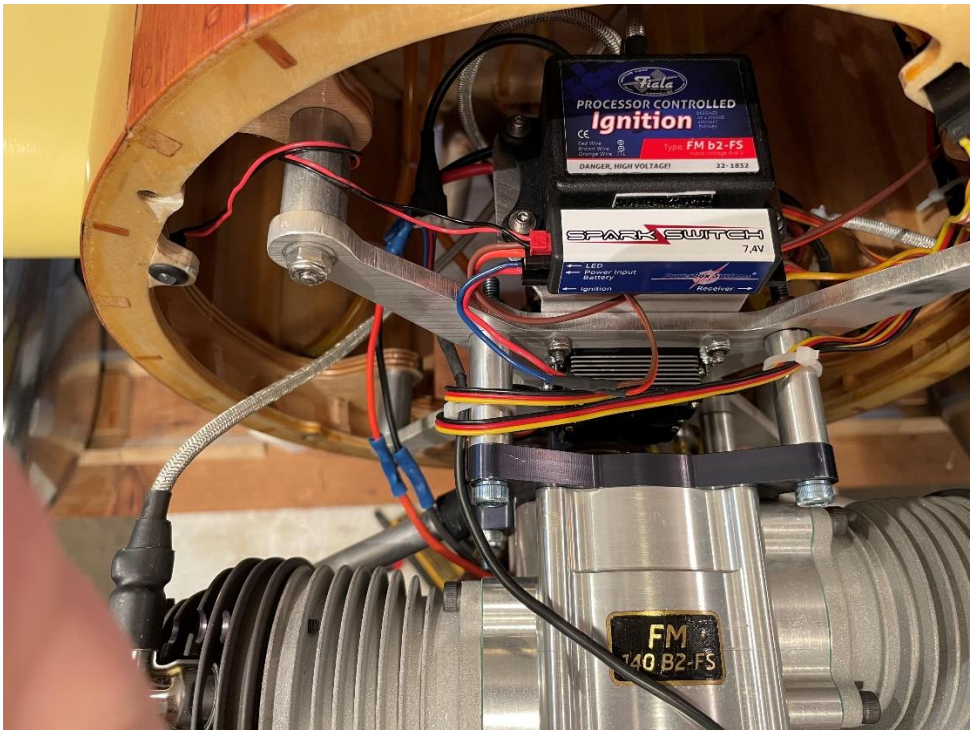
Moki 250 Exhaust Extensions

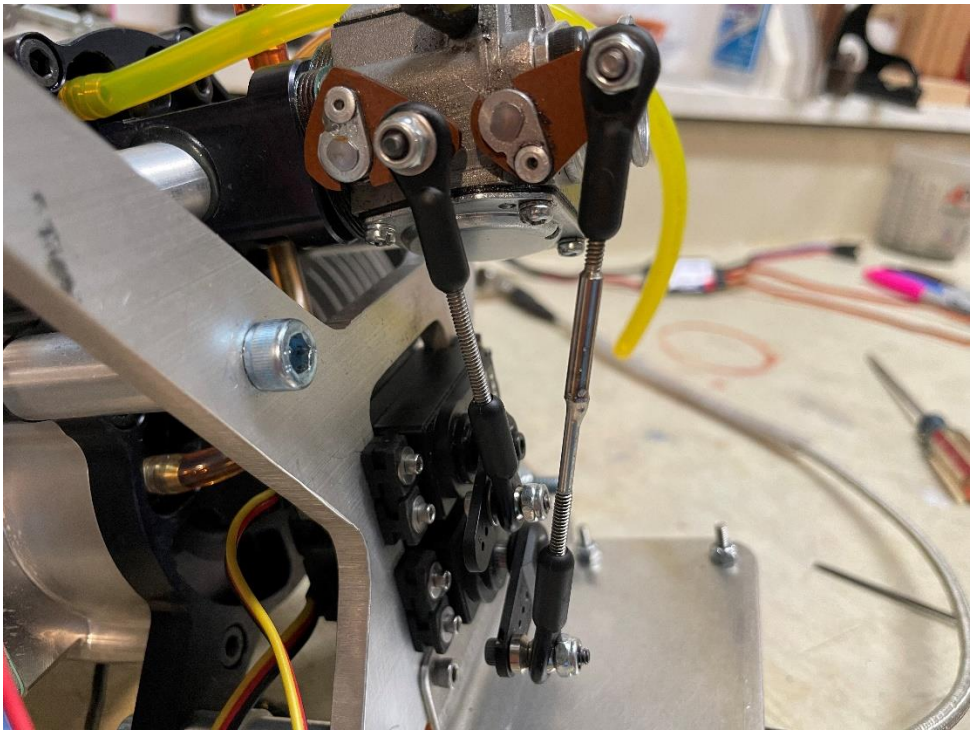
Make two exhaust extensions for 7/8” OD, 0.035” wall aluminum tubing (available from McMaster-Carr). Secure with hose clamps. Cut slots so the clamps will squeeze the extensions tightly to the Moki exhaust. The left side should be 5” long and the right side should be 6” long.

