Riley Model B - Series 11 - Fuselage Construction – Part 3

January 22, 2017

Mount Fin and Stabilizer to Fuselage

To insure that the stabilizer and the fin are straight and square set the fuselage with the landing gear mounts attached onto a flat surface. Raise the tail so that the fuselage is approximately level. In the pictures following, the table was too narrow, so I had to improvise. 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 of the load on the stabilizer and fin are carried by the 3/16" basswood spars. The tabs just hold the leading edges in place.

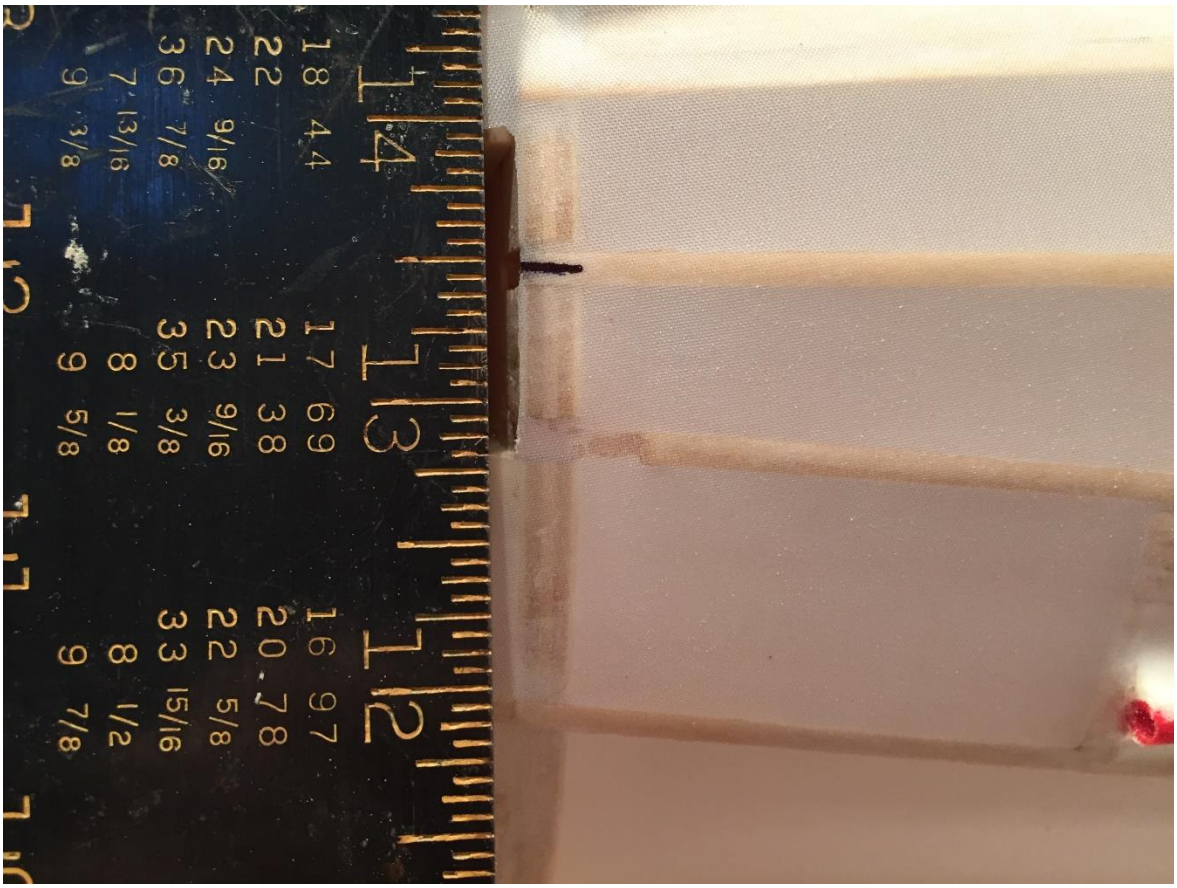
Check the fit. You want the tabs to be just snug –not so tight that you have to force it in. If the tabs are too tight, it is usually best to sand between the gaps of the tabs rather than thin the stringers on the fuselage.

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

Mount the stabilizer

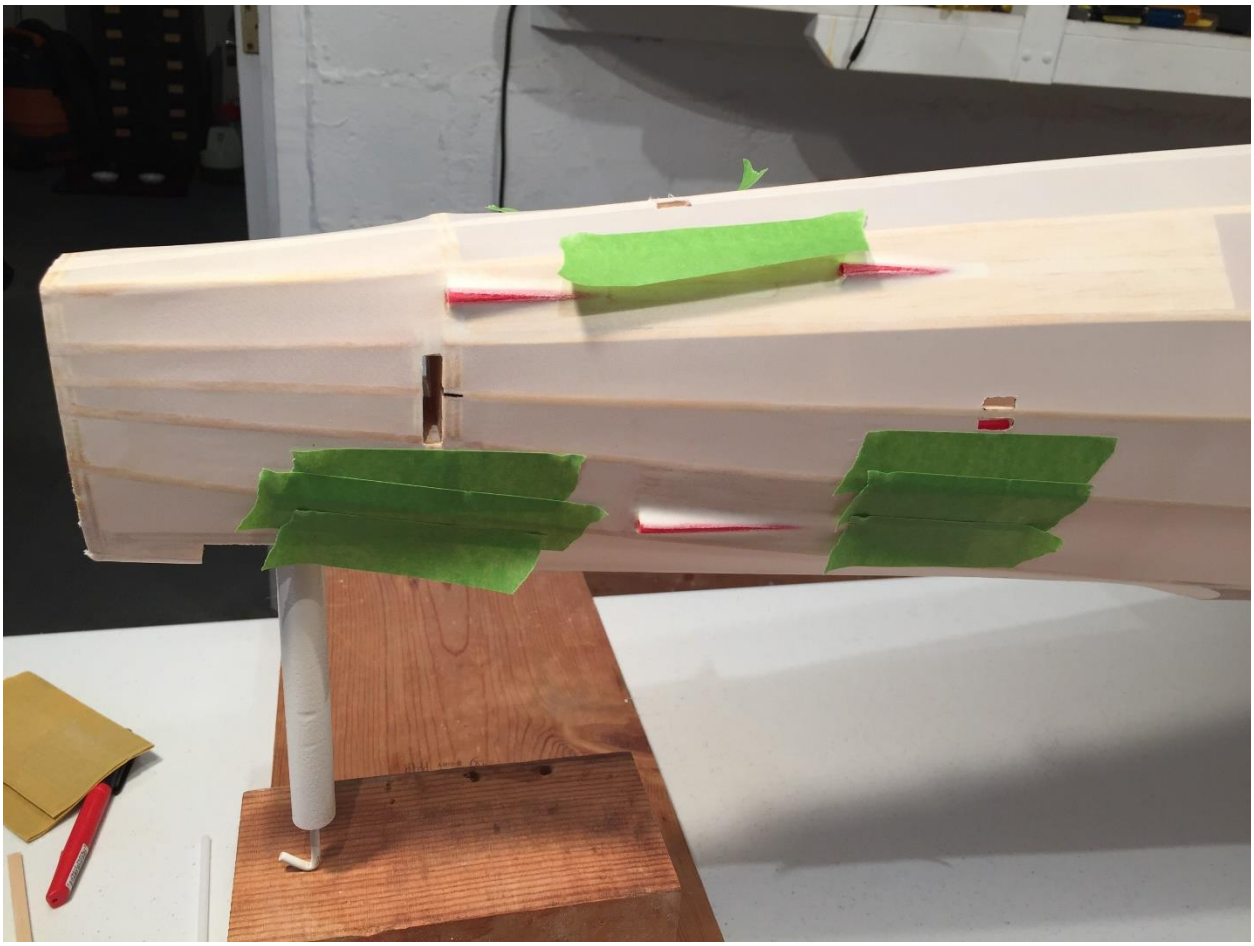
Measure the height of the stringers at 9A or 3P on-center near the spar pocket. This will also be the correct height of the stabilizer at the *tip*.

In the example below, the reference distance is 13-1/2." Therefore, the height of the stabilizer *tip* should also be 13-1/2" on-center.



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.

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



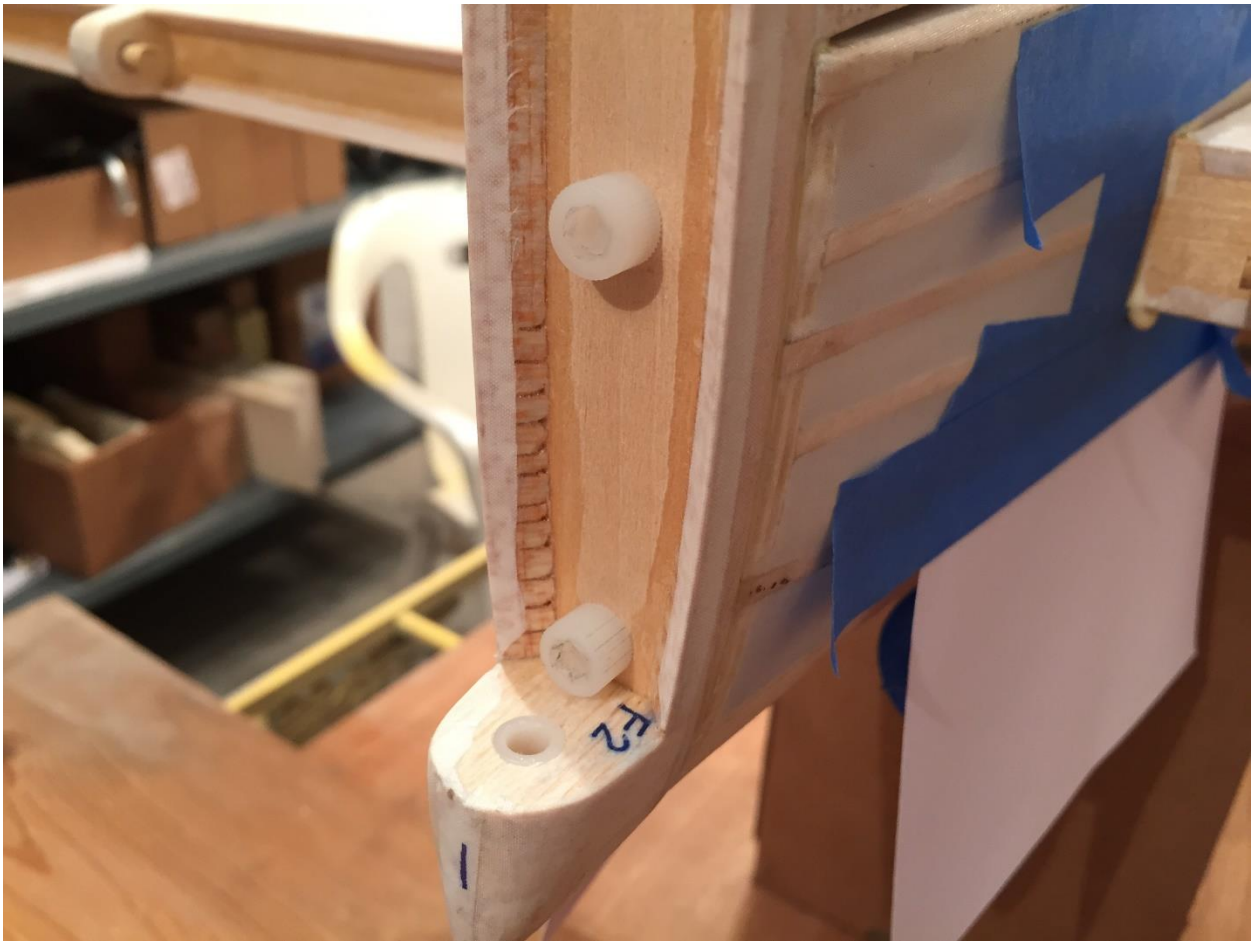
Spread a liberal coat of Titebond to the spar pockets on all sides. Use a scrap piece of basswood wing spar stock to spread the glue in the pockets, and apply a liberal cost of glue to the spar itself. Apply a moderate amount to the tabs.

Check everything carefully. Work slowly. When done, check again. Once the stabilizer halves and the fin are glued, their positions are permanent.


SAITO
AMSOIL

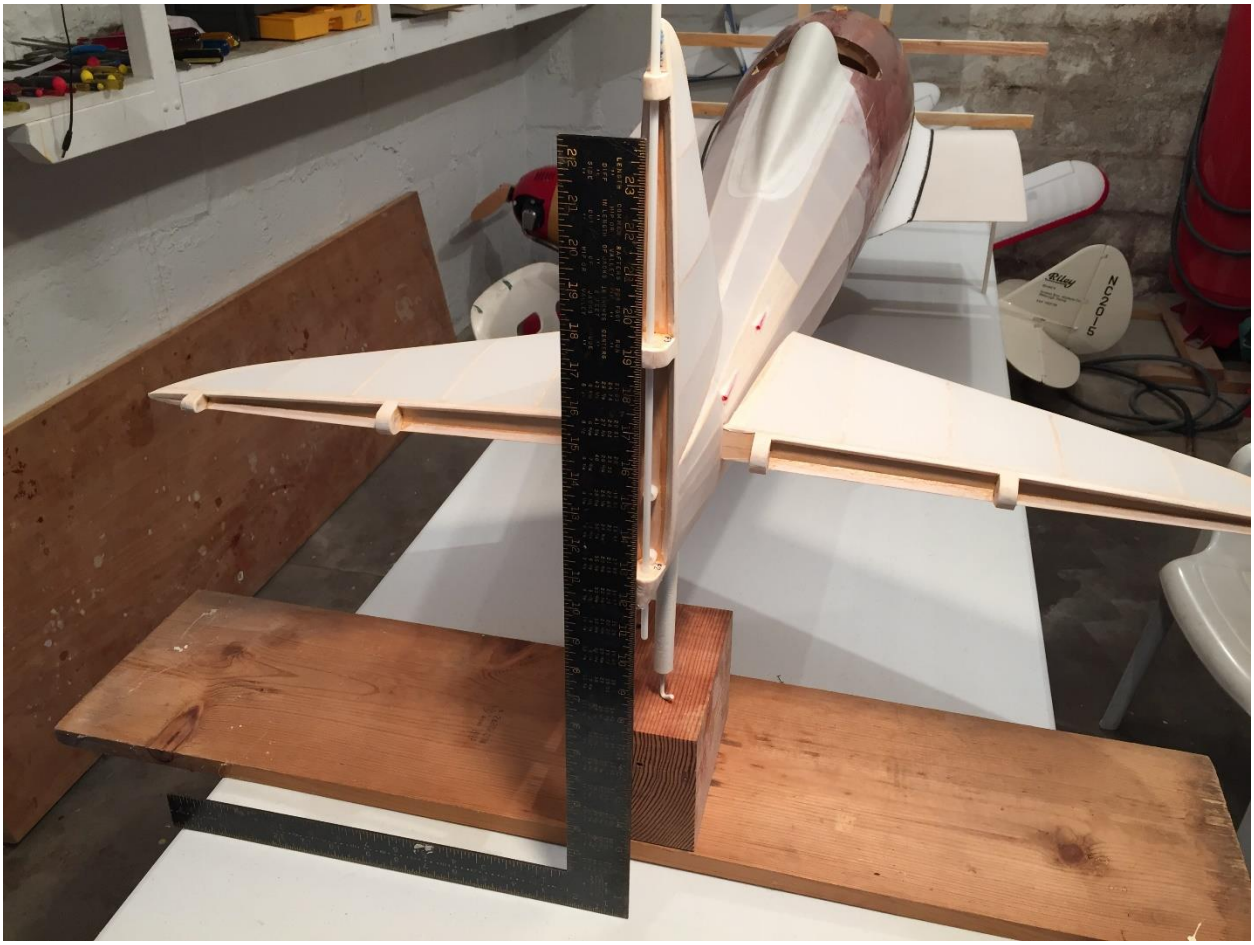
Mount the fin.

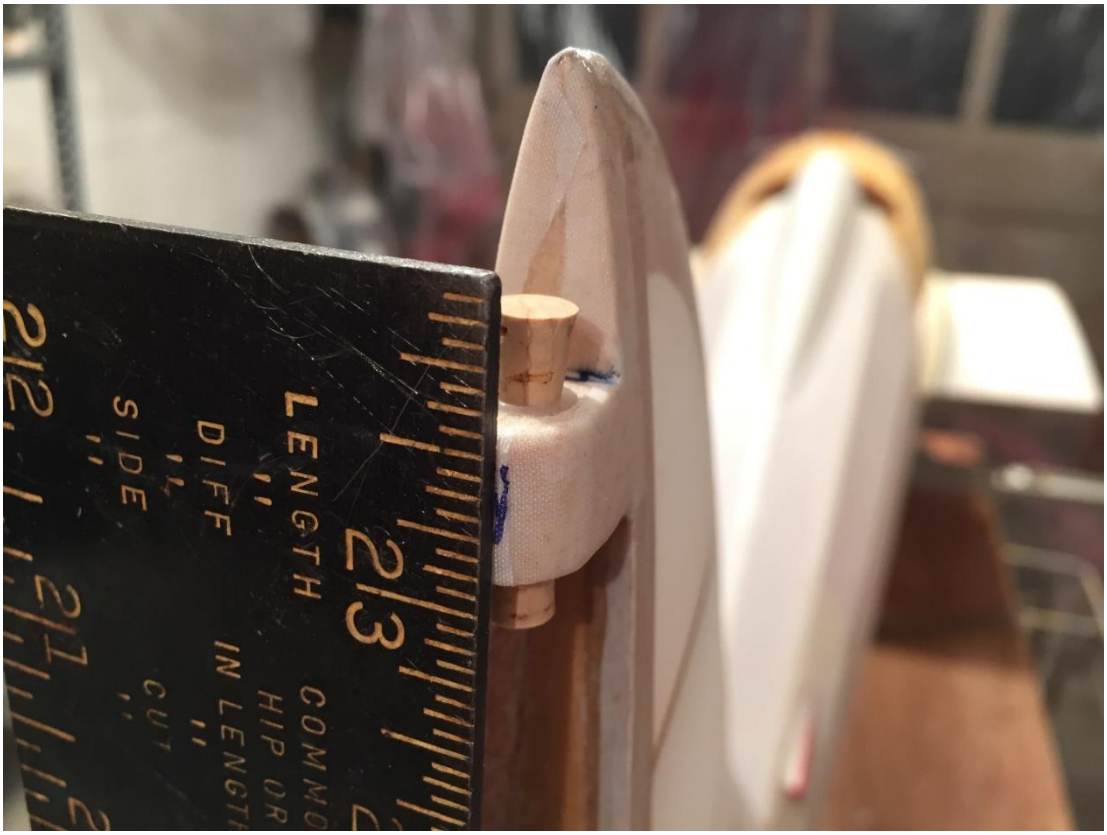
During glue up, the fin is held in place by two 1/4-20 x 1/2" nylon socket head screws. Now you know what those holes in the fin spar are for. At this stage of construction, their only purpose is to clamp (hold) the fin spar to F16 while the glue sets.



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, 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 wont' 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 screws; snug is plenty of clamping pressure. Don't allow any glue to get into the threads! It is advisable to remove the screws after about 30 minutes. Titebond will have set up by then and the clamping screws will

have served their 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.




