ViperJet Mk II

Instruction Manual

www.carf-models.com

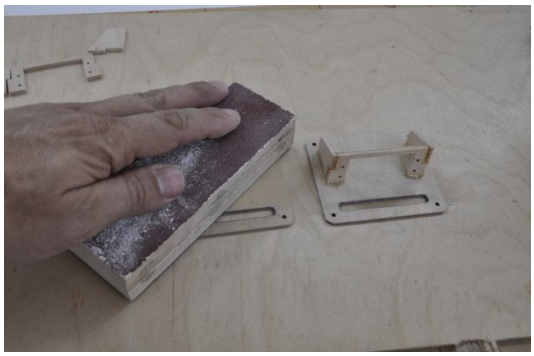
First Draft, July 2nd, 2012

This is a draft. Lets let all the disclaimers out and get started right away...

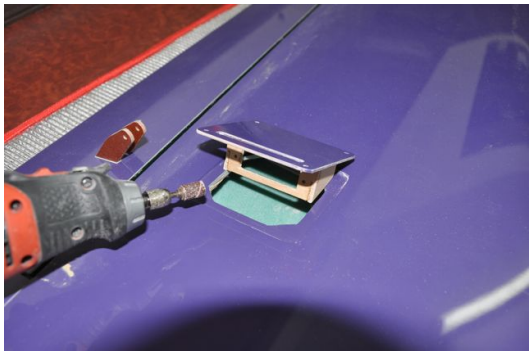
1. The Wings

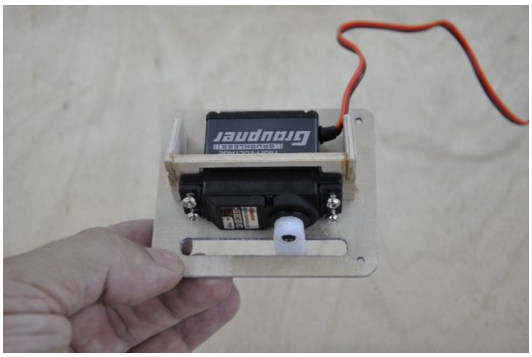
1.1 Aileron servo installation

Prepare 30 min epoxy, a little bit of glass cloth and thick CA glue. Cut the milled servo mount parts free, sand and prepare for gluing. Especially the hatch plate needs to be sanded very thoroughly with course sand paper. Wash the sanded surface with some lighter fluid or acetone.

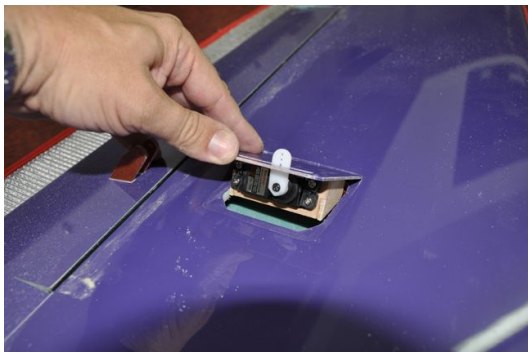


Center the servo mount on the hatch. Test fit with your servo and if necessary, sand to fit and. Allign the servo arm with the slot. Then glue with thick CA glue. Finally reinforce the glue joints to the base plate with 30min epoxy and some fiberglass cloth. Make sure this joint is solid and strong, as all force from the ailerons during flight will be resting on these glue joints.

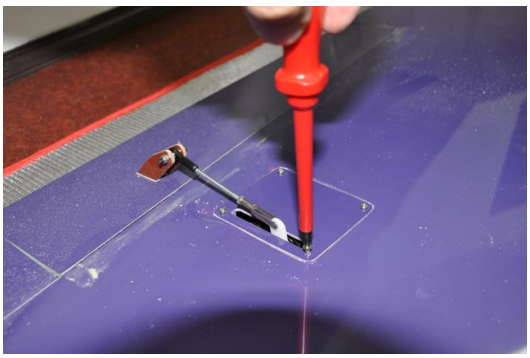




Test fit both right and left assemblies to the wings and use a dremel tool with a small samding drum to sand the inner contour of the opening to fit. Then permanently install the servos. It is a good idea to install the servo lead extension at this time, so you won't have to worry about it later.



Attention: Do NOT use the servo screws, which come with the servo. Since our production process requires the use of a 2mm end mill, the holes for all servo screws are 2mm diameter. You must use the included 2.9mm sheet metal screws to screw the servos into the frames!



Assemble the linkage. Turn the all thread all the way but one turn into the ball link, and make sure to install the M3 nut to counter the spring steel clevis, after the linkage length is set.

Use a M3x20 bolt and a self securing M3 nut to install the ball between the twin horns. Tighten well.

Use the same type 2.9mm sheet metal screws as in the servo mount to permanently screw the servo hatches in place. This completes the aileron servo installation.

1.2 Flap servo installation

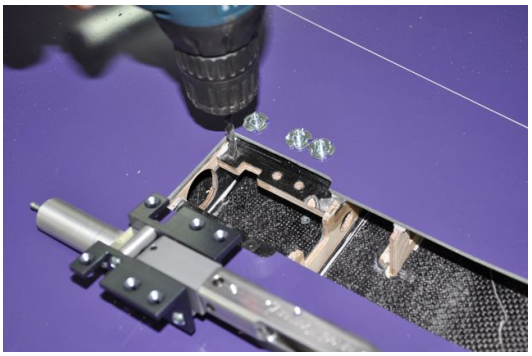
Prepare the flap linkage just like you did with the aileron linkage. Install the ball between the dual horn. You might have to sand or grind the slot in the rear spar a bit wider in order to feed the linkage through without binding.