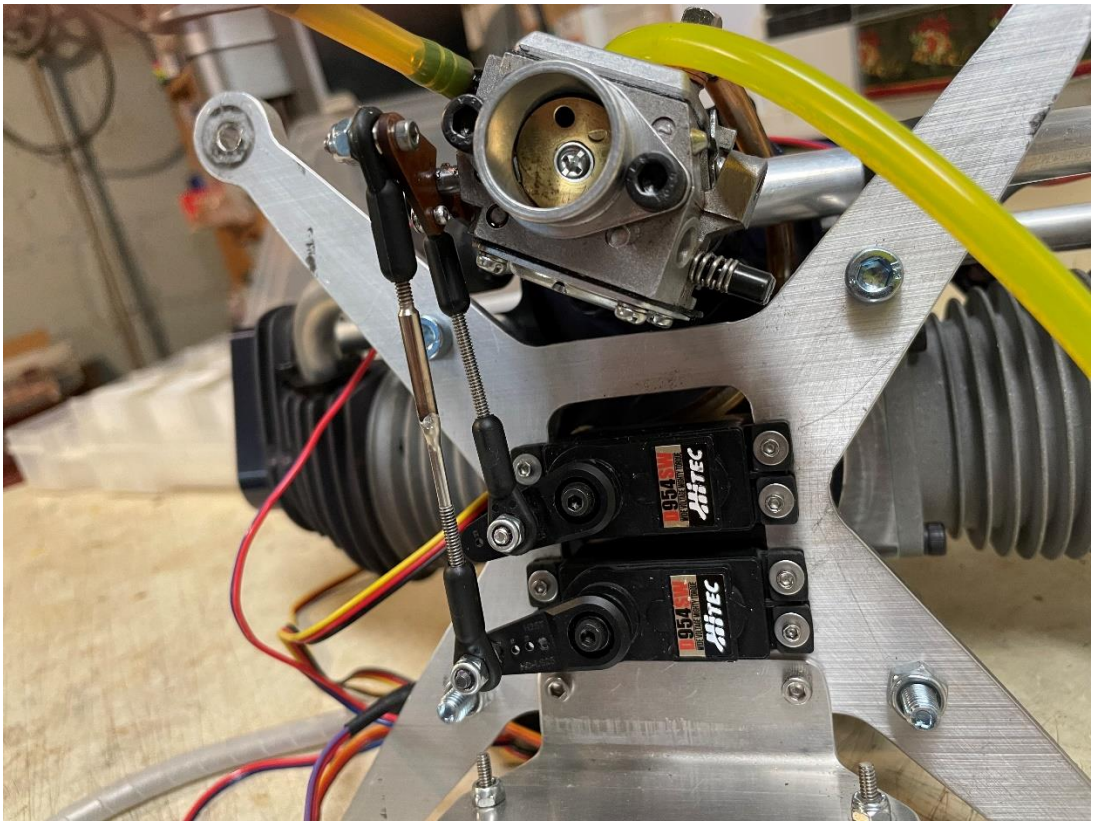
Shape the fuselage as shown so the left side exhaust extension will clear. The right side will clear without modification.