LENGTH
DIFF
SIDE

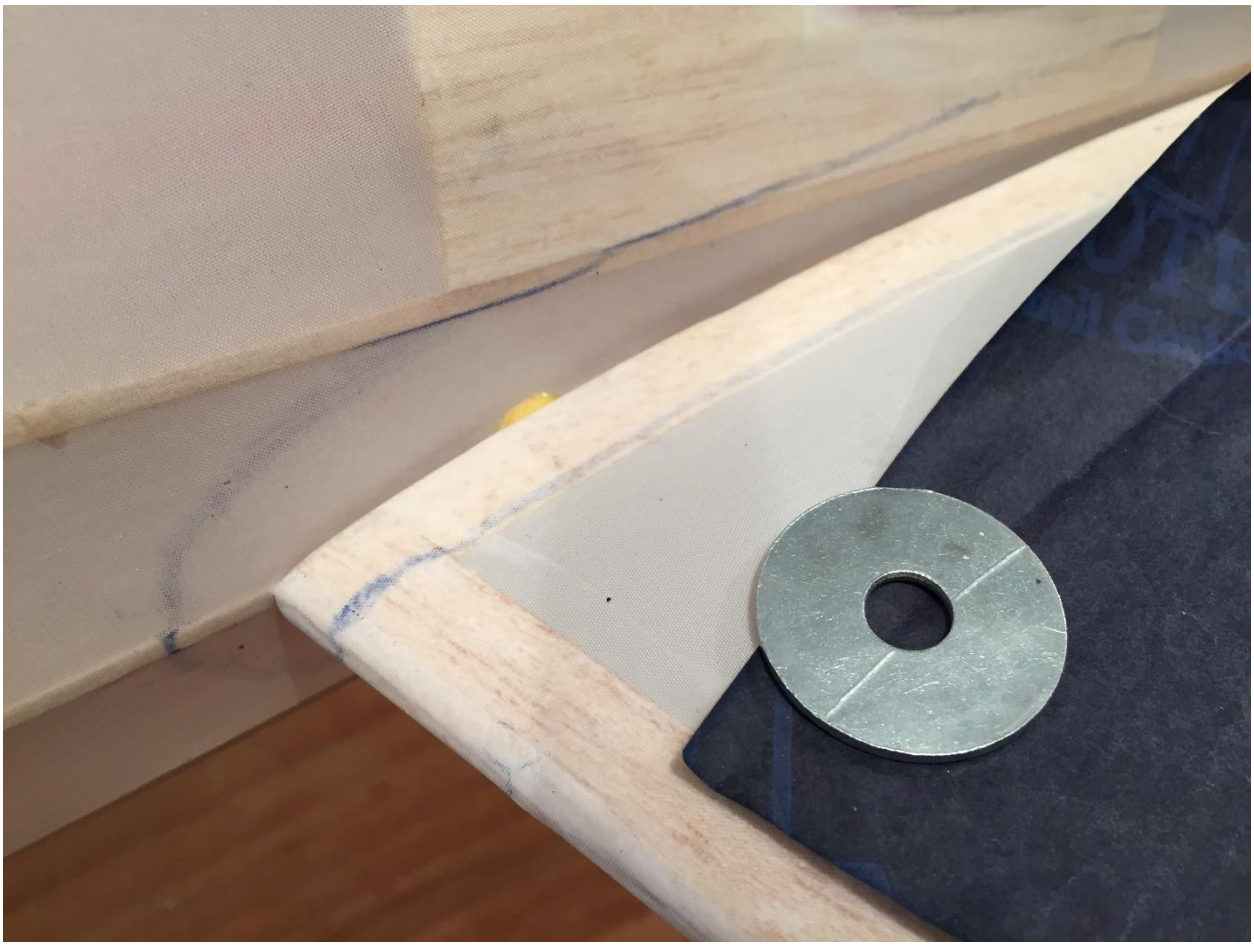

Riley
Model B
SAITO
AMSOIL

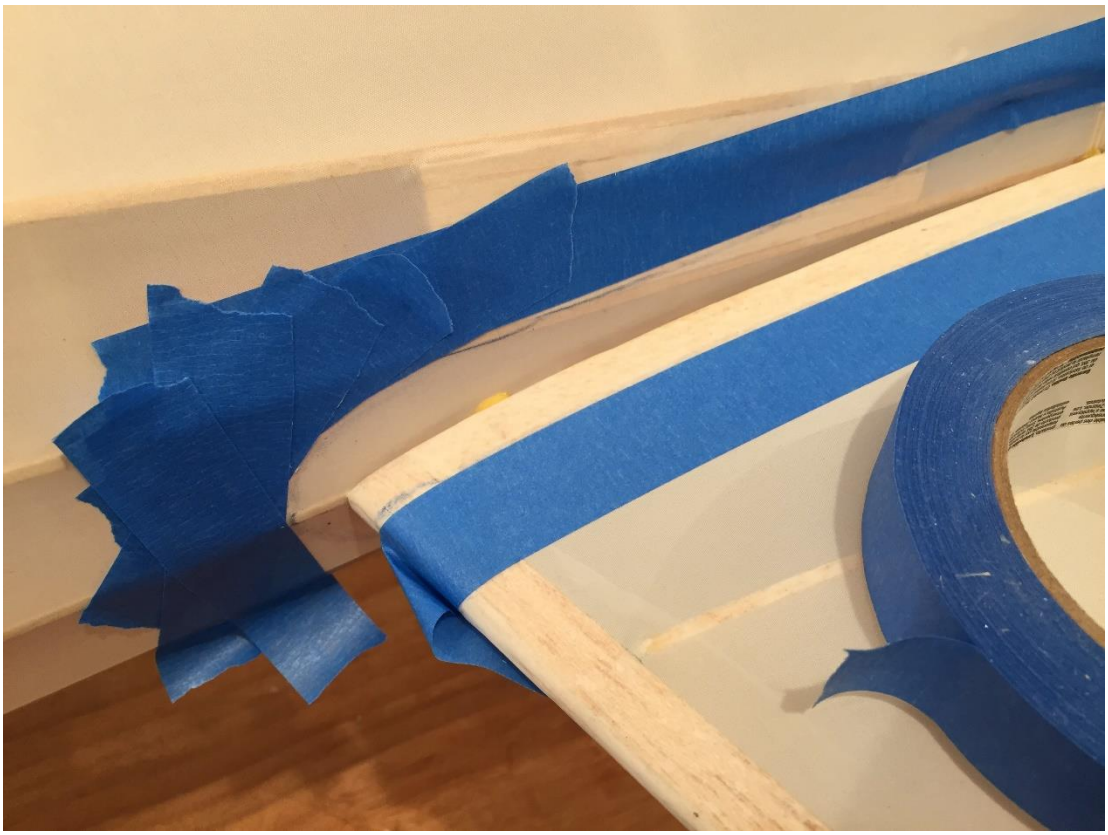
Tail Fillet

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. 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, but, again, if you can find something thinner, it will work better.

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.





To insure that the lite spackle bonds to the covering, brush on a coat of Titebond first. No need to thin, but do spread it out so it is fairly thin. In less than a minute, the Titebond will get tacky.

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.* And more importantly, 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 coast will take about two hours to finish.

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

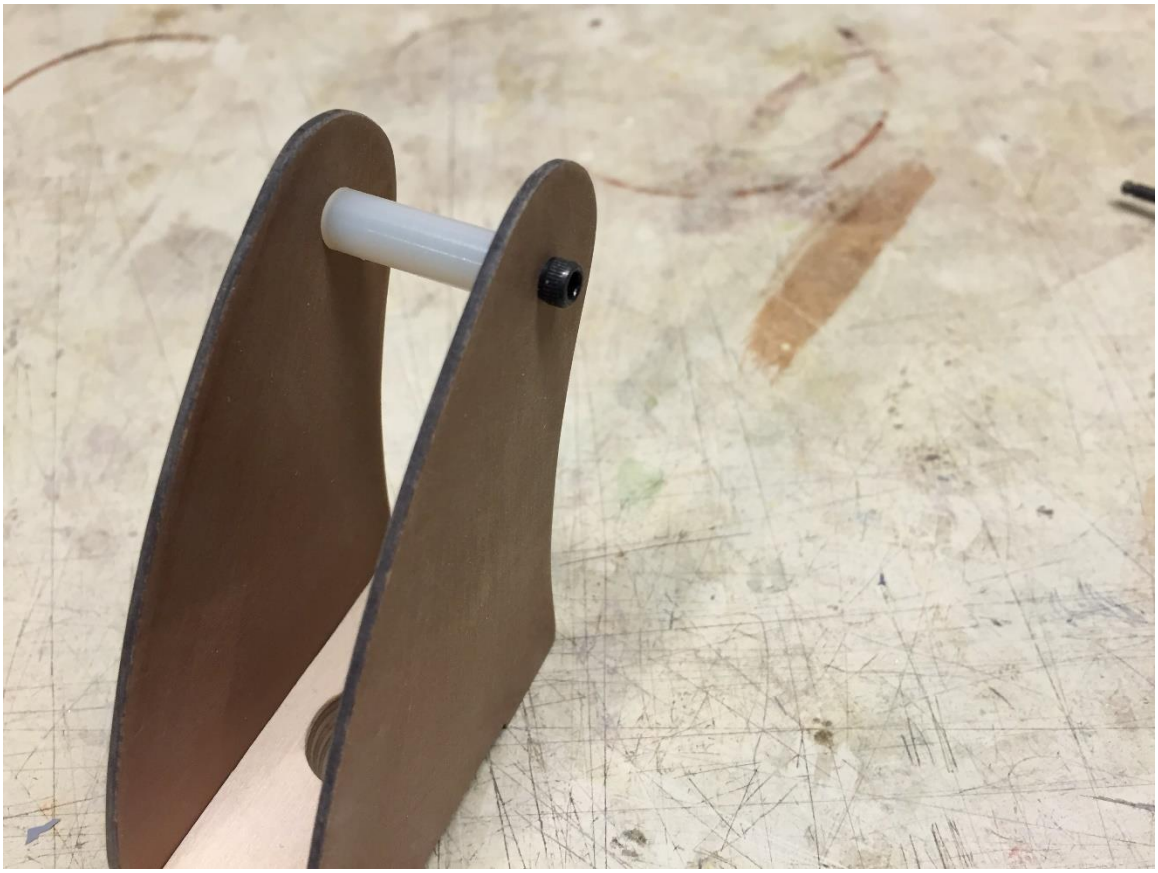
Tail Wheel Assembly

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 3/8” x 7/8” x 2” plywood 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 3/8” cap screws.



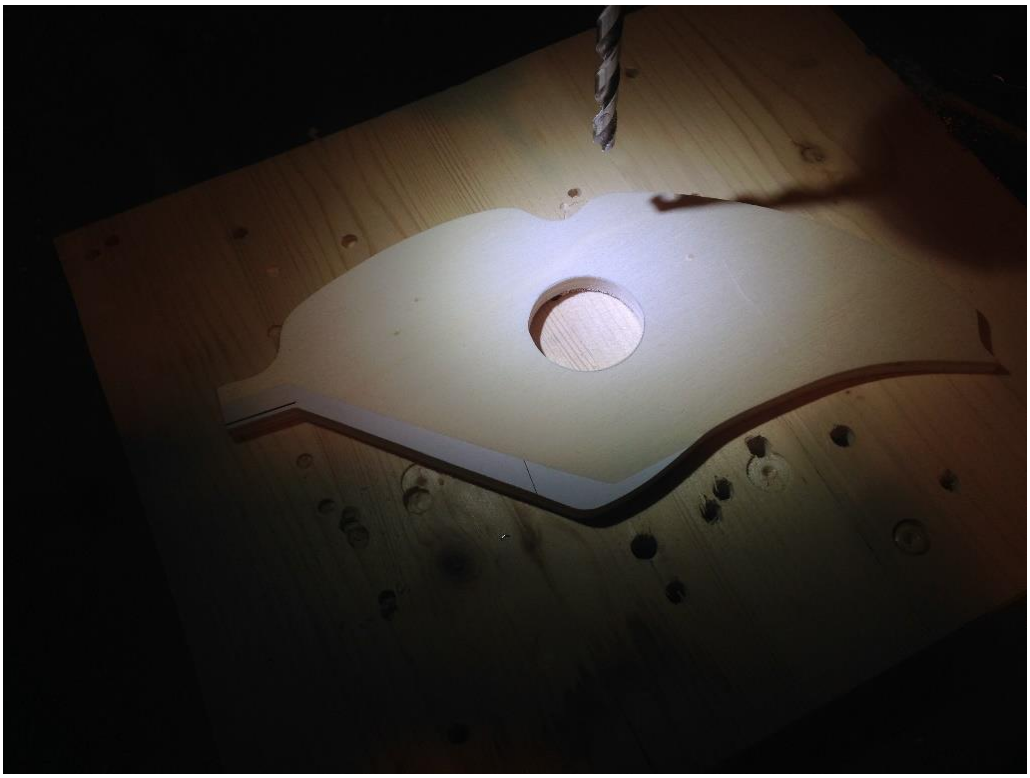
Glue forks to the plywood block. The control arm should be on the right side -the same side as the rudder control arm. Use Titebond. Clamp for about 20 minutes.

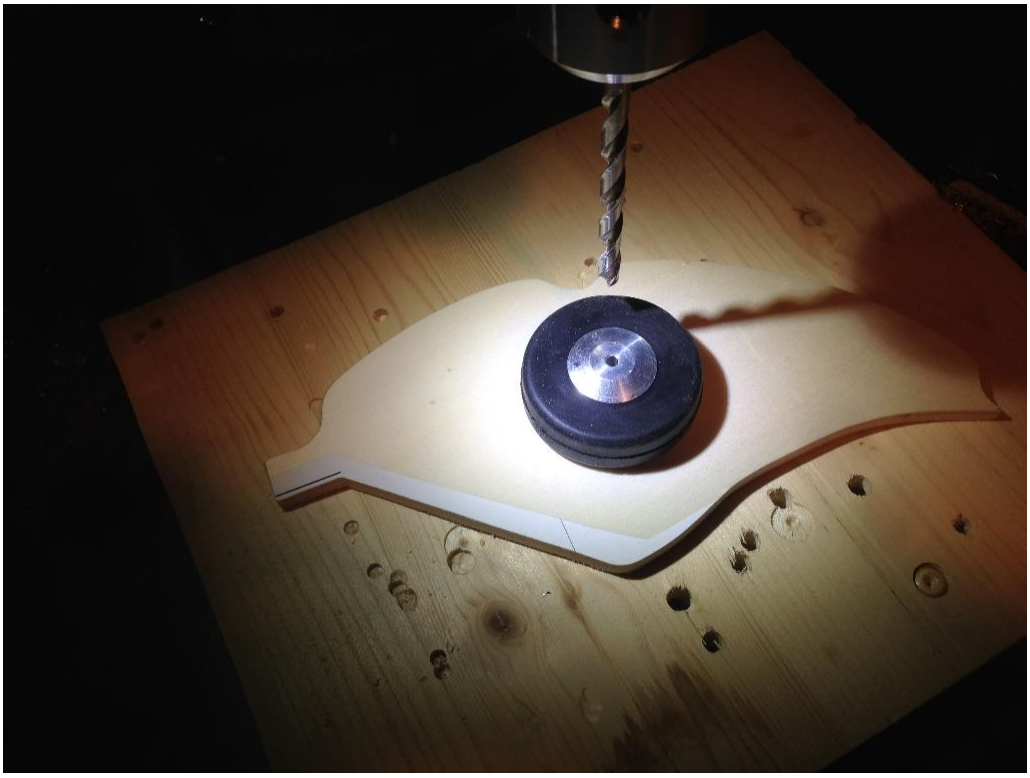
Glue 3/16” balsa sides to the forks. Also fill in the front and rear with 3/16” scrap. Shape with 60 grit and finish with 100 grit sandpaper.

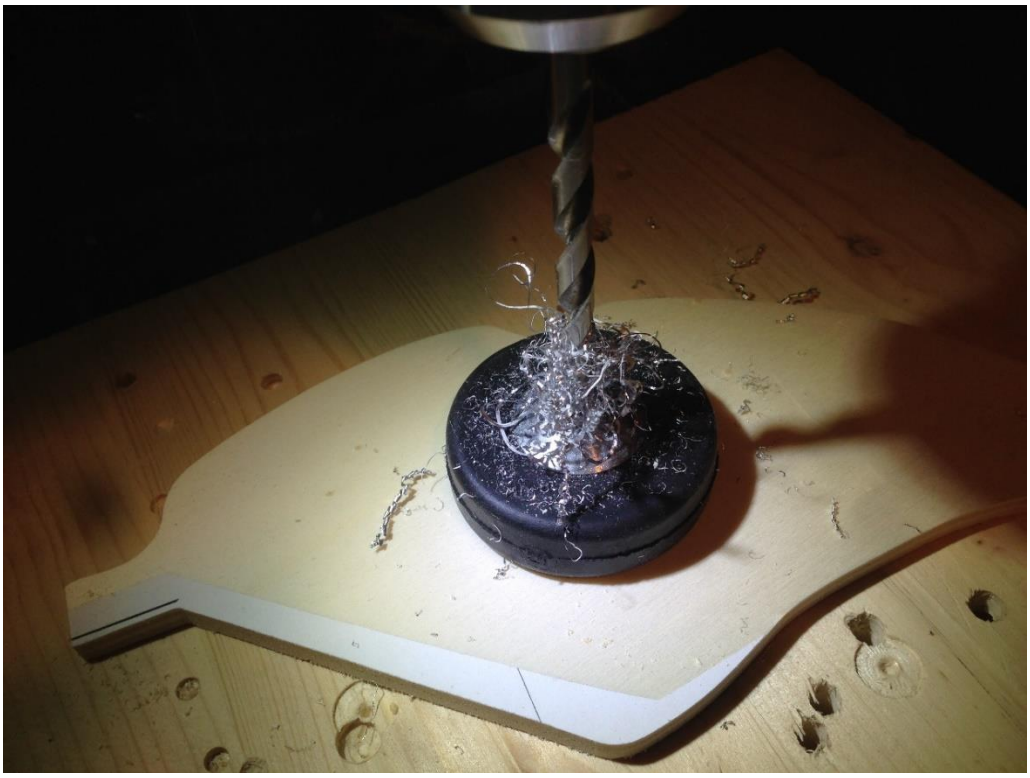
Since balsa is porous, it is best to fill the grain with lite spackle. Just rub it in with your fingers. When dry, finish with 220 sandpaper. Brush on one coat of nitrate dope thinned 1:1. Normally, the tail wheel forks will be painted the same color as the fuselage.

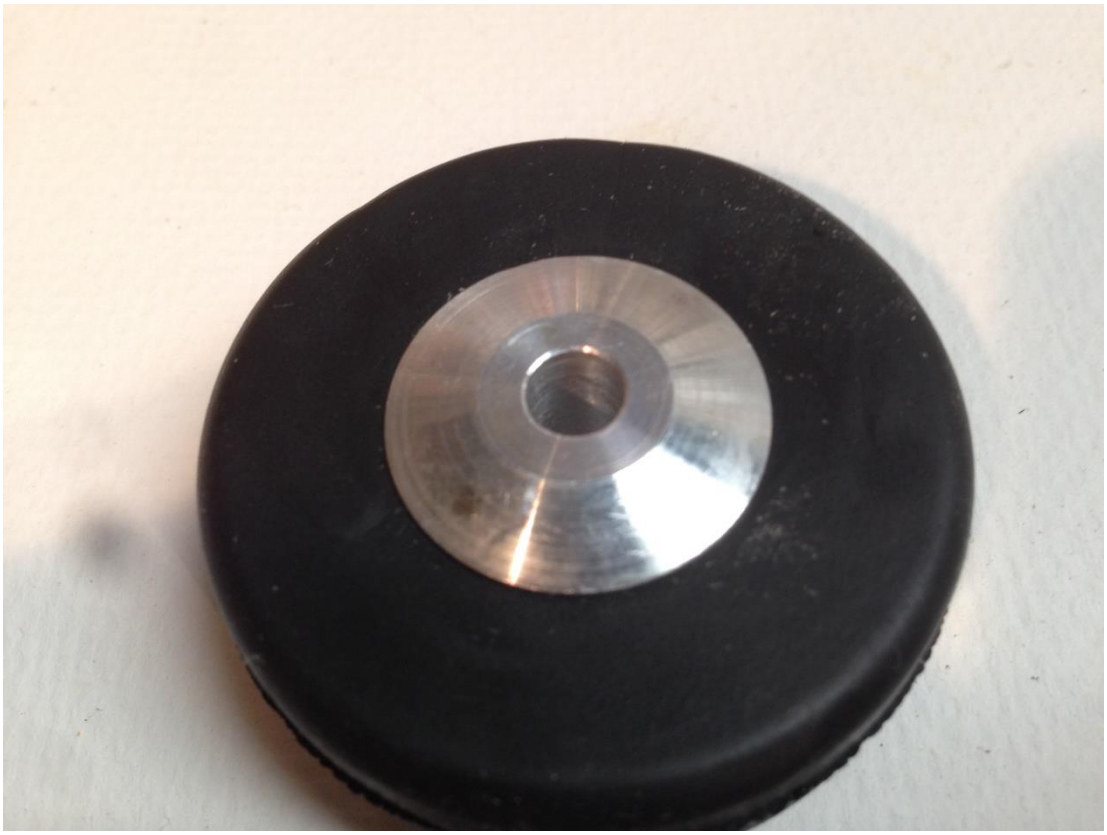
Prepare Tail Wheel

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. Place the wheel on the jig, hold firmly, and drill gently at about 500 rpm. Deburr each side of the wheel.

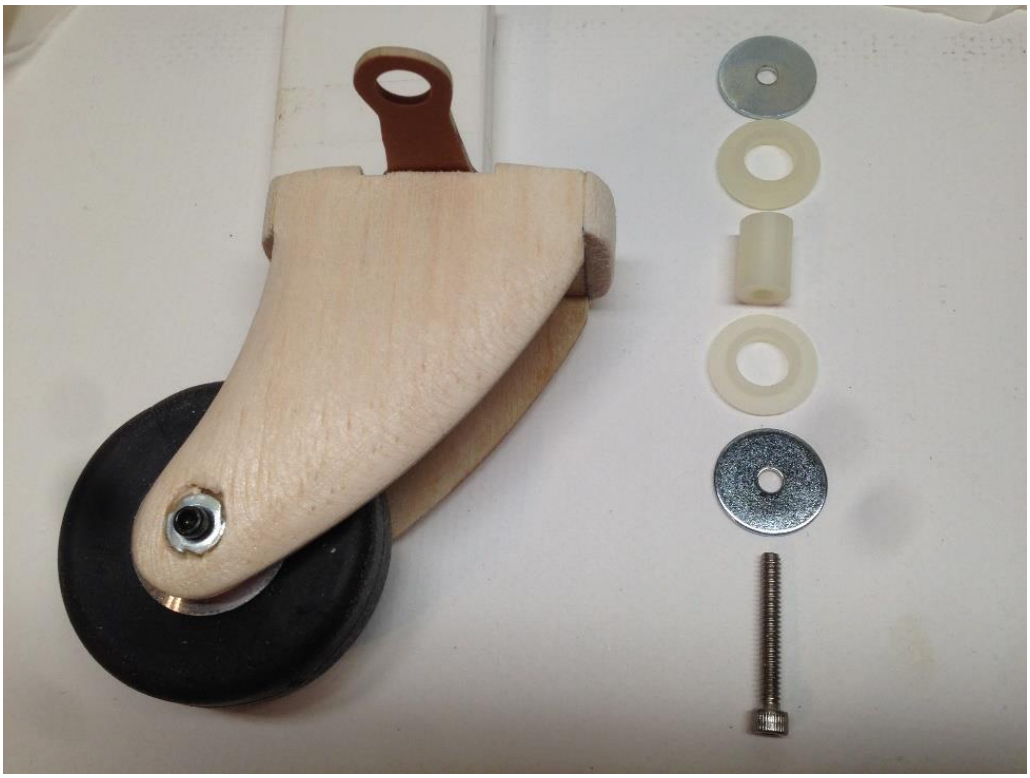








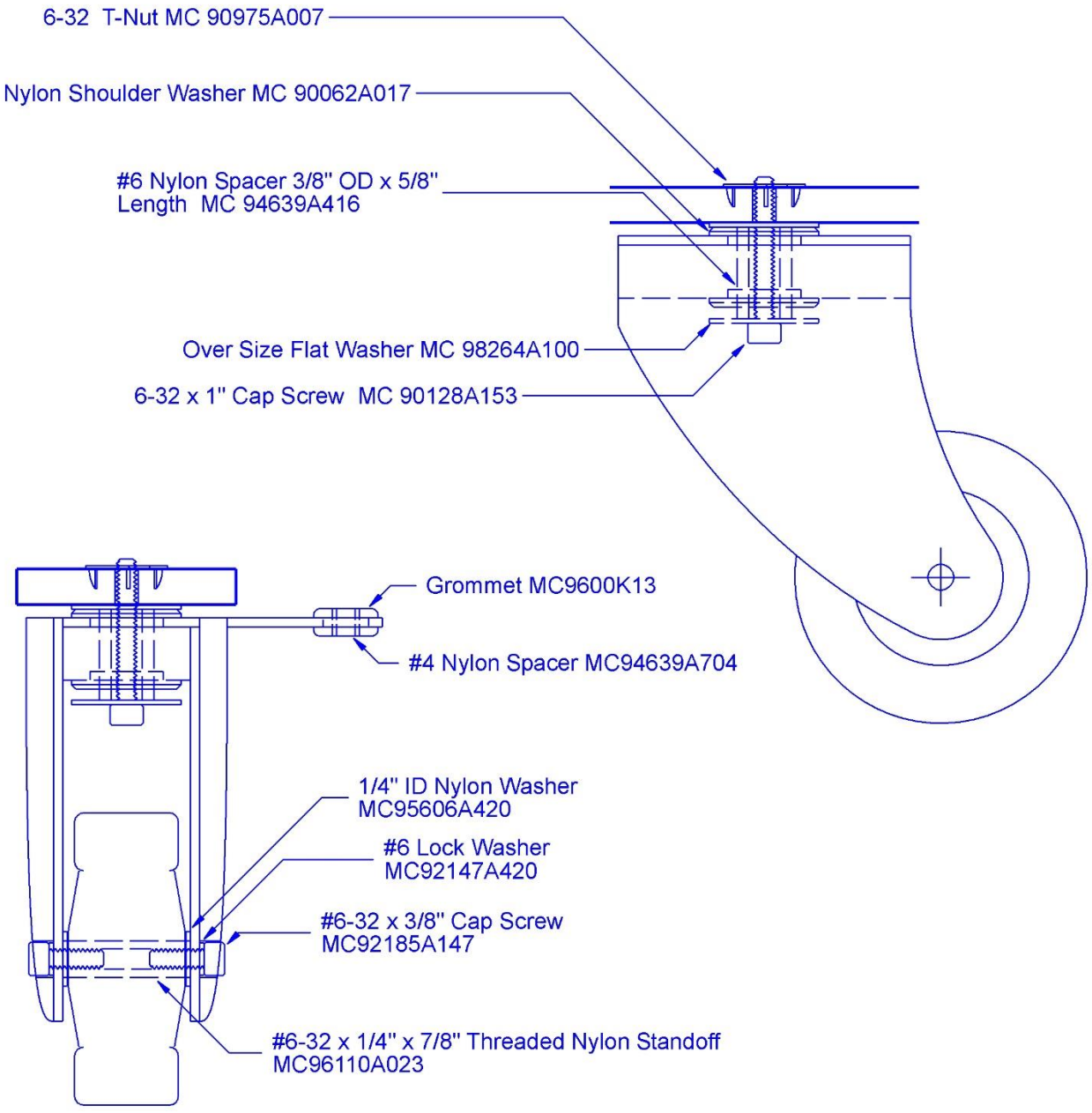
Upon final assembly (after painting), the tail wheel is attached as shown on the fuselage drawing using the parts shown in this picture. The tail wheel will be supported and turn freely on nylon bearings. (Note: the wheel axle mount in this picture is from an earlier design. The parts shown that mount the assembly to the fuselage are shown correctly.)

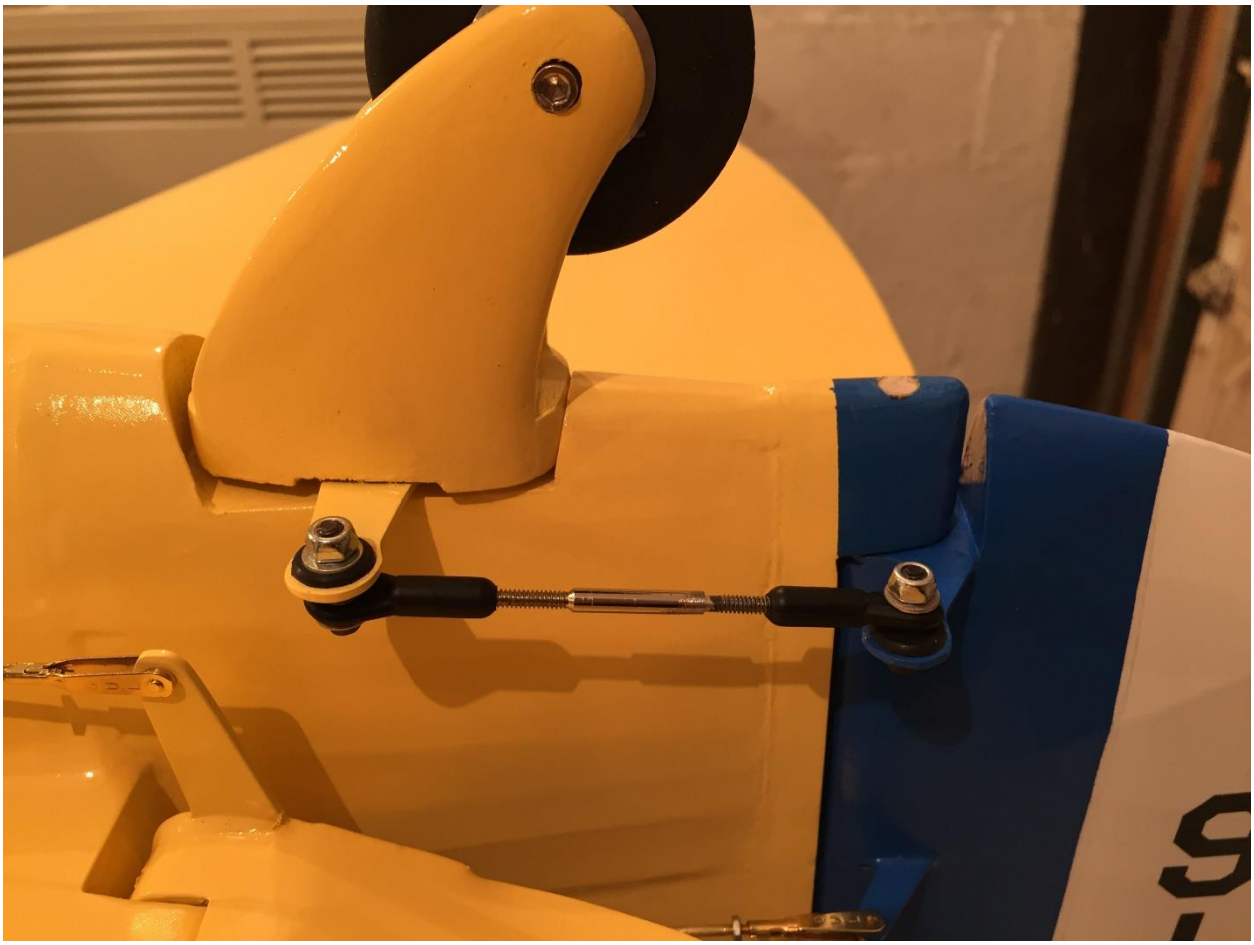


Drawings for final assembly are shown on the next page. MC part numbers are from McMaster-Carr Supply. www.mcmaster.com These same parts are also included in the Gratner Brothers hardware package.

Make sure to coat the tip of the 6-32 x 1" socket head screw with thread locker upon final assembly.

Note: The #6 - 3/8" x 5/8" nylon spacer will work fine. Ideally, however, it should be shortened about 1/32" to minimize up and down travel. To shorten, sand one end on a disc sander with miter (to keep the sanded end square). It won't take much. This step is not necessary, but it does create a nicer installation.


6-32 T-Nut MC 90975A007
Nylon Shoulder Washer MC 90062A017
#6 Nylon Spacer 3/8" OD x 5/8" Length MC 94639A416
Over Size Flat Washer MC 98264A100
6-32 x 1" Cap Screw MC 90128A153
Grommet MC9600K13
#4 Nylon Spacer MC94639A704
1/4" ID Nylon Washer MC95606A420
#6 Lock Washer MC92147A420
#6-32 x 3/8" Cap Screw MC92185A147
#6-32 x 1/4" x 7/8" Threaded Nylon Standoff MC96110A023



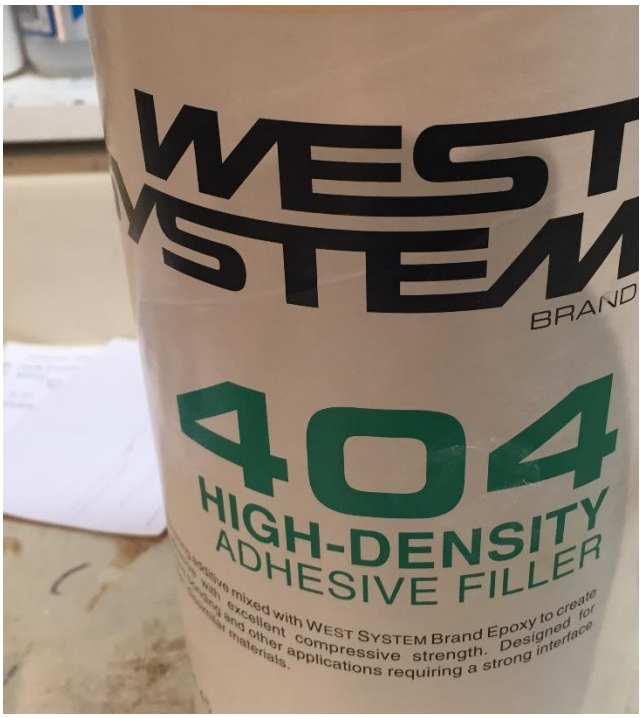
Mount Fiberglass Cowl to Cowl Ring

Note: The following pictures show the installation for the Valach 120 twin. The steps to mount the Moki 150/180 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 absolutely sure that the cowl is aligned exactly where you want it.



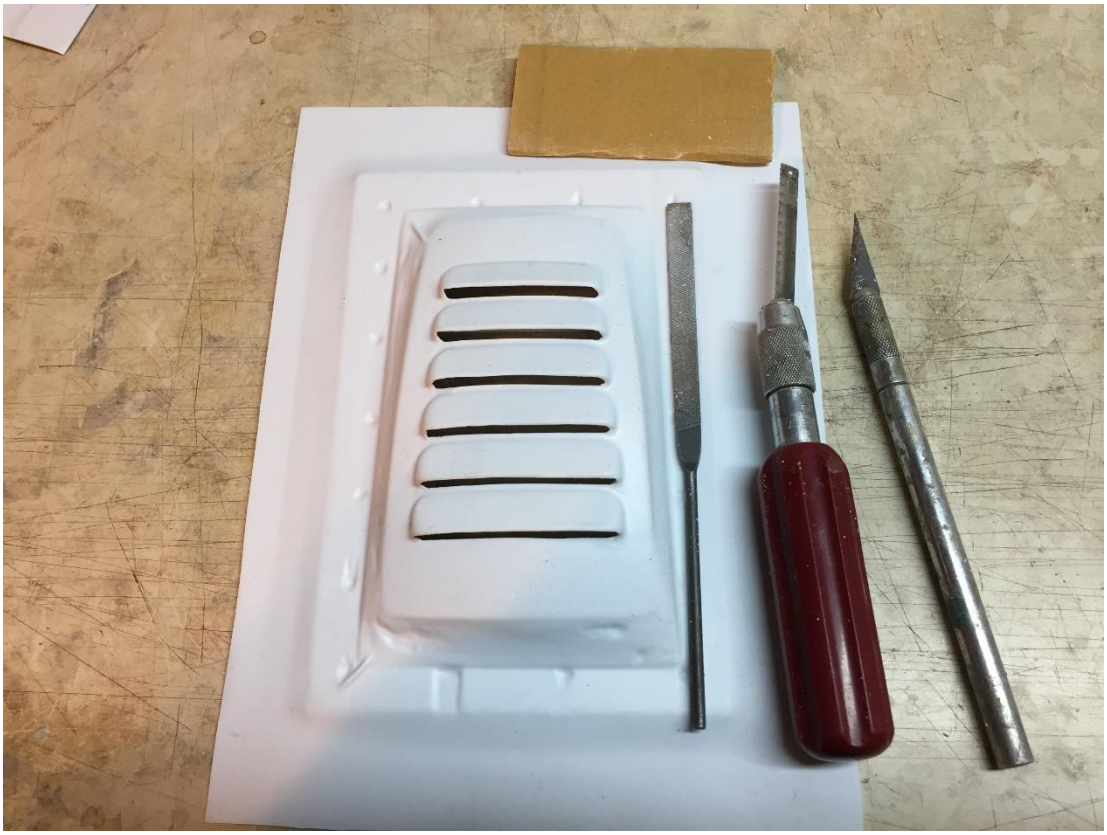
Insert the cowl / propeller hub alignment ring onto the engine hub flush with the face. The ring is made of any material 3/8” thick. Position the cowl onto the ring on-center – 3/16” back from the face of the hub.

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

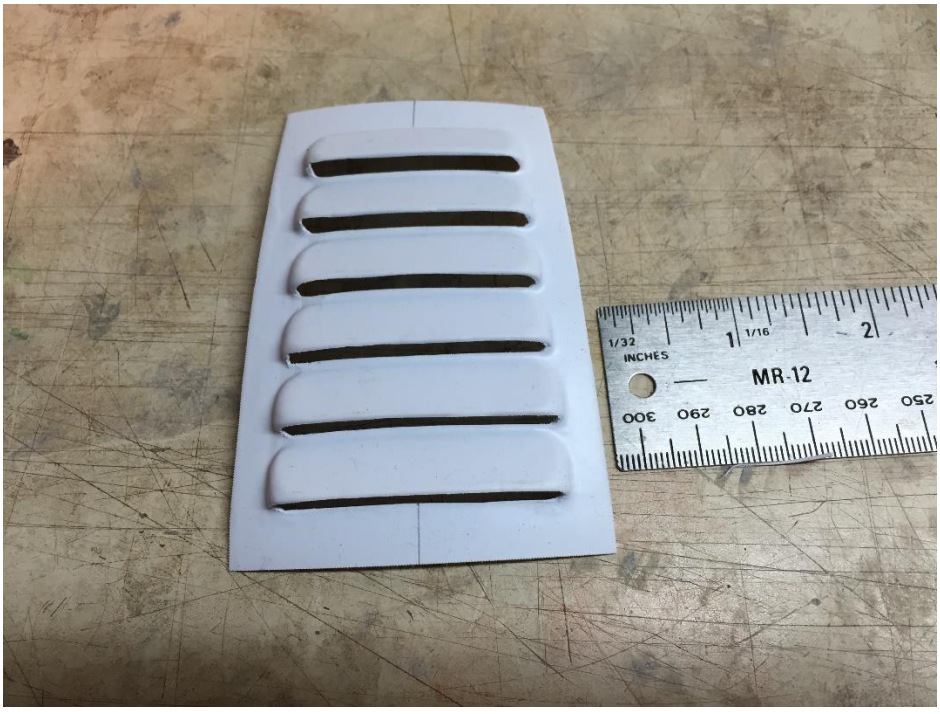
Mount Louvers to Cowl

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.

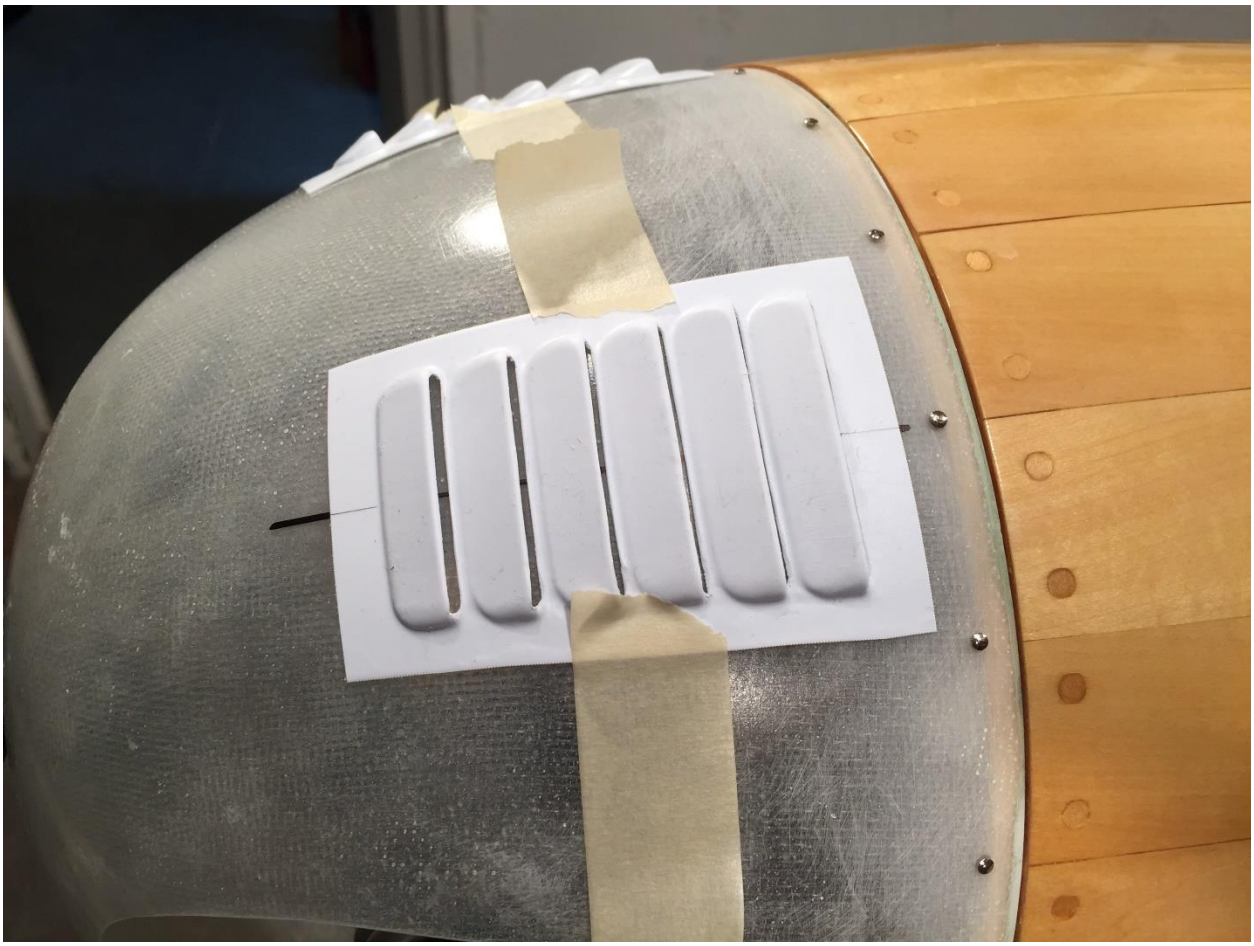
A small ignition file, a #11 hobby blade, a 32tpi x 1/4” hacksaw blade, and of course, sand paper can all be used. It is easier to make the cutouts before trimming away the sides.