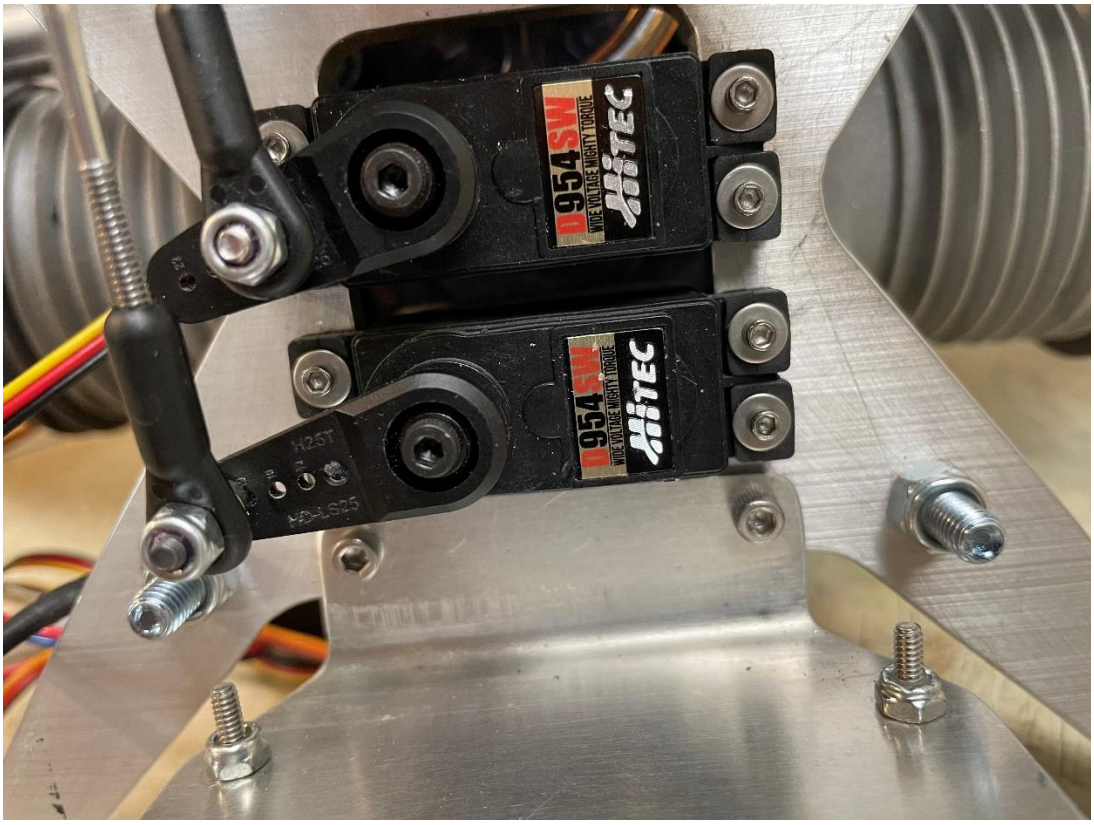
Fiala / Valach 140 with Starter Motor Mount, Choke and Throttle Servos

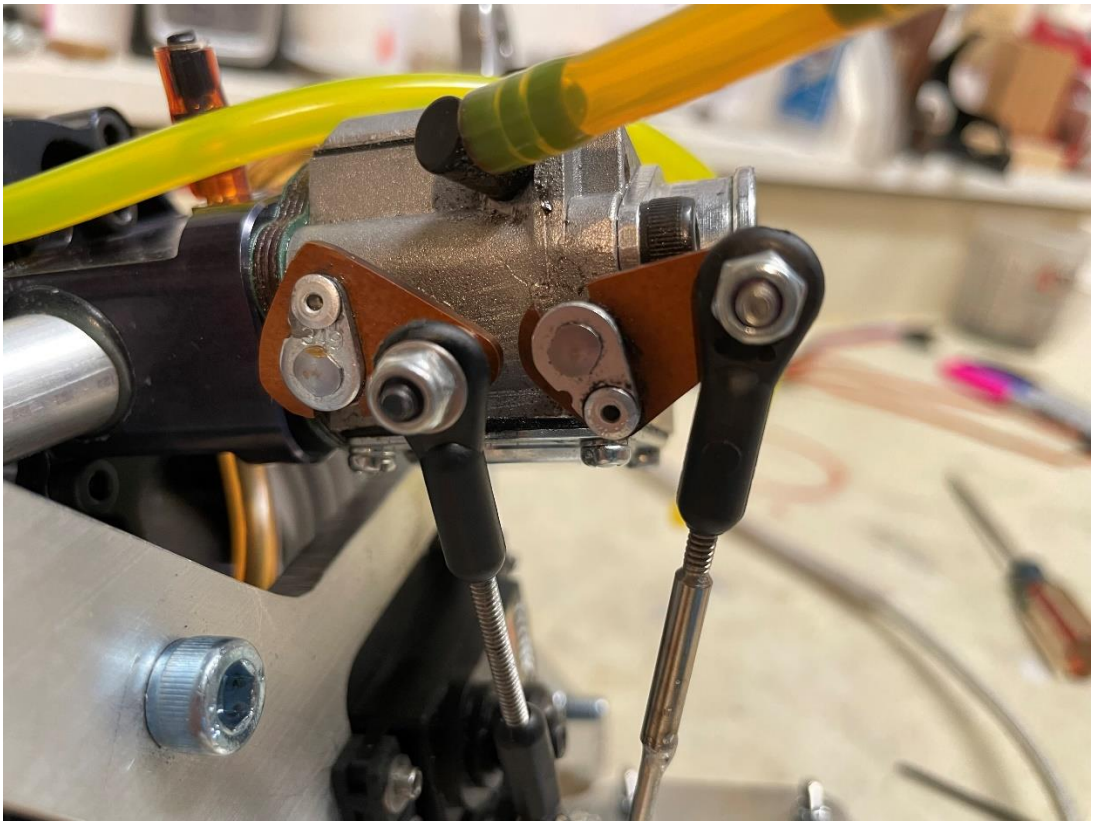
Glue the pilot to the plywood base with Epoxy. Secure with four 1/4-20 x 1/2” nylon socket head screws.