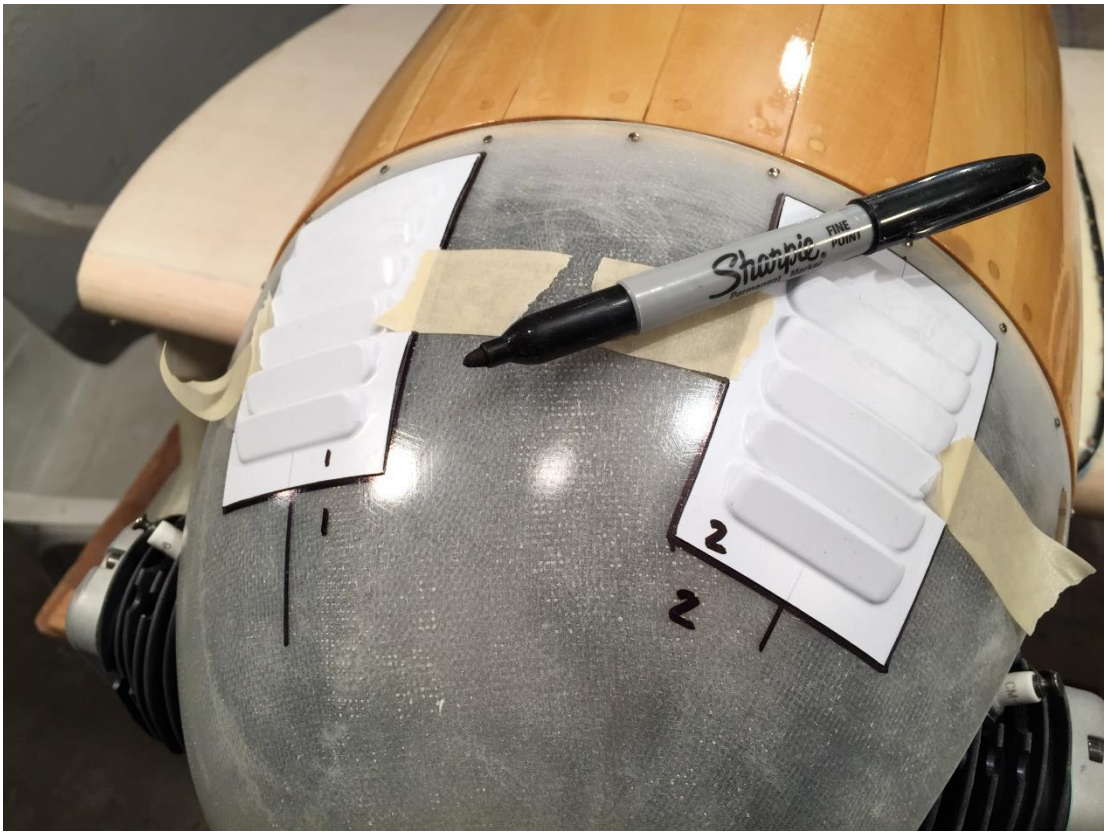
Trim the section to about 1/4" away from the louvers on all four sides.



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.



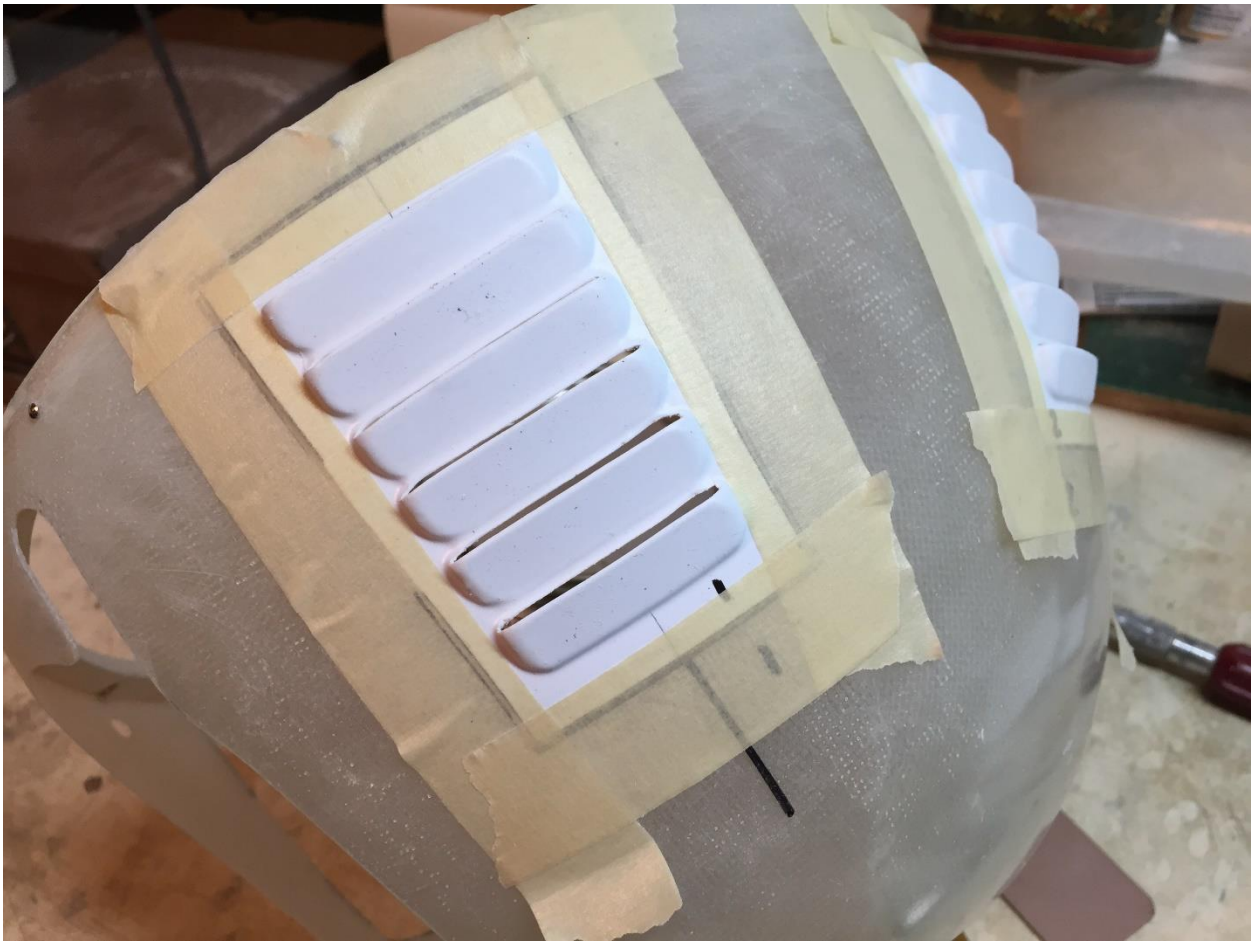
Mark the outline lines of each louvers section with a felt tipped marker. Since the outline of each louver section will be slightly different, make sure to label each section and note its location on the cowl.


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 Shrouds

Lay the left and right shrouds in approximate position on the stub wings.

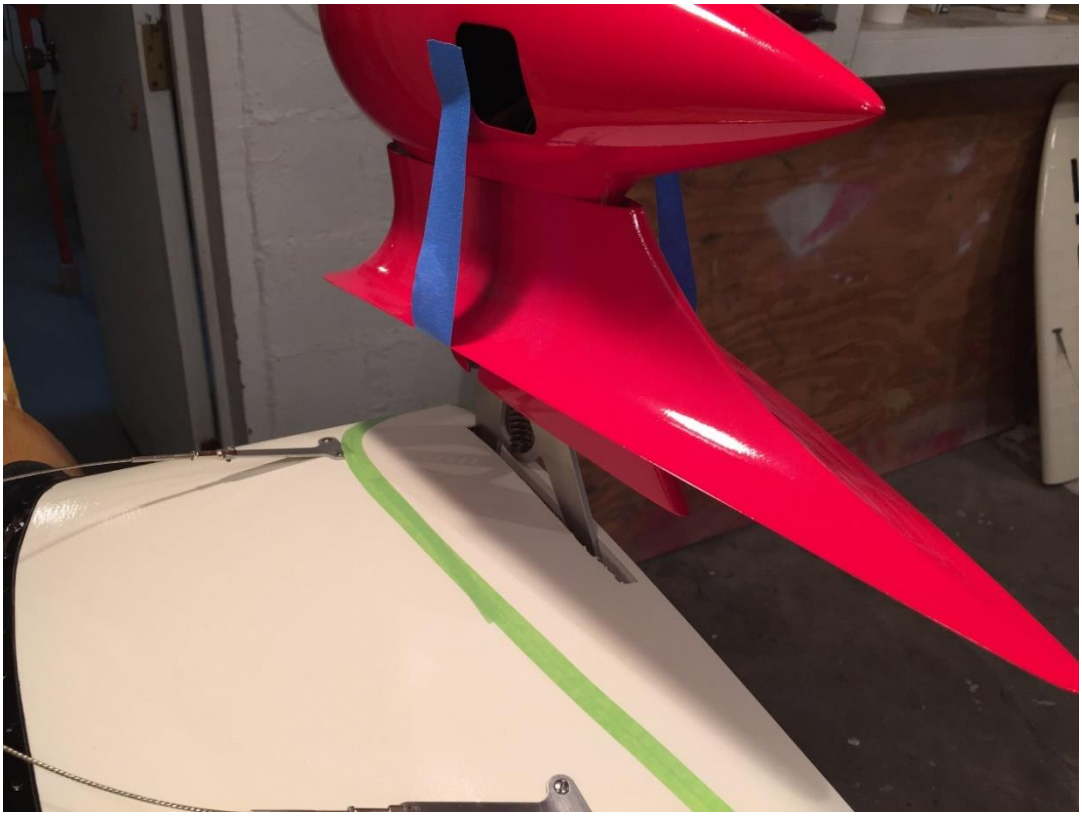
Insert each wheel pant / landing gear assembly through the shrouds and secure with 1/4"-20 x 1/2” nylon socket head screws.

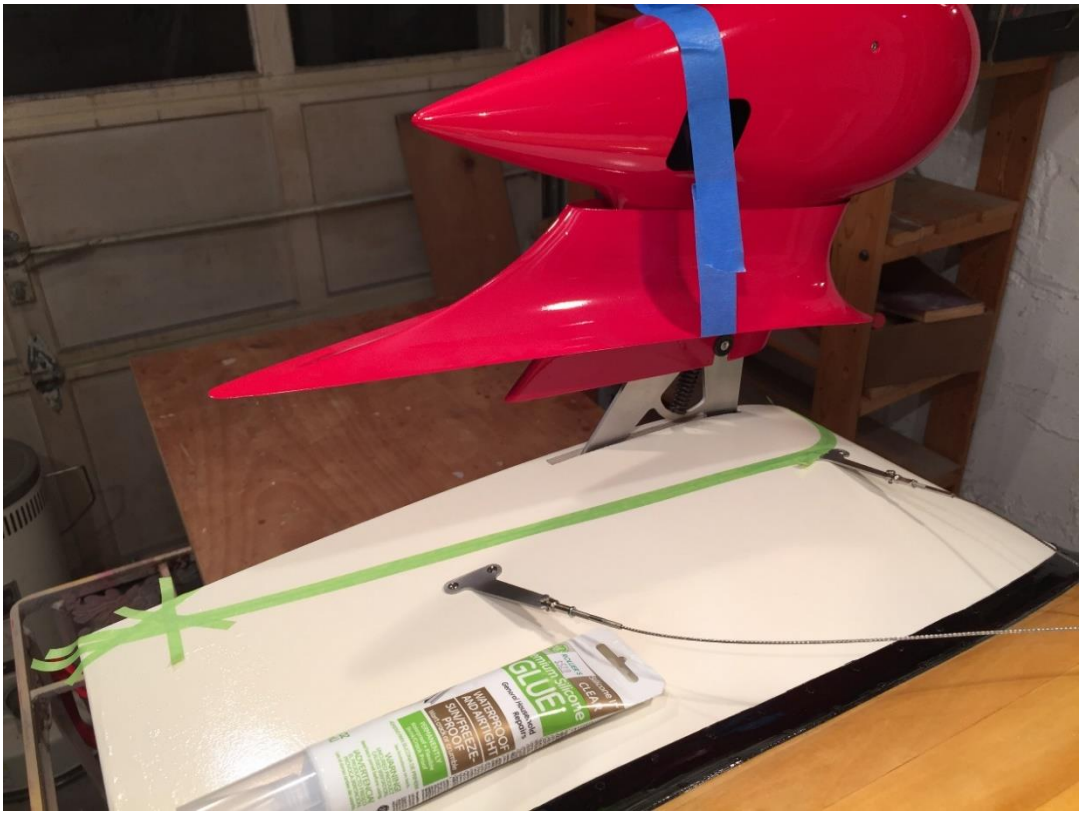
Using your best judgement position the shrouds for best overall clearance to the wheel pants and secure with masking tape.

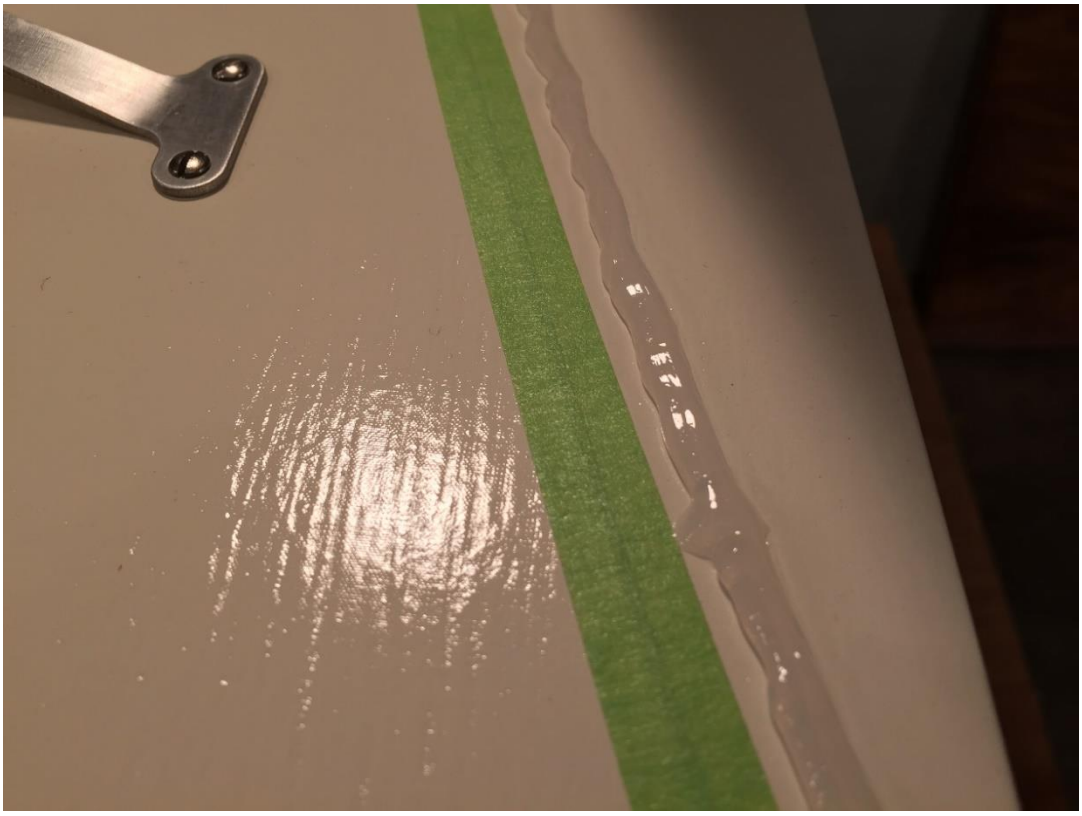
Outline the shrouds with masking tape so the silicon glue that will ooze out won’t mar the surface of the stub wings. 3M green 1/4" wide masking tape works very well.

Tape the shrouds out of the way, then lay a healthy bead of clear silicon glue to the stub wings following the approximate perimeter of the shrouds. Press down gently to make sure you get a good bond. If any glue gets onto the painted surface of the shrouds, wipe off with mineral spirits (paint thinner). After the glue sets, trim at the edge of the shrouds with a #11 blade and pull off the tape. Done! See pictures below.


ROLLIER'S
$529
CLEAR
GLUE
General Household
Repa
WATERPRO
AND AIRTIGH
SUN/FREEZ
PROOF
PERMANENTLY
ADHESIVO PARA SILICONA
WARN
ADVERTE
2.8 FL OZ
82.8 mL)




GLUE!
WATERPROOF AND AIRTIGHT
SPITFREEZE-PROOF



Rudder and Elevator Pull-Pull Control Cables

The rudder servo mounts on the right and the elevator servo on the left inside the cockpit. Use .031" stainless steel cable and solder the couplers with Stay Brite silver solder.

The elevator cables combine at the elevator servo into Sullivan #513 couplers. All other ends use Sullivan #512 couplers. The clevises are standard Sullivan 2-56 size.

	Pin-to-Pin	Coupler-to-Coupler*
Rudder – both sides	46-3/4"	45-3/4"
Top elevator – left side	42-1/4"	41-1/4"
Top elevator – right side	42-5/8"	41-5/8"
Bottom elevator – left side	42-1/8"	41-1/8"
Bottom elevator – right side	42-1/2"	41-1/2"

* Meaning end of coupler to end of coupler.

Instrument Panel

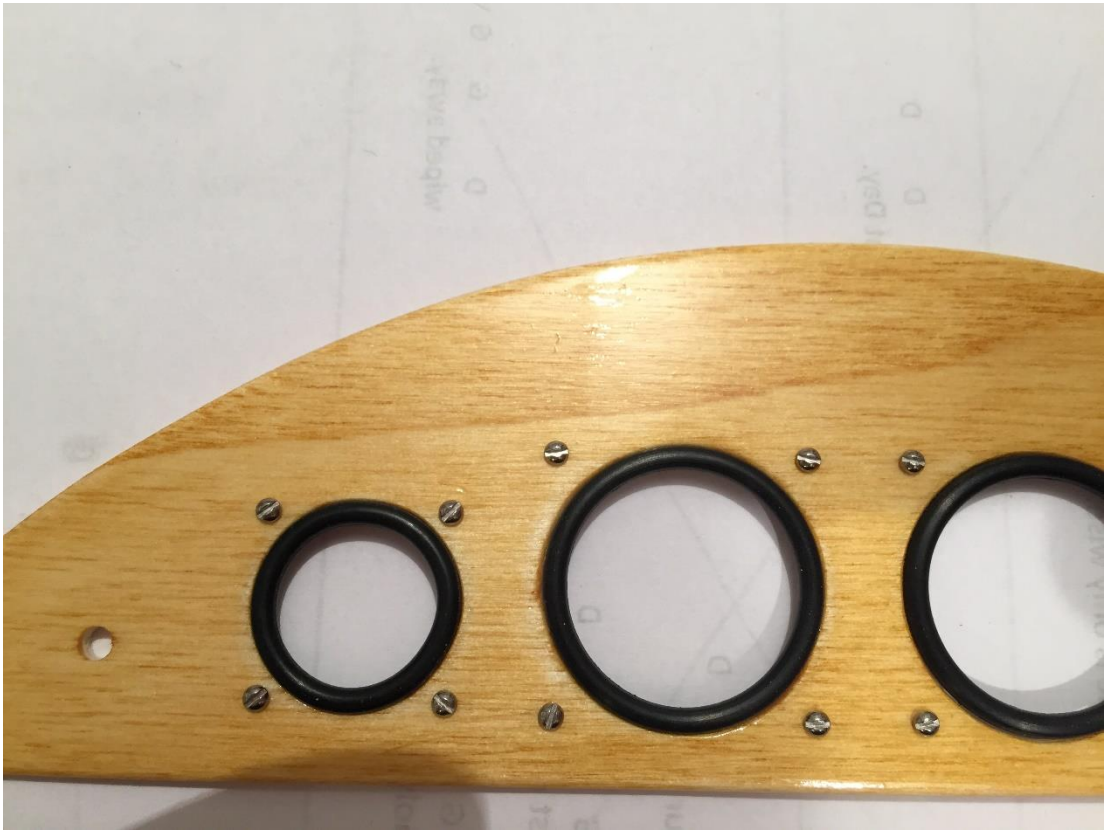
The instrument panel (3mm lite ply) has been finished with a base coat of amber shellac, followed by two coats of varnish.

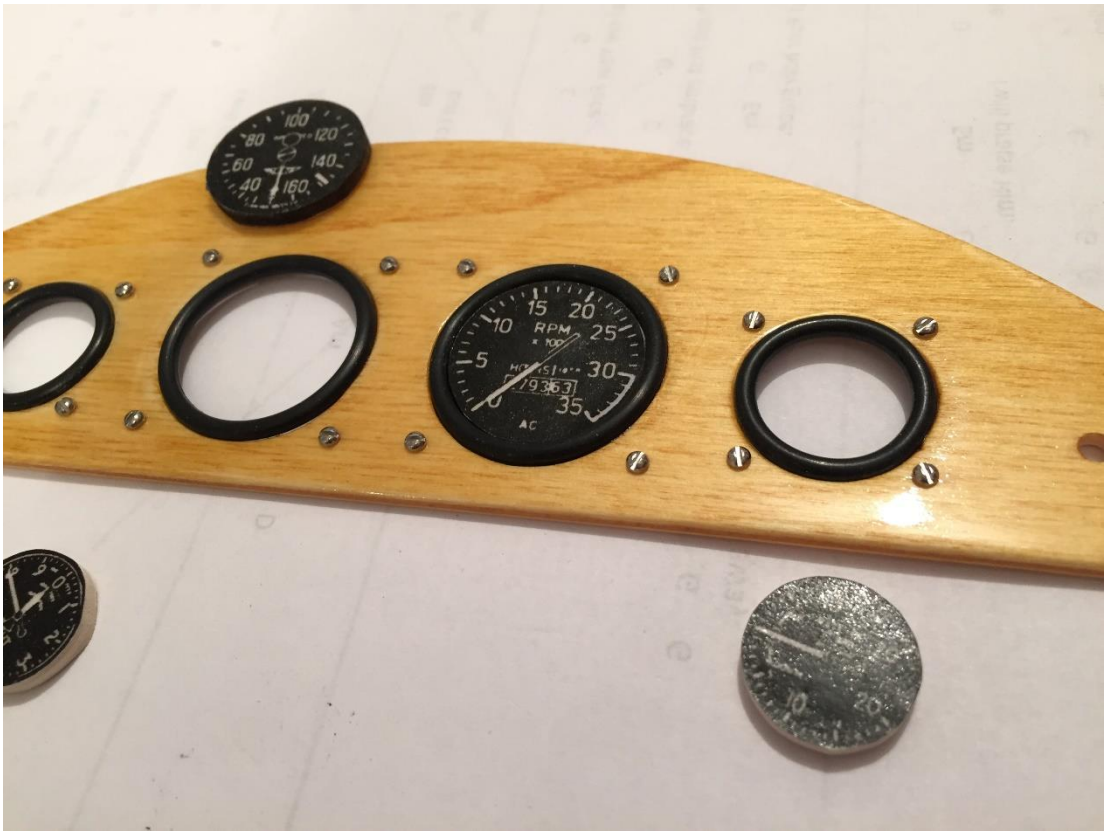
Insert 0/80 x 1/8" machine screws into the panel. Tweezers are a big help.

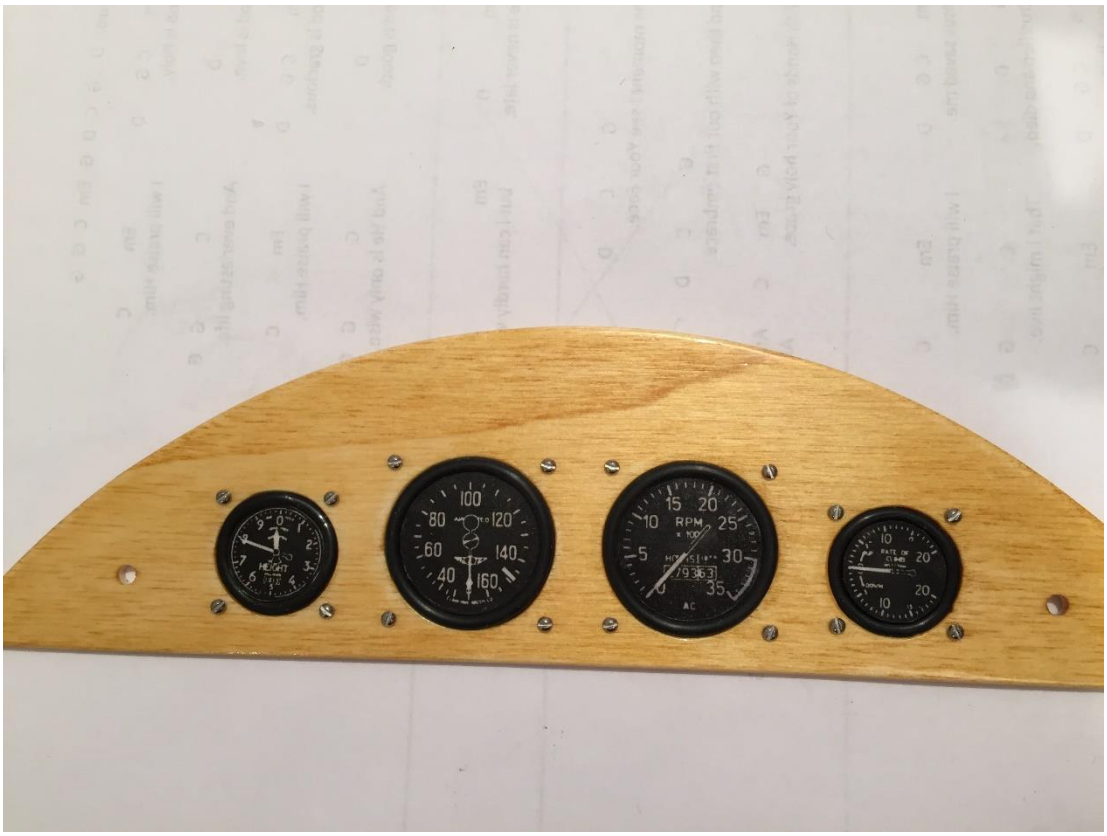
Turn the panel over and press in the O-rings and glue in place from the back side. The effect you are trying to achieve is for the O-rings to protrude on the front side of the panel about half their width.

The paper instruments themselves are from Jtec Radiowave, although you can certainly adapt anything you like. Apply the instruments to scrap 3mm lite ply with 3M #77 spray adhesive and cut out. Use a black Sharpie felt tipped pen to outline the edges so the white wood won't show. Insert into the O-rings and glue from the back side. Attach to F5 with servo screws.


1PK (100EA)
0/80 X 1/8
18-8SS
SLTD ROUND MACH SC
Taiwan




RPM
AC


RPM
AC

Fuel and Smoke Tanks

The fuel and smoke tanks are from 3W and available in the USA from Aircraft International.

http://www.aircraftinternational.com/

You will need to drill out one nipple for each tank to accept a 1/8" soft brass vent tube – 3/16" is plenty. Solder with Stay-Brite. Bend tube so that it is about 1/4" from what will become the top of the tank.

Drill three 13/64" holes in the caps. Start with 3/32" pilot holes. Drill from inside the cap. The threaded end and nuts are secured on the outside of the cap. There is no need to use Loctite on the threads. Gas and smoke oil will swell the plastic somewhat and create a tight seal.

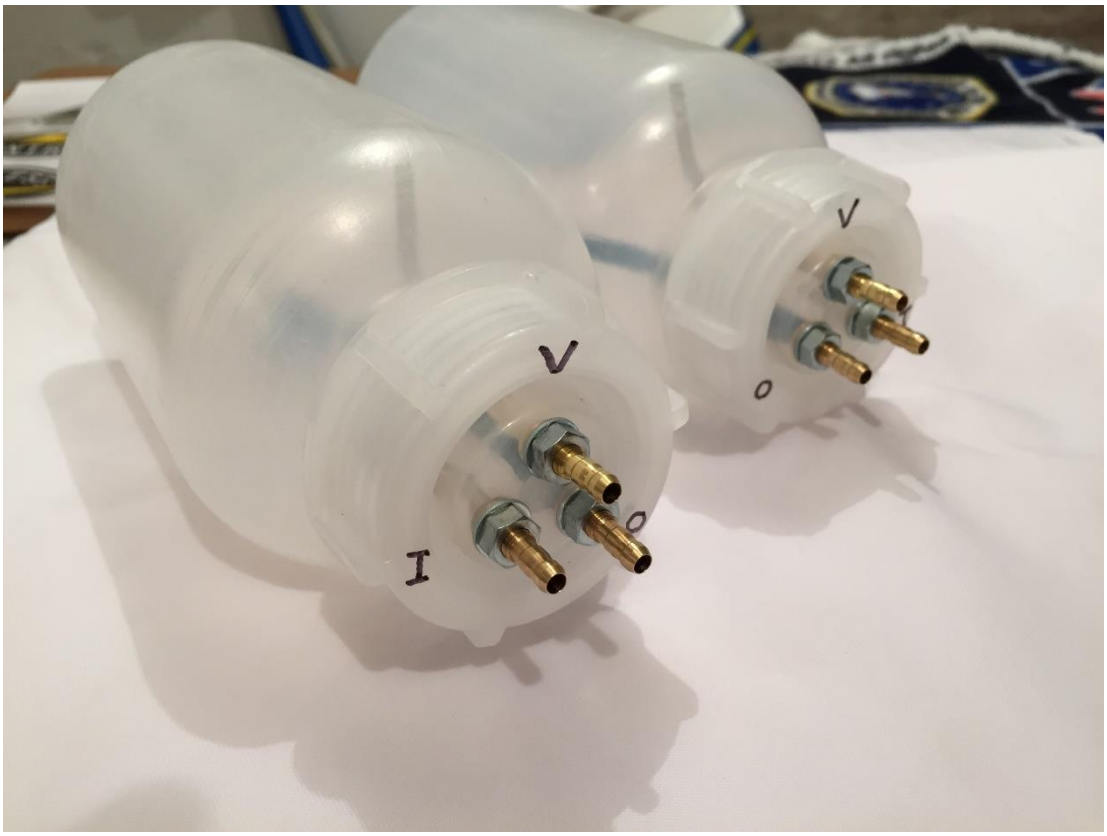
Cut the Viton tubing included with the tanks to 5-1/4." Remove the cotton filter from the clunk in the smoke tank only. Obviously, you will leave the cotton filter on the gas tank clunk.

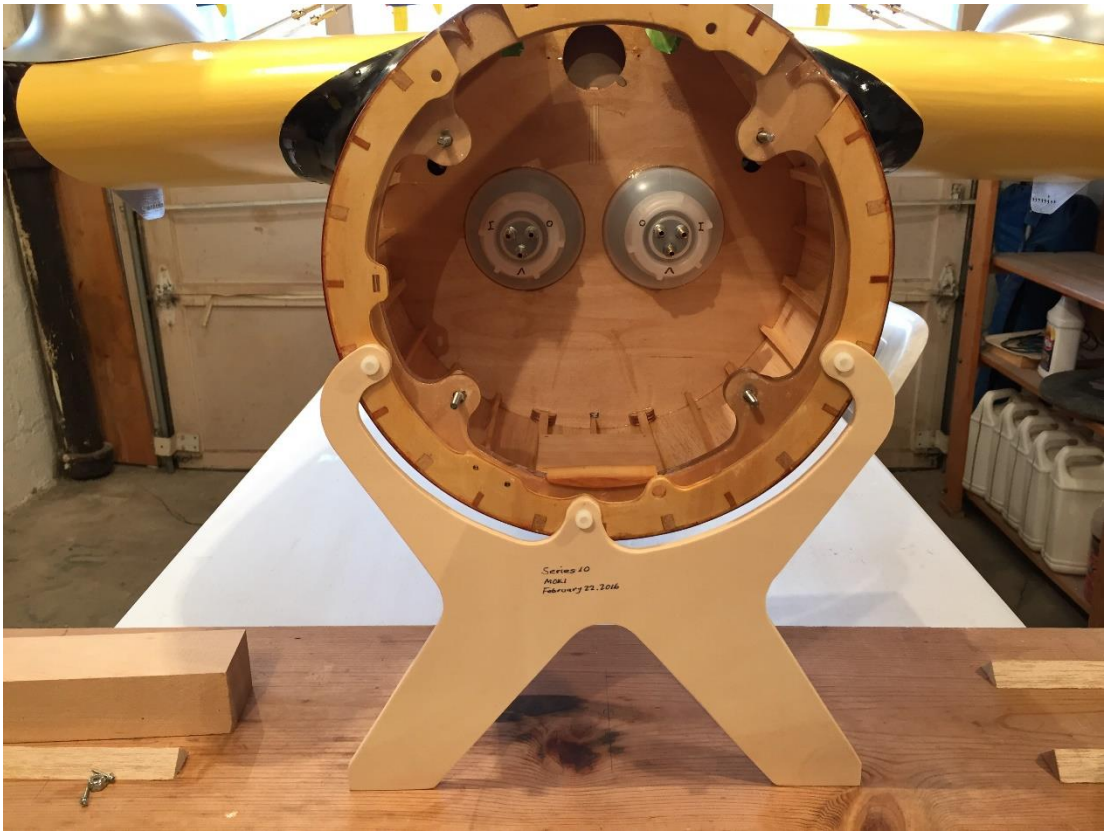
The face of the tank caps should be 2-1/4" forward of the face of F3. This is to position the tank center of mass directly over the center of gravity.

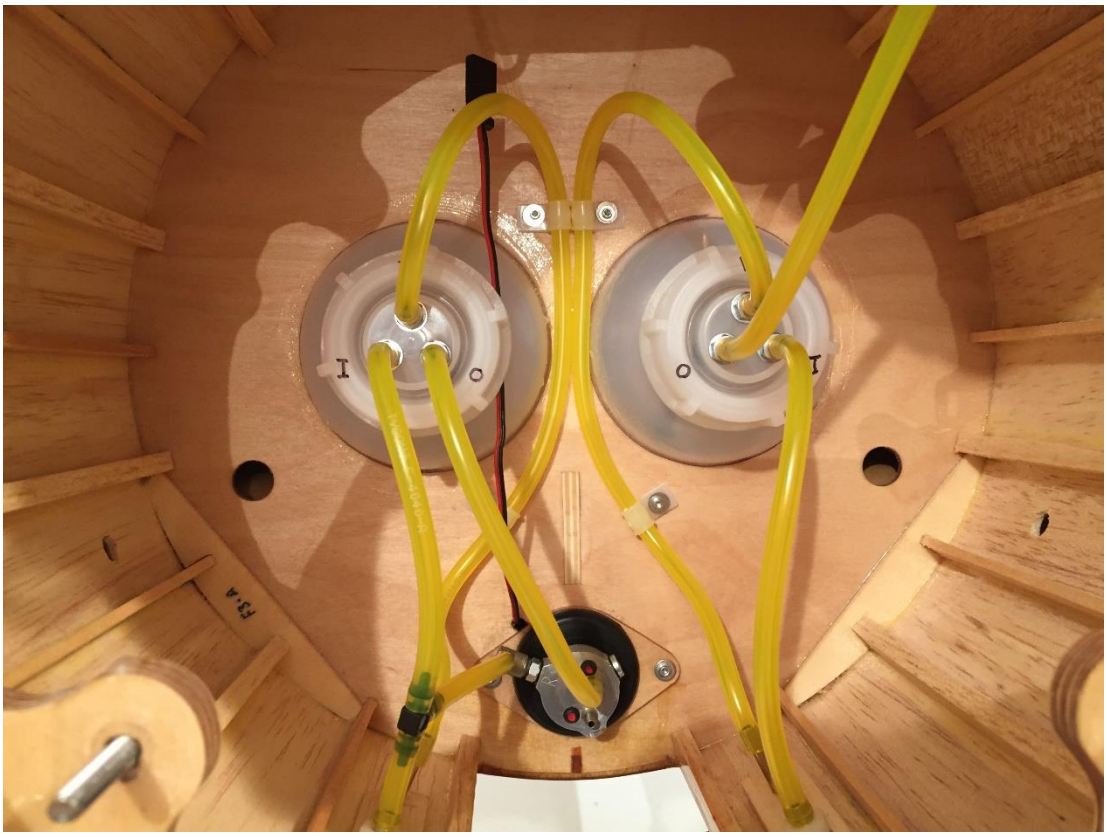
You will need about 62" of 1/8" Tygon tubing. Mark the caps so that you know which nipple is which.

Note that the vent tubes are routed higher than the tanks to prevent unnecessary leaking when transporting the model. Use the jig when working on the fuselage inverted.

I mount the fuel tank on the right and the smoke on the left as seen from the cockpit. The tanks simply slide into the tubes. Complete all internal tank plumbing and screw the caps on tightly. Mark the location of each nipple so you can orient the tanks correctly during installation. I have marked them "V" for vent, "I" for in, and "O" for out. Coat the first one inch behind the front curve of the tank with silicon glue and slide in. The excess glue will ooze out the front. Use your finger to make a nice filet around the rim. This will mount the tanks permanently to the fuselage. Simply unscrewing the cap will provide access should it become necessary to clean or replace the clunk tube.


V
O
V
I
O

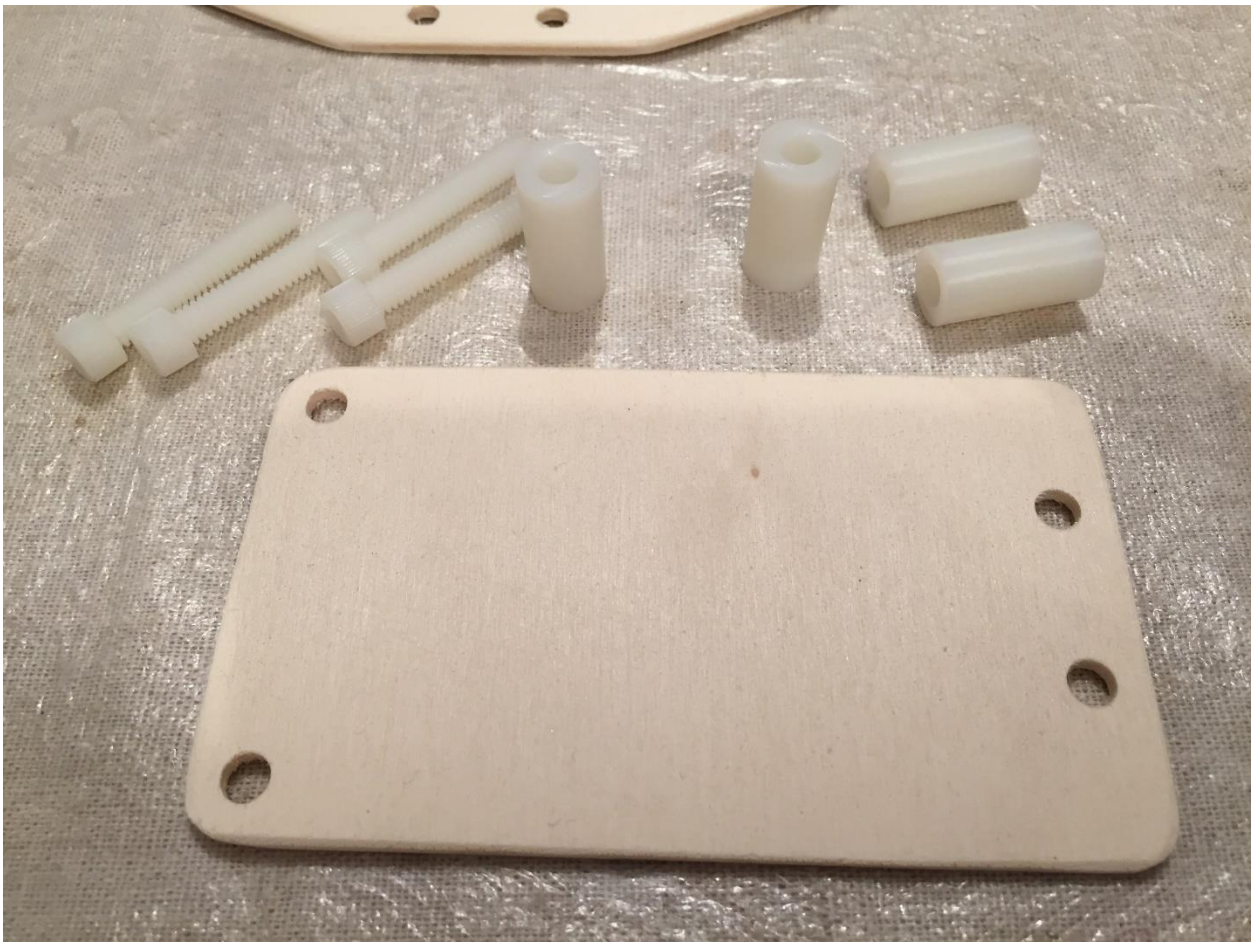

Series 10
MORI
February 22, 2016

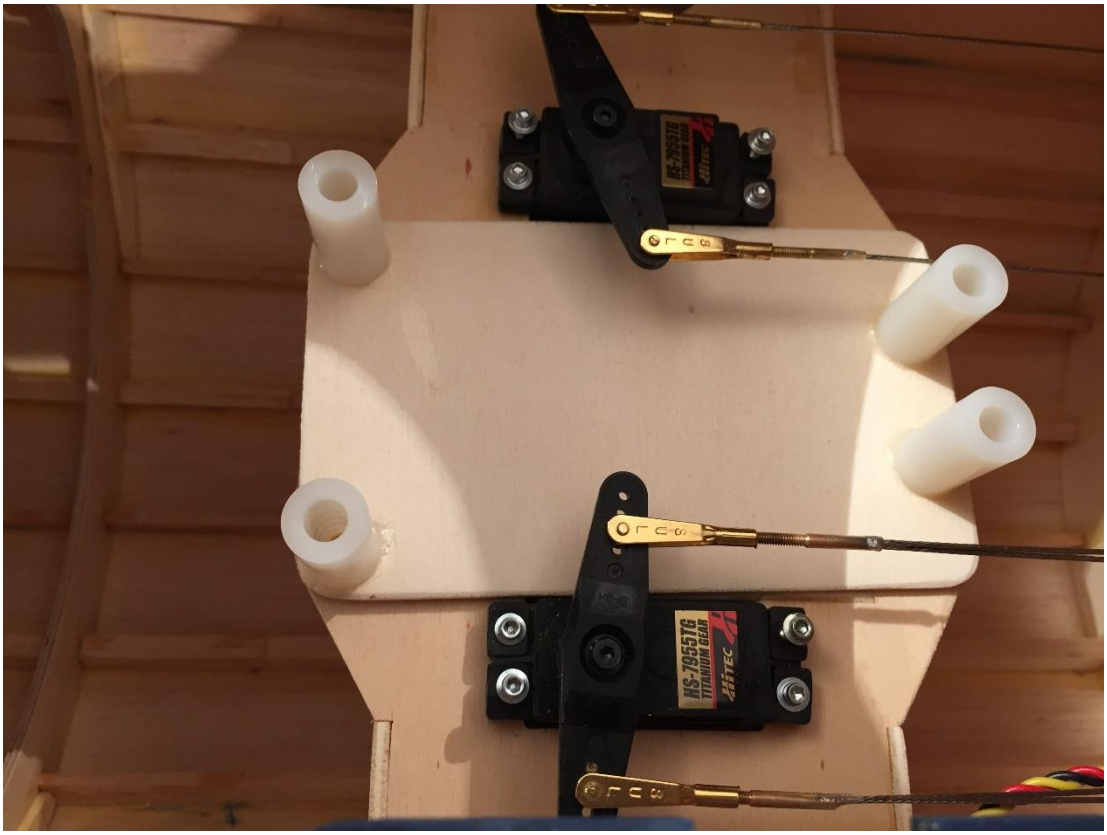


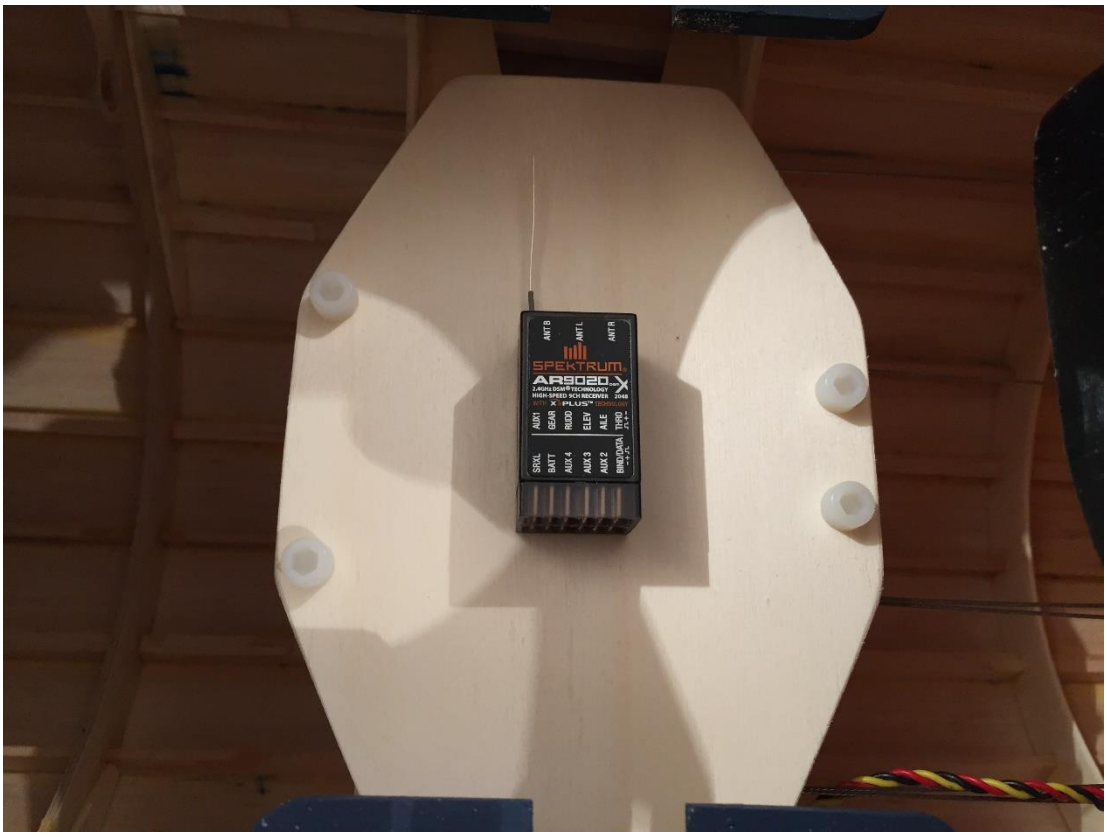
Battery Box Cover and Receiver Tray

Glue four 1/4” ID x 1/2” x 1” nylon standoffs to the top of the battery box cover. Use 1/4” nylon socket head screws to keep the standoffs centered on the holes while you glue them in place. Swab accelerator on to the wood only. Wick thin CA around the base of each standoff. This step is not absolutely necessary, but it sure makes the receiver tray installation a lot easier.