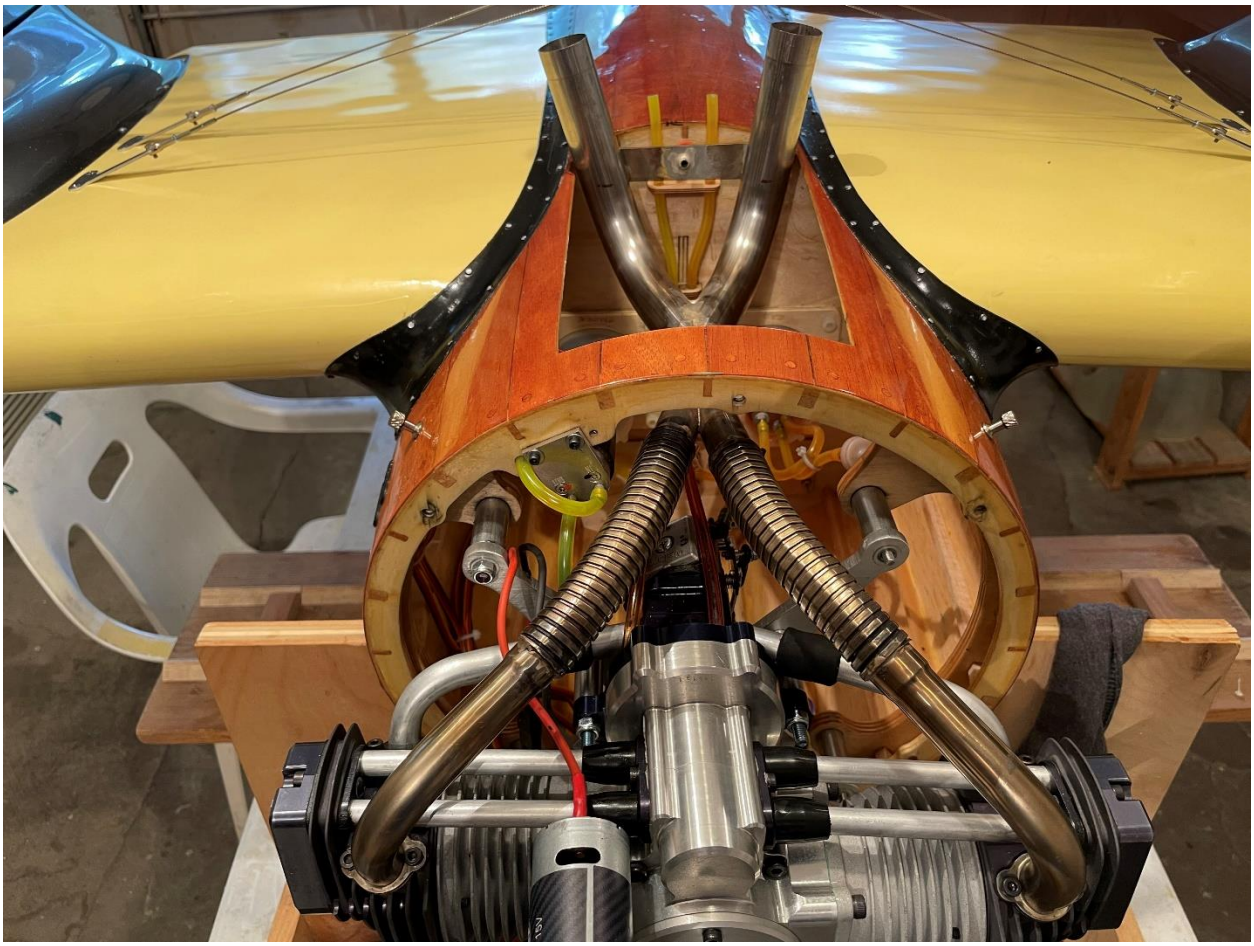

D954SW
WIDE VOLTAGE MIGHTY TORQUE
HiTEC


D954SW
WIDE VOLTAGE MIGHTY TORQUE
HiTEC
H25T
M2-LS25



Fiala / Valach 140 Exhaust System

Exhaust parts are available from Vogelsang Aeroscale. Shown below is just one way it can be done.



Pilot Mount

Glue the pilot to the plywood base with Epoxy. Secure with four 1/4-20 x 1/2” nylon socket head screws.

Point of Balance

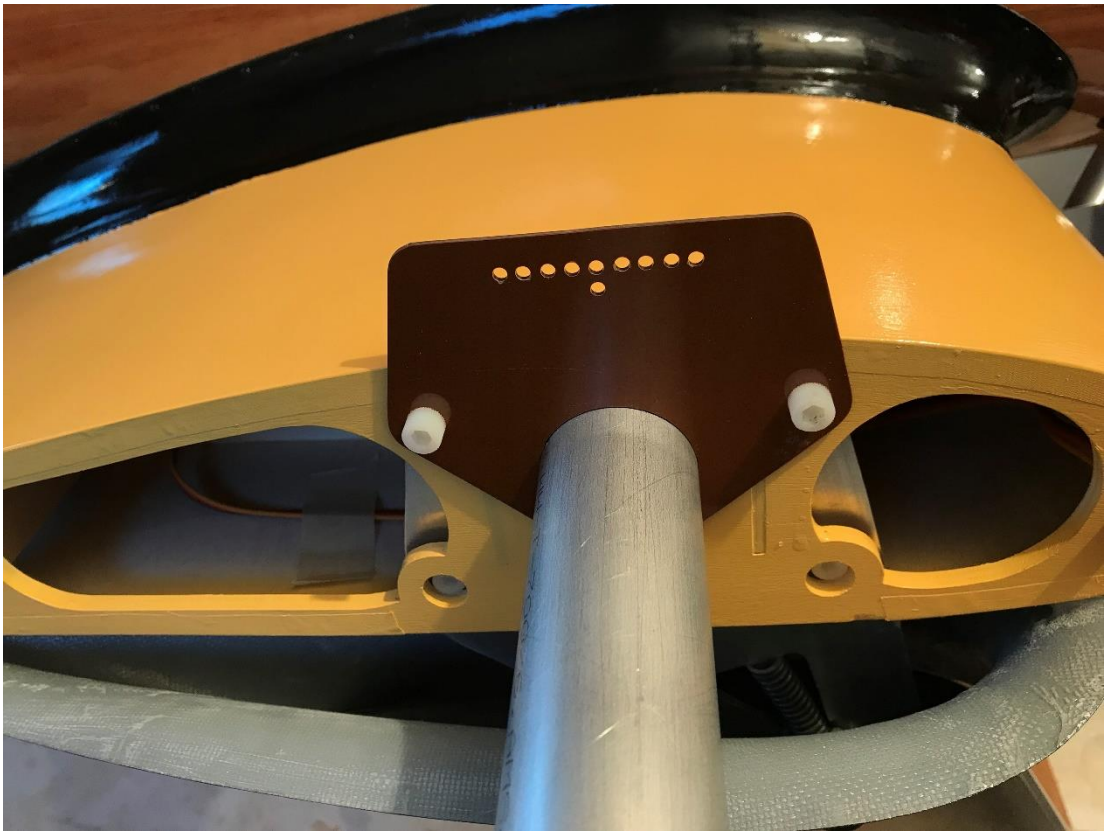
The point of balance at the ideal CG location is determined by suspending the model from the two aluminum brackets which are bolted to the stub wing. Since the balancing bracket and the screws that hold it in place will prevent the wings from fully mating with the stub wing, you will not be able to attach the flying wires. Use masking tape or rubber bands to secure the upper and lower wires near the attachment points. It is also a good idea to use masking tape to temporarily secure the wing to the stub wing. Otherwise, the wing can easily pull away from the rear nylon locating lug and rotate out of position. Any method for suspension will work, just be careful to not suspend the model very high off the building surface or floor. Should something break or go wrong, you sure don't want the model to fall very far and sustain damage.