The receiver tray is bolted to the battery box frame with four 1/4-20 x 1-1/2” nylon socket head screws.




HS-7955TG
HITEC


SPEKTRUM
AR9020

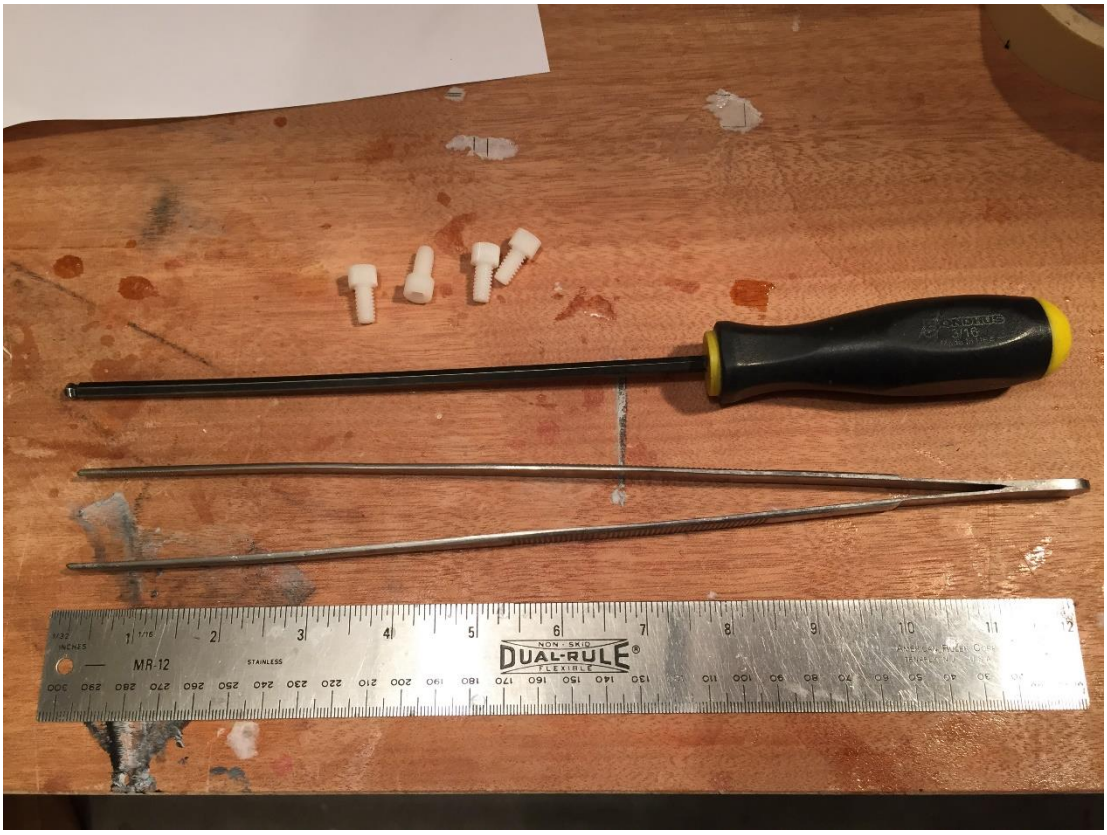
Receiver, Batteries and Servos

The pictures below are provided to give you an idea of how I wired this model. This is not the only way to do it and your preferences may be different. I use the nine channel Spektrum AR9020 receiver. All servos are Hitec HS-7955TG. The ignition switch and smoke pump are made by PowerBox. The A123 batteries and switches are from Electrodynamics. I have never had a problem with any of these products and they all work fine in this airplane.

www.electrodynam.com

Having a pair of long (12”) tweezers can save you from a lot of frustration when wiring.

Mount one remote receiver perpendicular to the main receiver antenna on the plywood receiver mounting plate. Mount the second receiver behind the headrest so that the antenna is vertical.



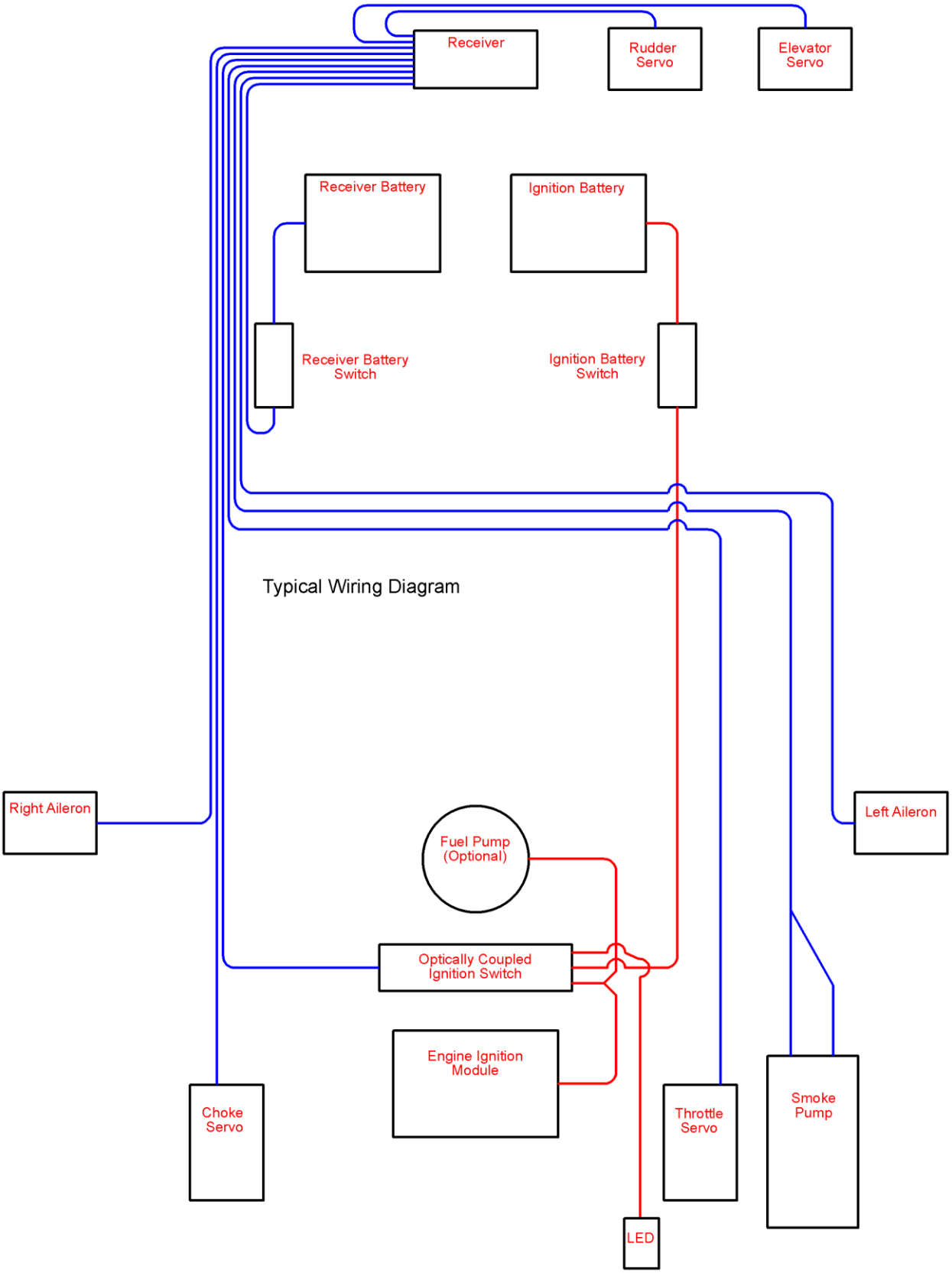
Ideal wire lengths. Custom lengths and connectors are available from Electrodynamics.

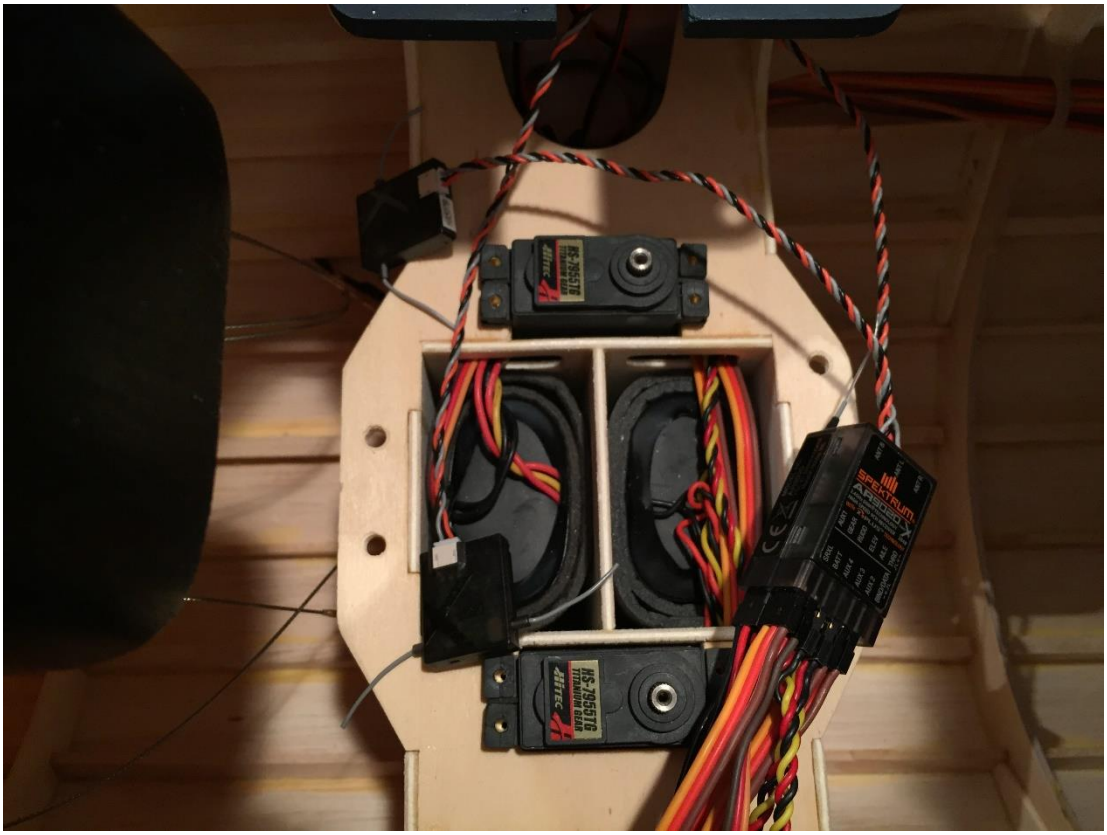
Left Aileron	42”	
Right Aileron	30”	
Throttle	36”	
Choke	30”	
Spark Switch to receiver	30”	Female connectors on both ends.
Spark Switch to battery	40”	
Smoke Pump	40”	All female connectors with Y at pump.
Optional Fuel Pump	Short Y	Two female and one male connector.

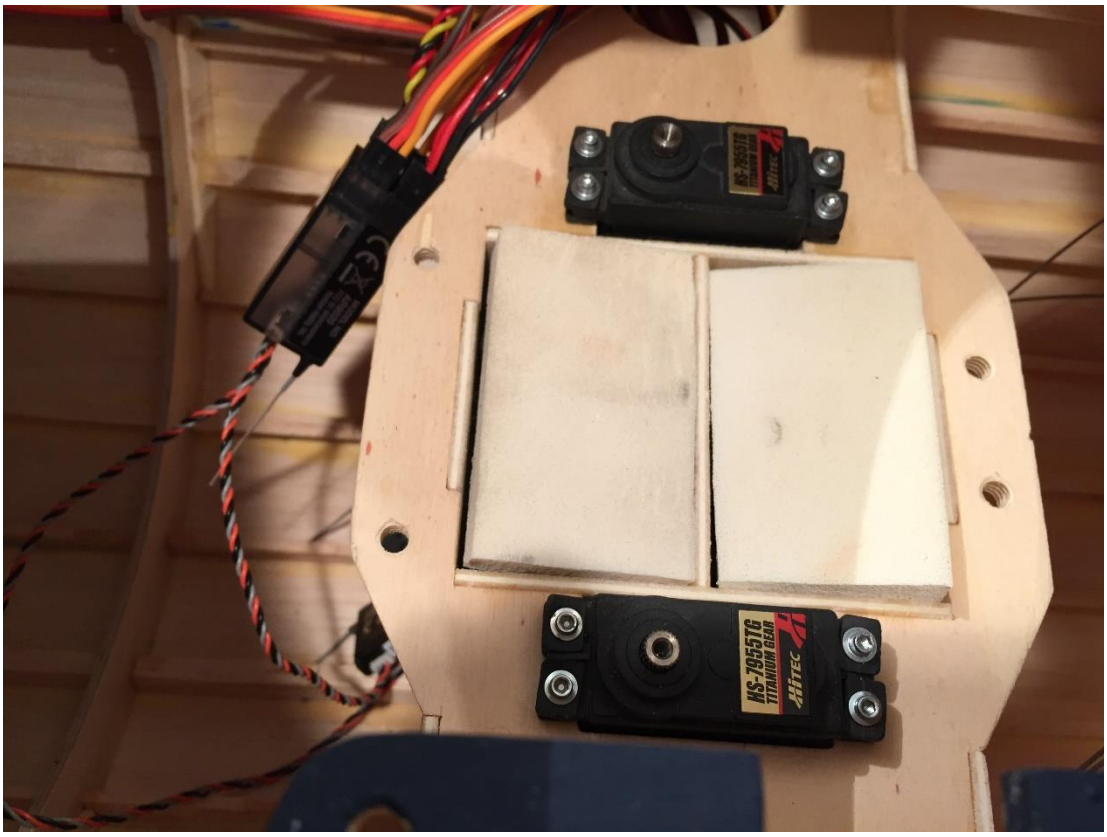
This assumes that the receiver switch, receiver battery and all receiver wires are connected to the receiver from the left side of the cockpit. And that the ignition battery and switch is on the right side.

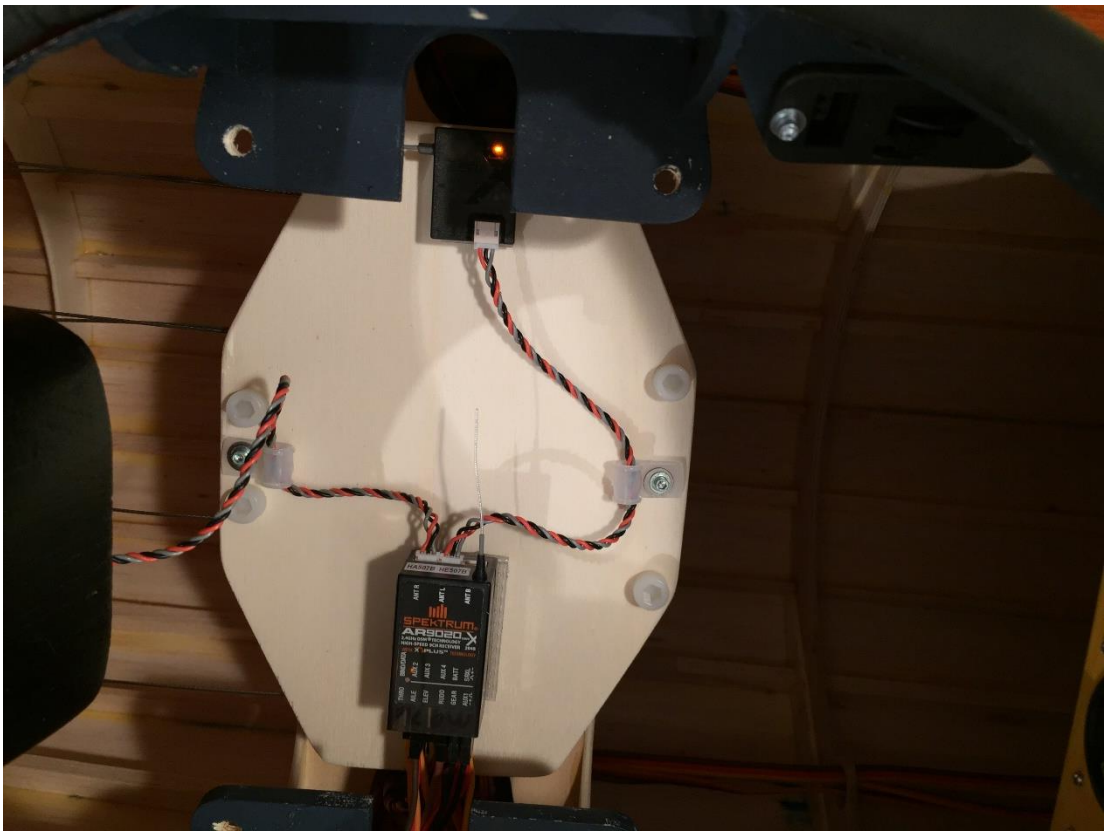
It is best to power the PowerBox smoke pump from the receiver battery to avoid electrical coupling between the receiver and ignition batteries. If you use a Y connector at the smoke pump you can power the pump off of the signal wire.