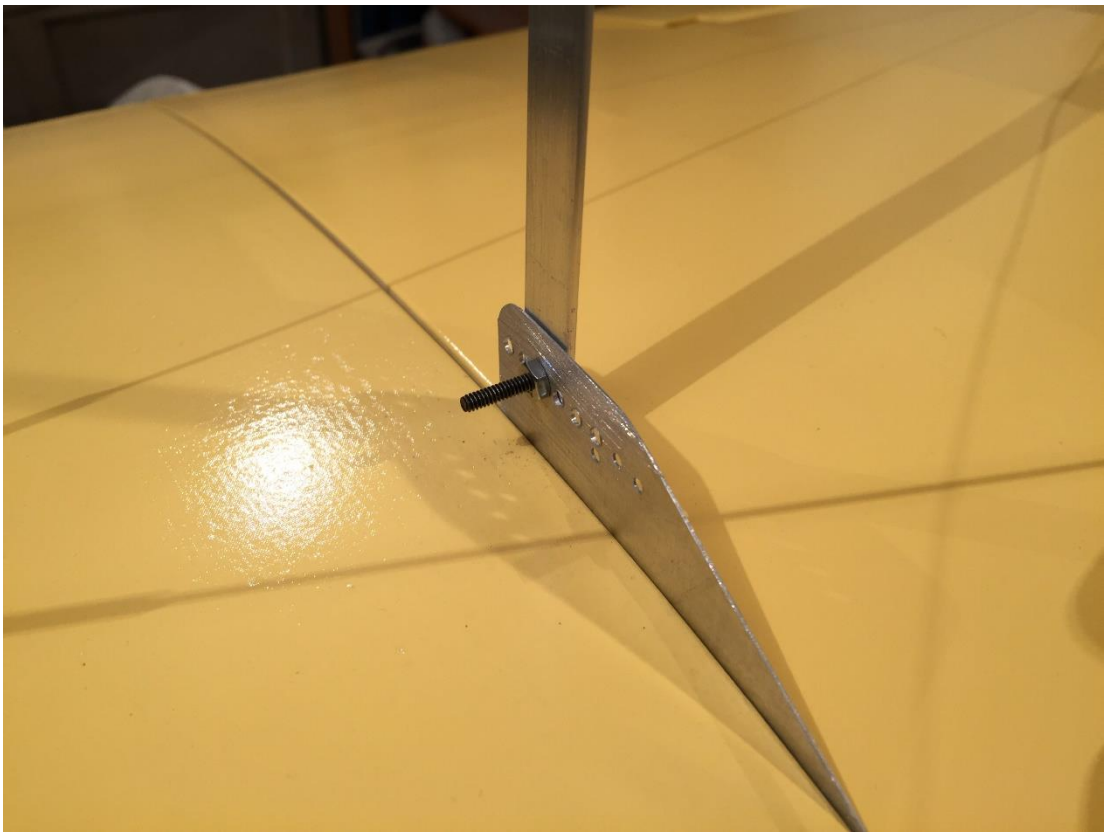
The Riley Model B is designed to balance at the center of the wing tube, which is 30% of the mean wing chord.

If you are using the Fiala 124 engine, you may find it necessary to add some weight to the nose. The Moki 250 should balance very close to 30% without any added weight.

Whatever you do, make sure you take the time to balance properly.

The pictures below are from an earlier build. The procedure is the same, however.





The model has been suspended with 1/16” x 1/2” aluminum bar stock. The turnbuckles are not necessary but work very well if minor vertical adjustments are needed to keep the wings level.


HORIZON
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