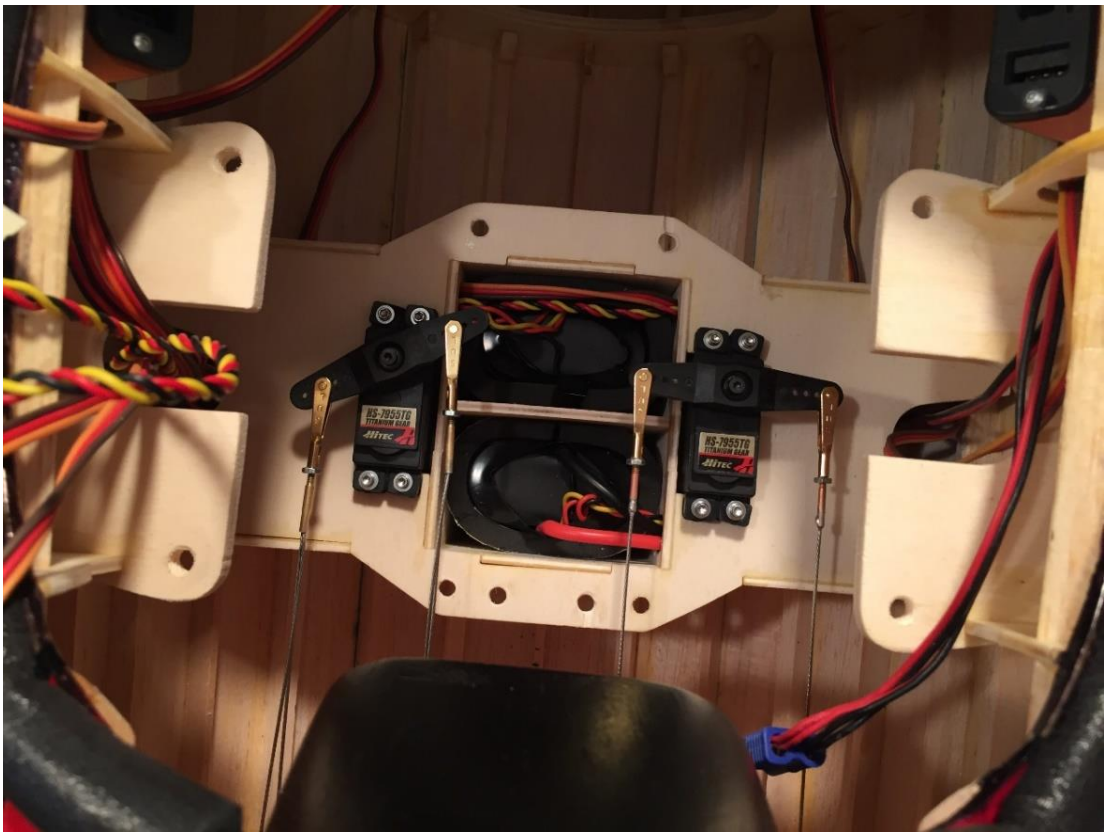
See suggested wiring diagram on the next page.


Receiver
Rudder Servo
Elevator Servo
Receiver Battery
Ignition Battery
Receiver Battery Switch
Ignition Battery Switch
Typical Wiring Diagram
Right Aileron
Left Aileron
Fuel Pump (Optional)
Optically Coupled Ignition Switch
Engine Ignition Module
Choke Servo
Throttle Servo
Smoke Pump
LED


HS-7955TG
TITANIUM GEAR
Hitec
SPEKTRUM
AR6610T

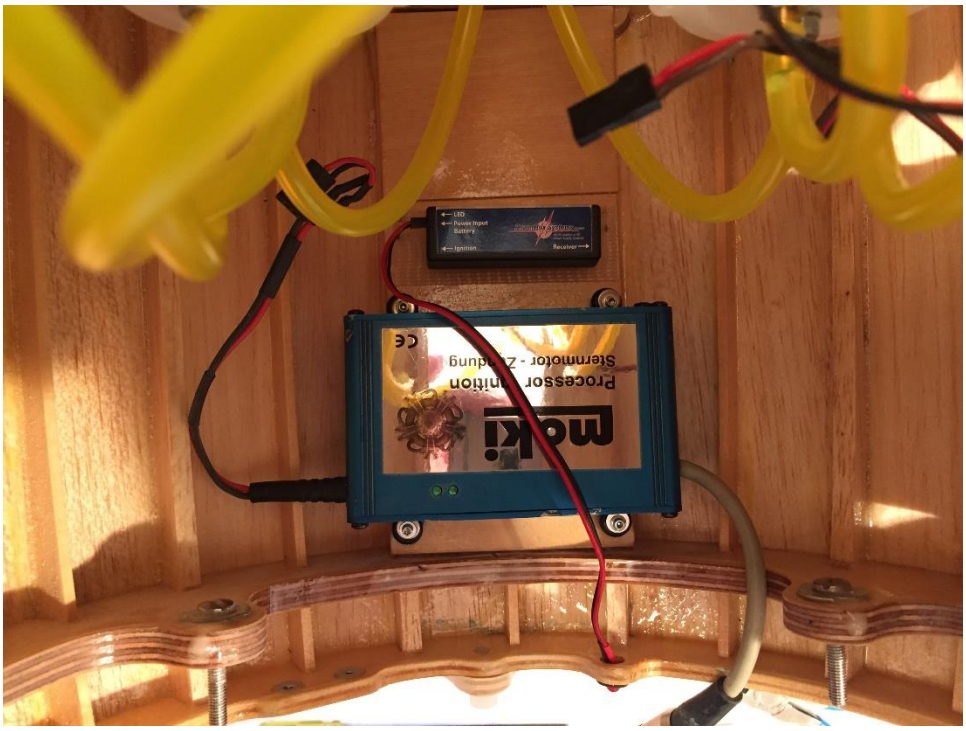

HS-7955TG
TITANIUM GEAR
Hitec

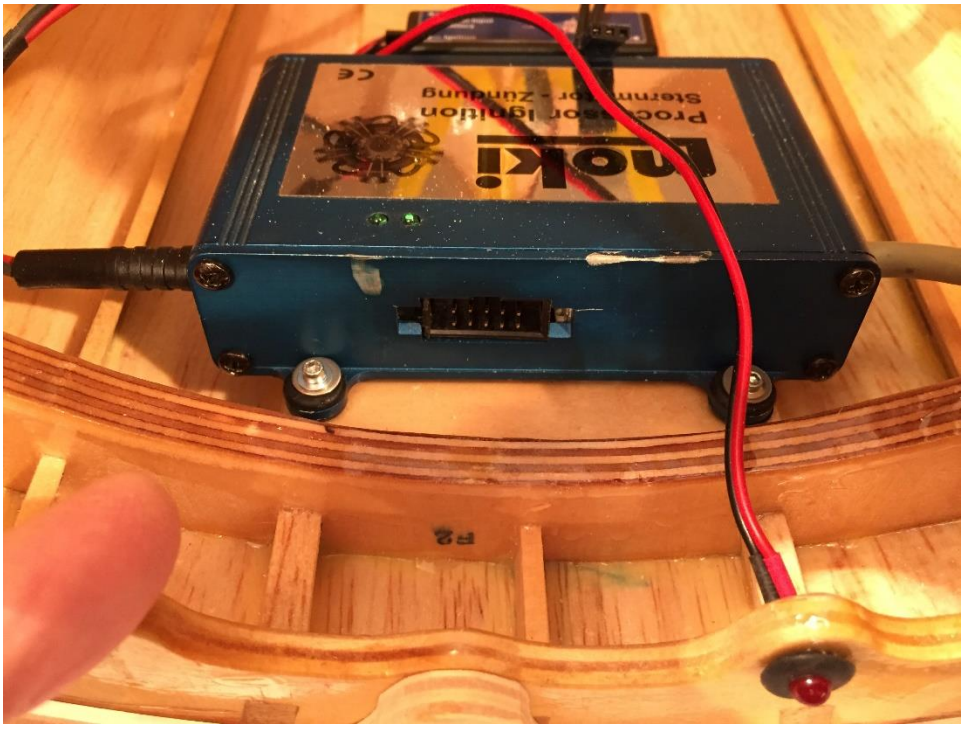

SPEKTRUM
AR9020

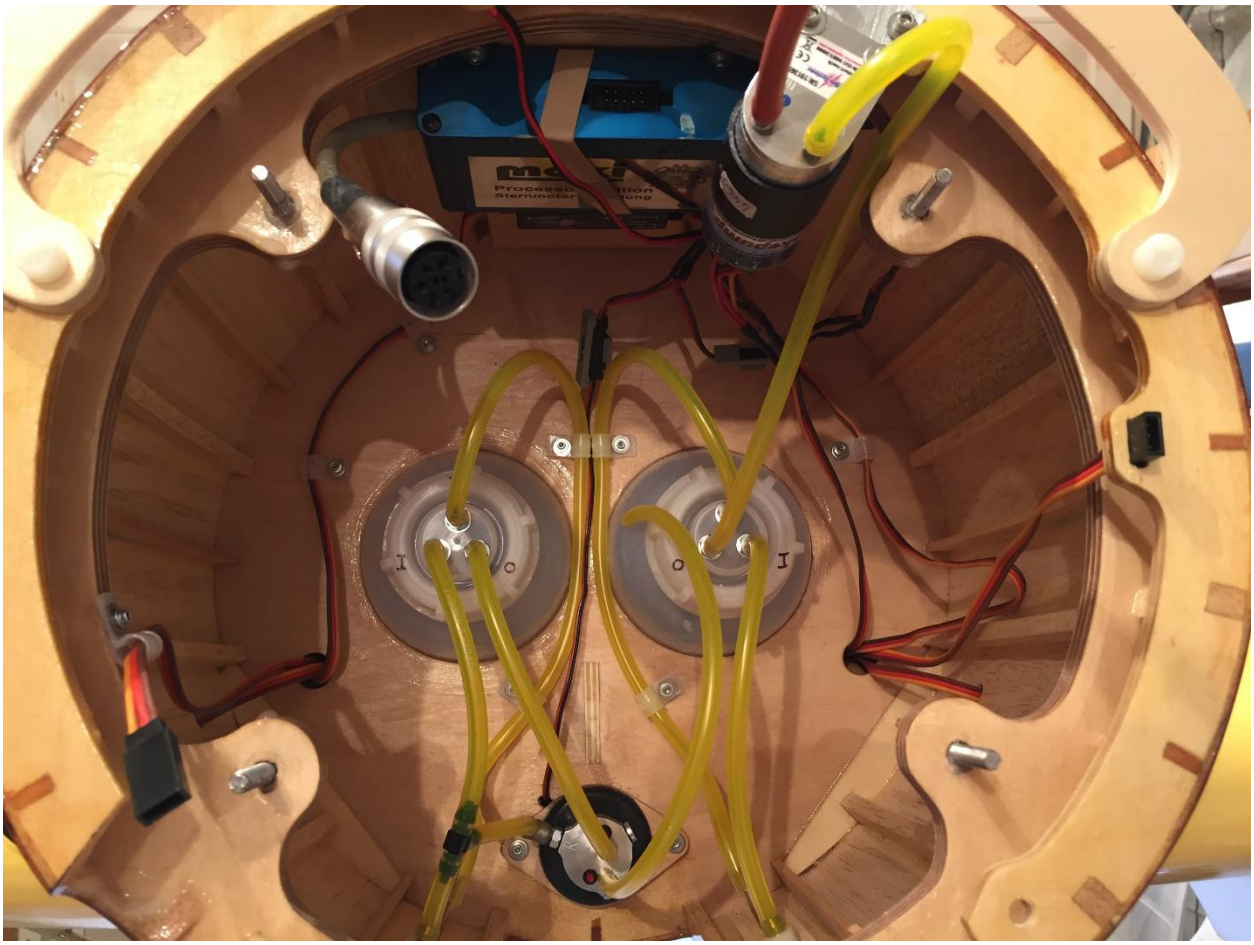

HS-7955TG
TITANIUM GEAR
Hitec
HS-7955TG
TITANIUM GEAR
Hitec

Ignition and Smoke

Mount the Spark Switch, LED and smoke pumps according to your preference. I used regular Velcro to mount the Spark Switch. The connector mounted in F2 is for the throttle servo.





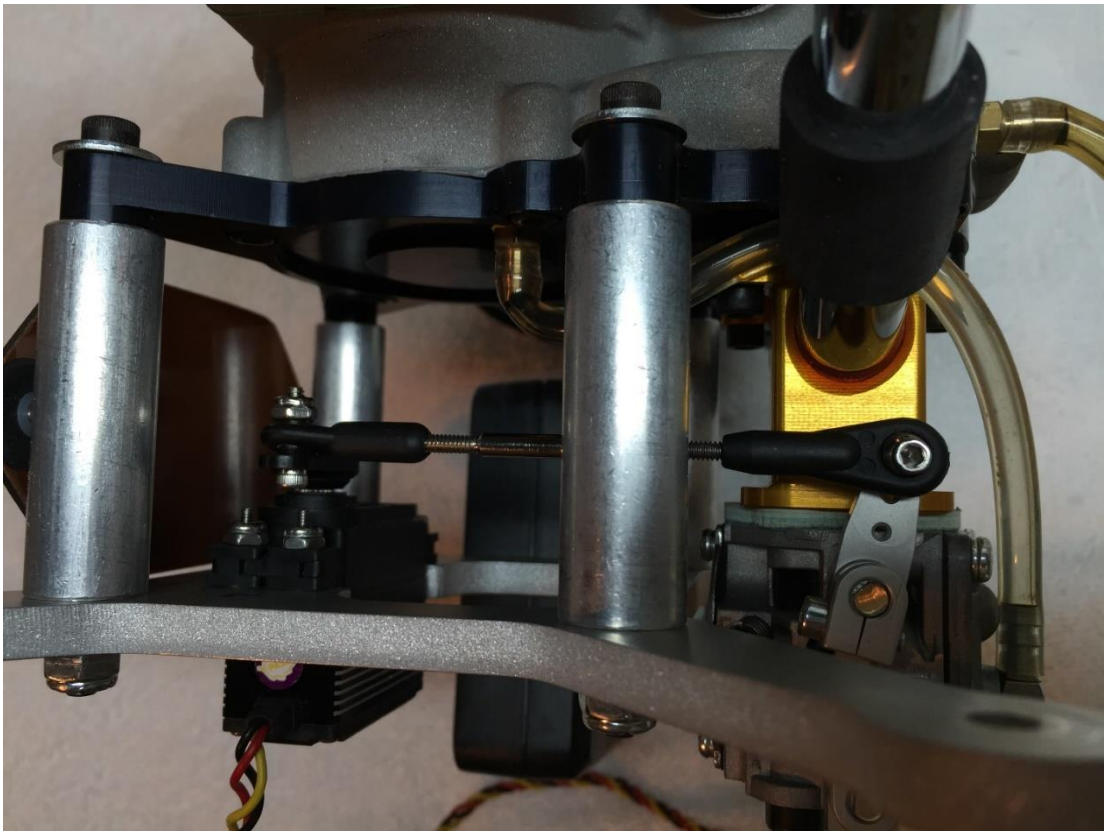


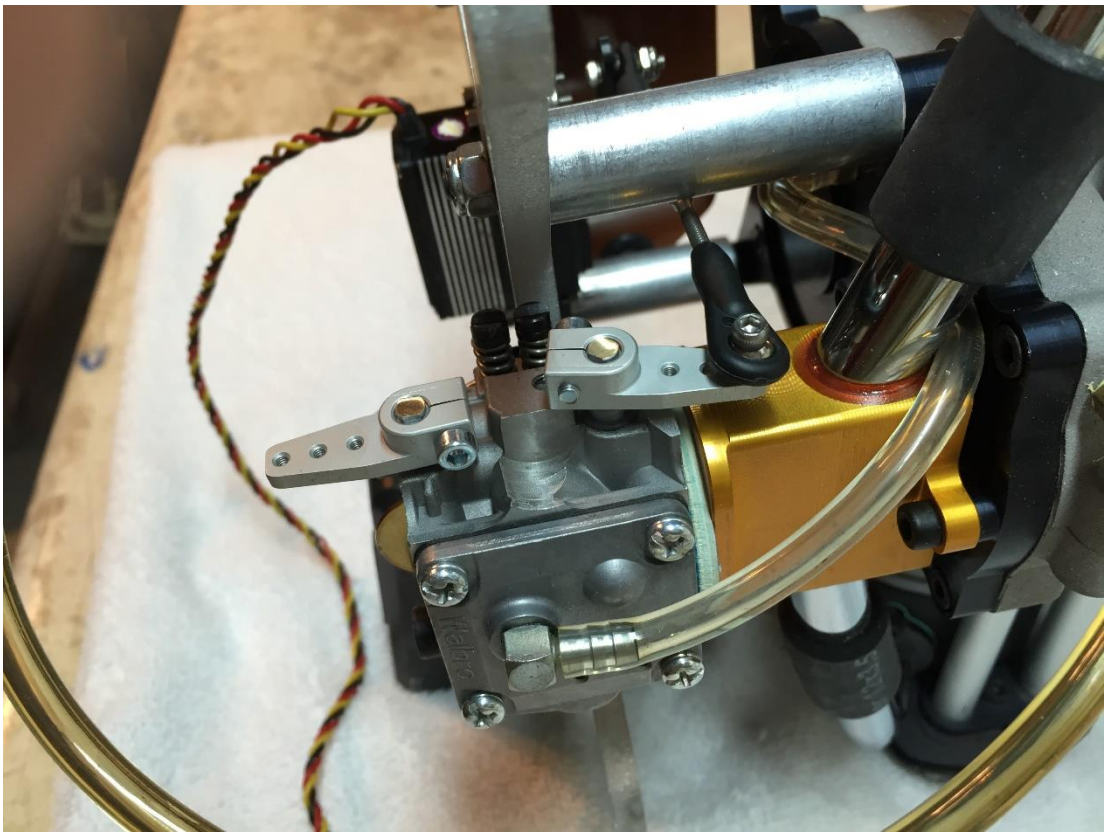
Motor Mount and Throttle Servo

The motor mount is designed so that the throttle servo mounts directly to the motor mount, and therefore, it is unnecessary to unhook it when removing the engine. The throttle and choke arms are made by Kunkel and are available in the USA from Vogelsang Aeroscale or Toni Clark in Germany. Obviously, some pictures refer to the Moki radial installation; others refer to the Valach 120 installation.

http://www.vogelsang-aeroscale.com

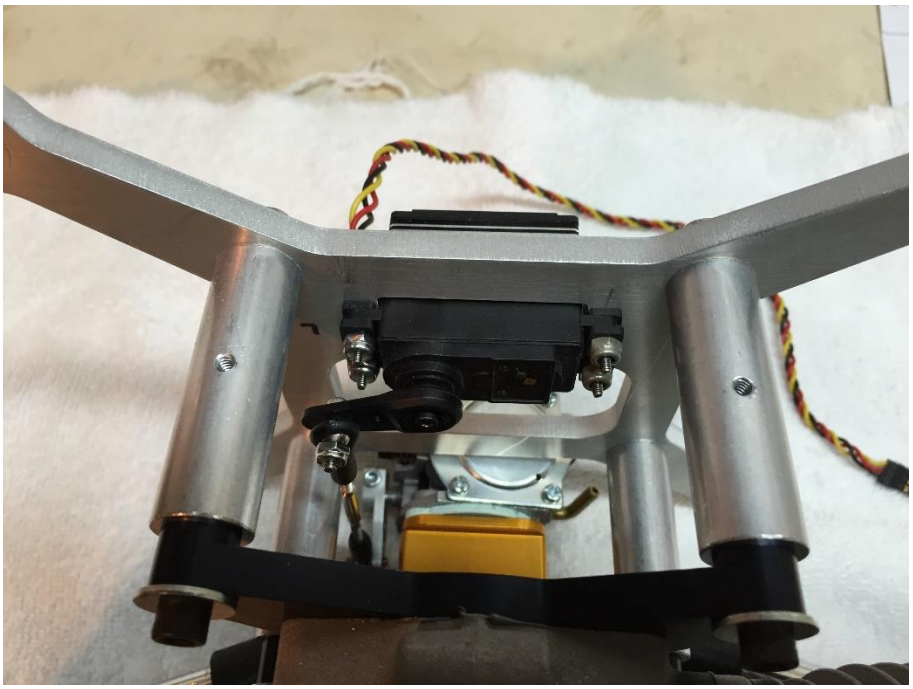
http://www.toni-clark.com

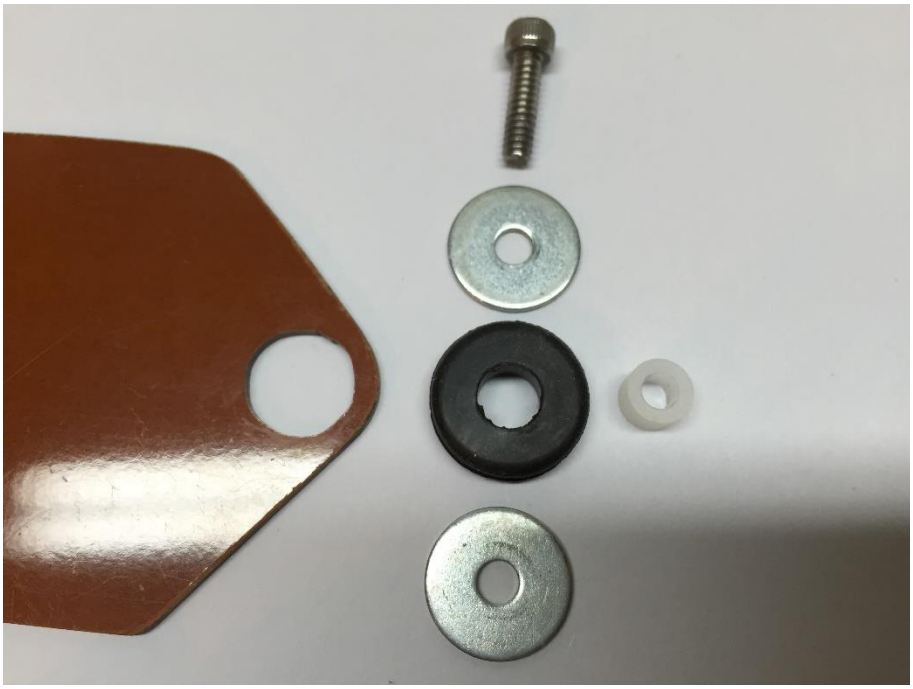


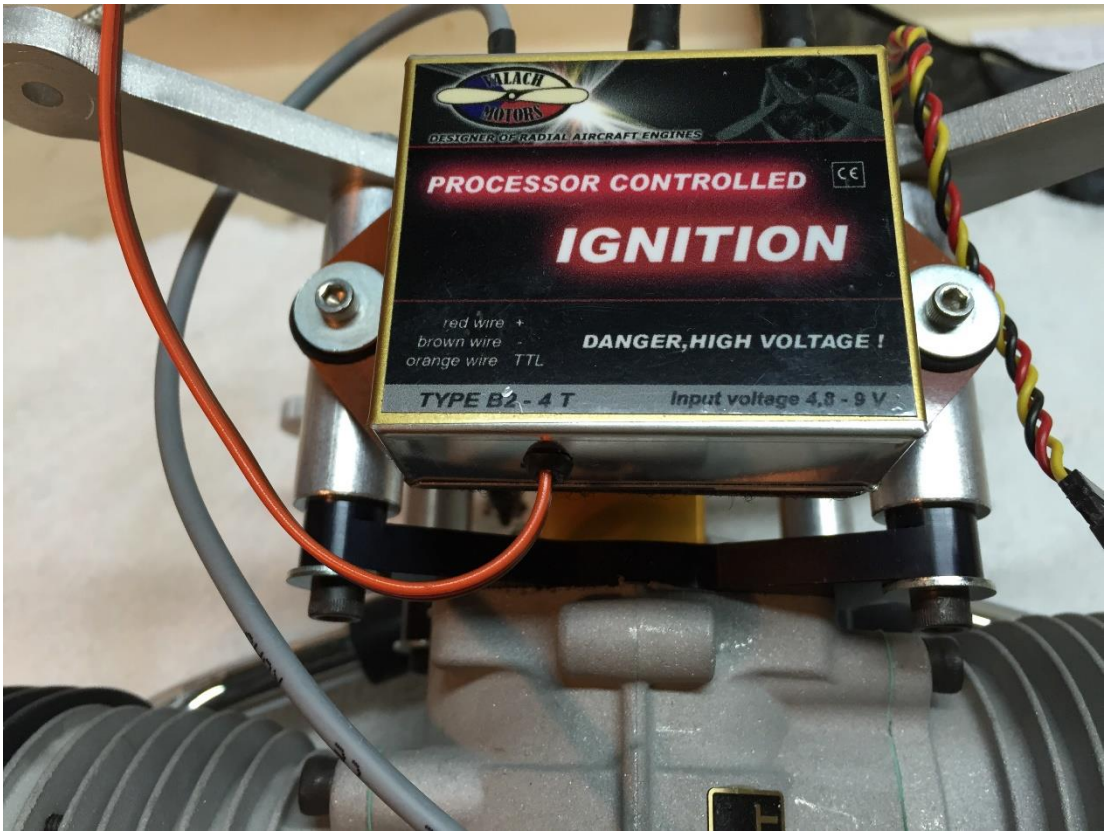


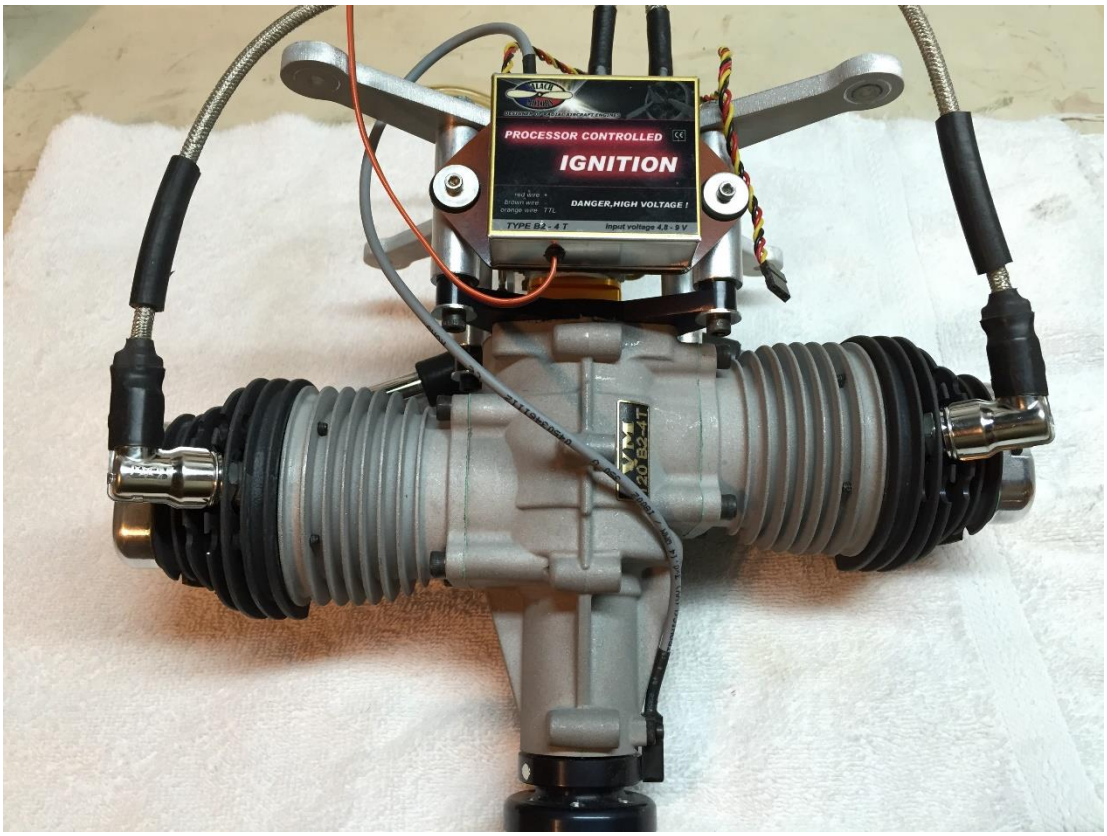
Ignition Mount

The Valach ignition module is mounted onto a plate with Velcro that is secured with grommets and 6-32 x 1/2” socket head screws. The upper two spacers need to be drilled and tapped on center to accept the 6-32 screws. Use Loctite on the threads.



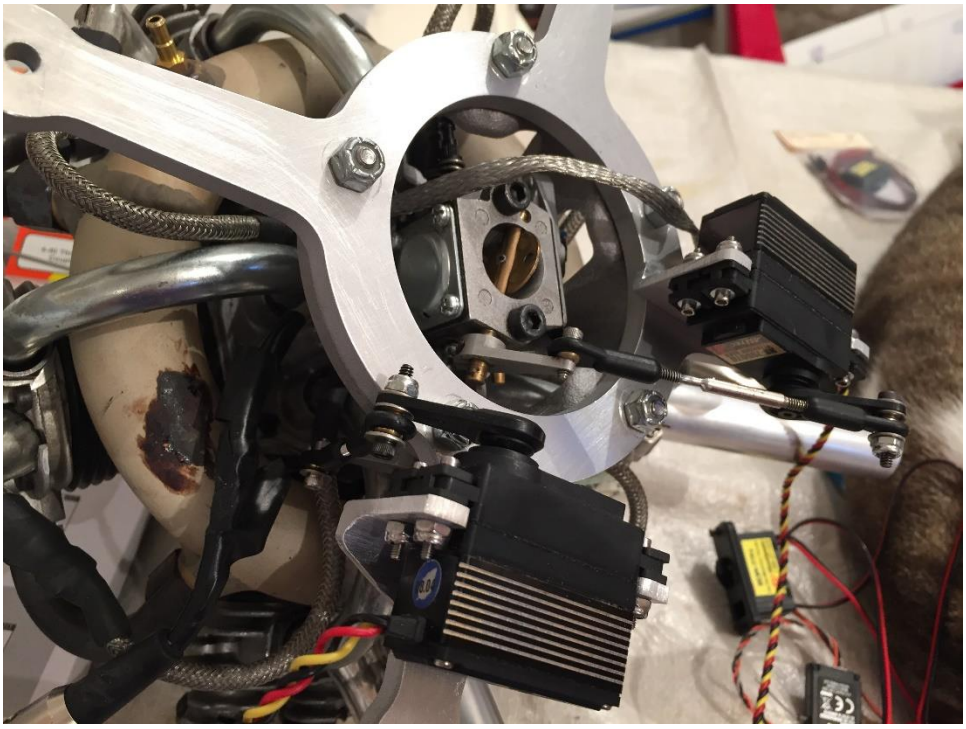


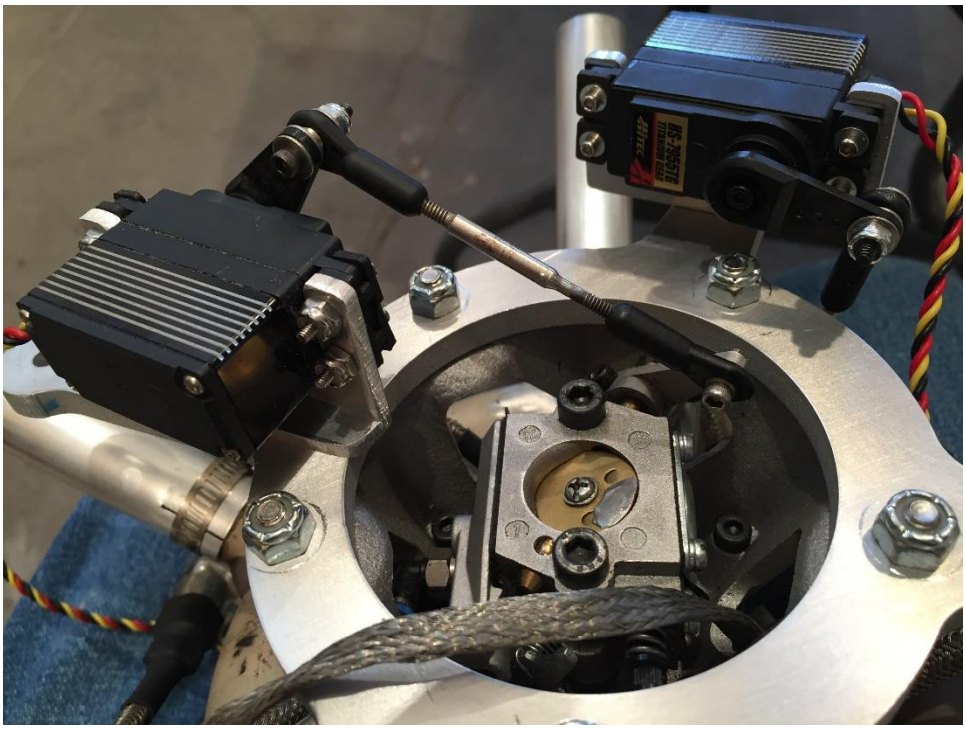

DESIGNER OF RADIAL AIRCRAFT ENGINES
PROCESSOR CONTROLLED
IGNITION
red wire +
brown wire -
orange wire TTL
DANGER,HIGH VOLTAGE !
TYPE B2 - 4 T
Input voltage 4.8 - 9 V

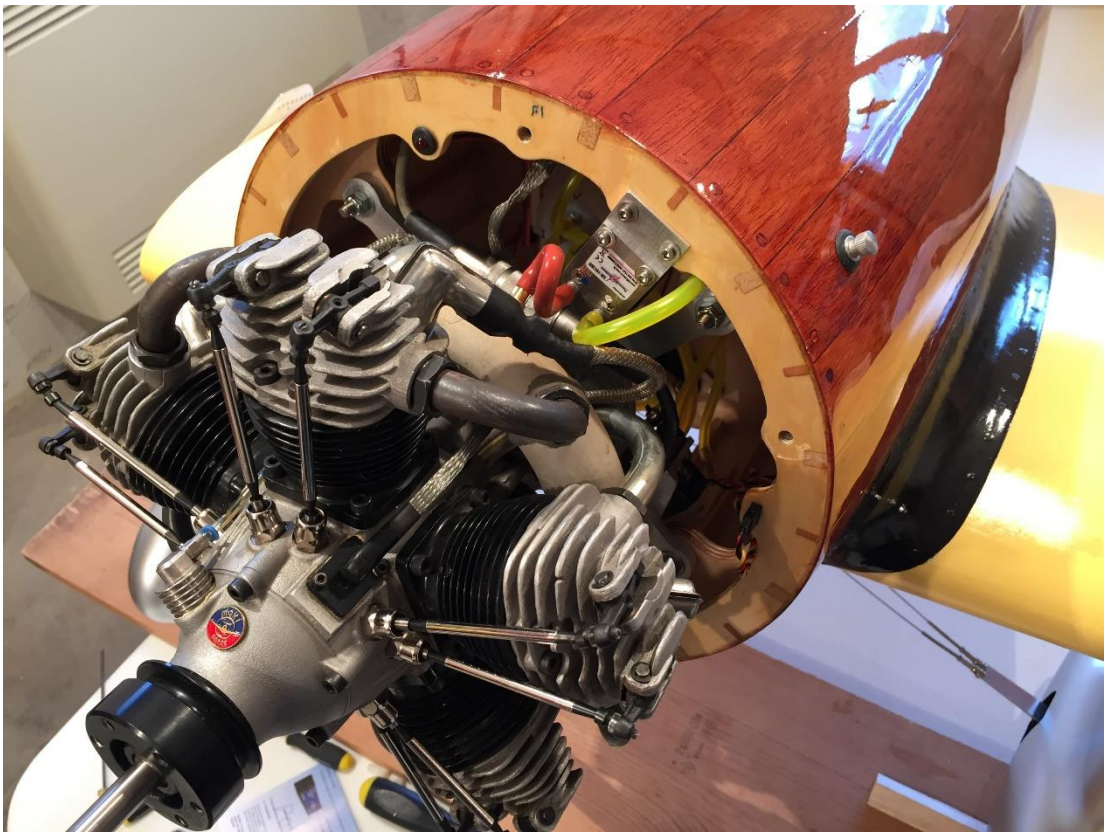

PROCESSOR CONTROLLED
IGNITION
DANGER,HIGH VOLTAGE !
TYPE B2 - 4 T

Moki Throttle and Choke Mounts

The Moki radial is a complex engine. I have found it much easier to mount the throttle servo directly to the motor mount. The same is true for the choke. Drawings to make the mounting brackets are on the fuselage parts sheet.







Exhaust

Creating an exhaust system for the Valach 120 could take many forms and you may want to do it differently than I did. The pipes are secured in the rear with KS Muffler 20mm“Comfort Mounts.” The exhaust parts are all available from Vogelsang Aeroscale or Toni Clark. The smoke nipple is 1/8” stainless steel tubing from KS Metals and silver brazed to the header.

Pilot Mount

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

Point of Balance

The point of balance for the ideal CG location is determined by suspending the model from the two aluminum brackets which are bolted to the stub wing. The wings must be attached and secured with the upper flying wires. The bottom wires will just dangle as they will not close. You can use masking tape or rubber bands to bring the lower wires near the attachment point if necessary.

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.

Although the wing tube is located exactly 30% of the root chord, flight testing has shown that 33% is closer to ideal. The model flies very nicely at 33% and because of the high tail volume, it is still very stable. That said, the acceptable CG range is 28% to 34%.

Balance the model so that when suspended from the 33% holes, the fuselage is level. A small bubble level at the flying wire attachment points will give an accurate reading.

If you are using the Valach 120 engine, you may find it necessary to add weight to the nose. Even better, would be to relocate the batteries from the cockpit to the engine compartment.

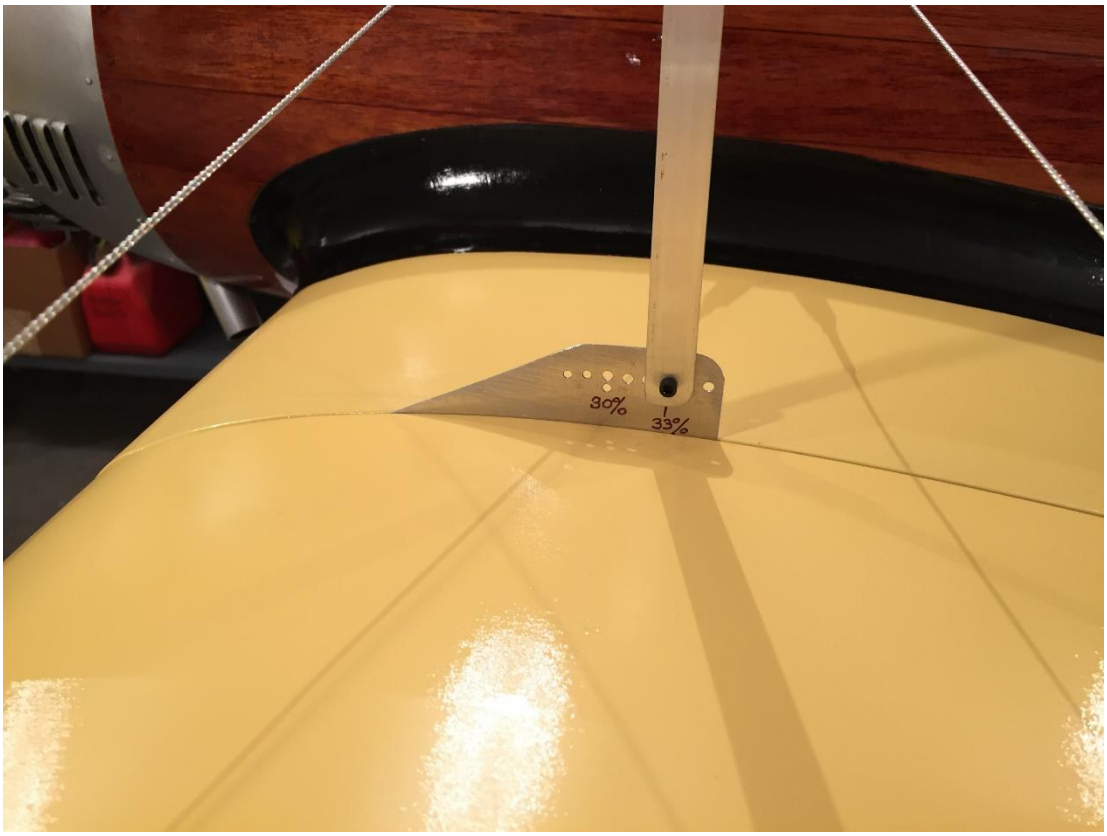
With the Moki 180 radial, you may need to add a small amount of weight to the tail.

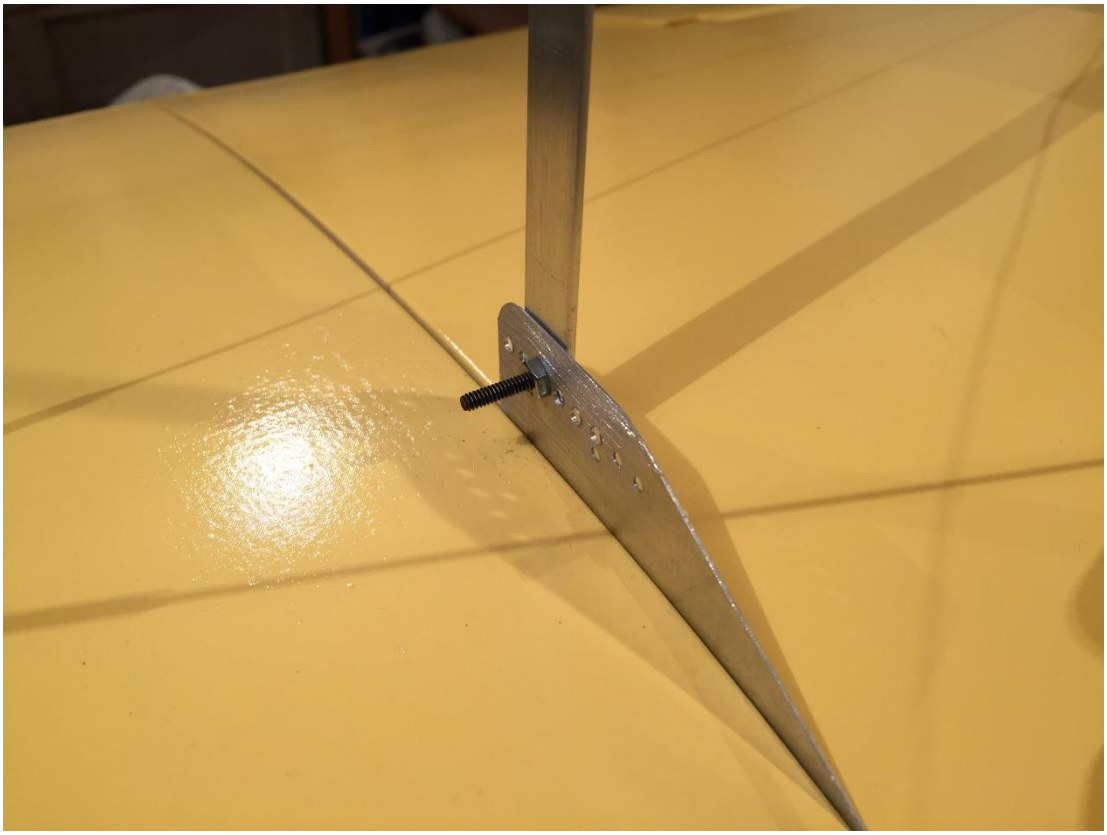
Whatever you do, make sure you take the time to balance properly.

This is NOT a model which has been designed for crazy (and stupid) violent maneuvers which are inappropriate for an airplane of this type. With enough force you can tear the wings off *any* airplane. Use common sense and stay with loops, rolls, inverted, wing overs and hammer head stalls . . . and nice landings.

See the pictures below.


30%
33%


30%
33%



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
Riley
NC205
WIRELESS CONTROL