Then use the 2.9mm sheet metal screws to install the servo. Adjust the length of the servo arm so that your flap deflects between 0 and 80 degree at the 45 deg. positions of the Servo arm. Make sure that there is a 100% symmetry between the right and left wing's flap servo installation. It is important to check this seriously! The servo lead needs to be extended by ~200 mm (8") and later fed through the main spar together with the pneumatic lines of the landing gear.

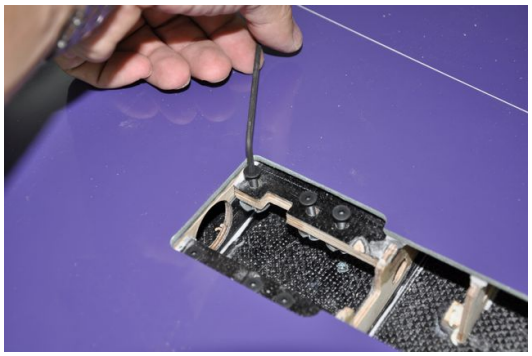
1.3 Main Gear Installation

The CARF Viperjet gear is made by Airtech Germany to fit the plane. Mount strut and gear unit (do not yet tighten the set screws) and slide into position.

Mark the position of the holes, take the unit out and drill with a 5.5mm drill bit, to accept the T-Nuts from the underside.

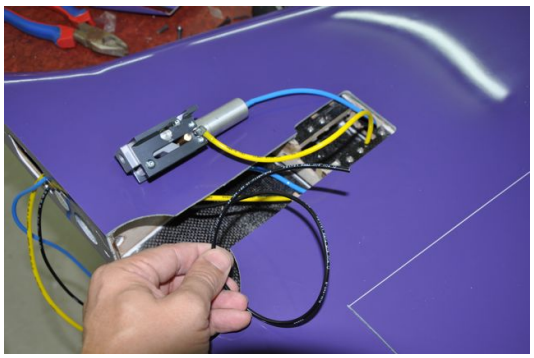


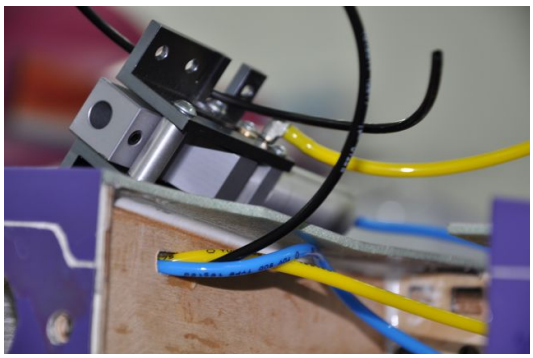
Install one T-nut after the other by tightening one of the M4 bolts, pulling the spikes into the gear mount fully. You do not have to cut the sides of the T-Nuts, even though they extend over the edge of the cutout. There is enough room. However, you must shorten the one bolt which would otherwise interfere with the air nipple in the retract unit!



Then mount the retract unit with all 6 bolts and make sure nothing is binding.

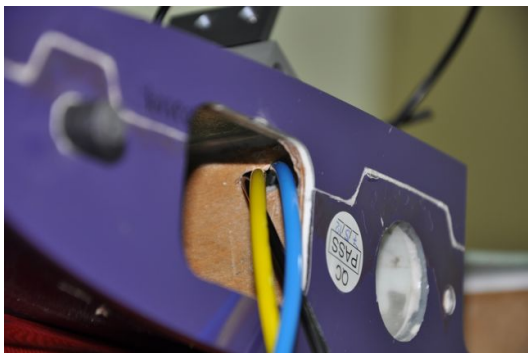
Make sure the wheel is not touching the root rib of the wing when fully retracted and locked. Use a dremel with a small drum to create clearance if necessary. If the wheel does not clear the root rib, resulting binding can cause the landing gear to get stuck in the air!

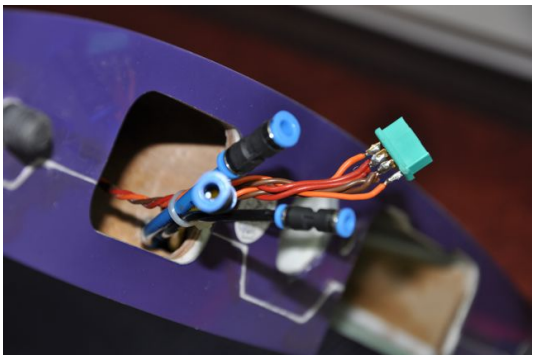




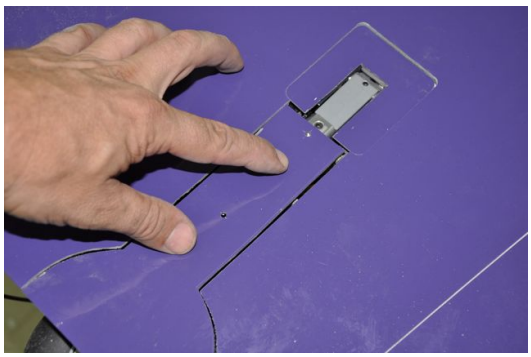
Remove the gear again to install the air lines. Stay with one color code (e.g. blue up, yellow down). Mill an opening into the root rib (the plywood rib behind the fiberglass has already a cutout, which will serve as guide when milling the fiberglass. If you use an old 3mm drill bit instead of a biting milling tool, this will go very smoothy. You will have to drill a hole in the front main spar to feed the airlines and the flap servo wire through.

To make it easy, feed through a piece of strong wire first and attach the air lines and leads to the end of this wire with tape. Then pull everything through towards the front. If you have purchased our pneumatic installation pack, connections are made with standard FESTO push-in connectors. We recommend to make the electrical connections with the so called “MPX connectors.





With a diamond disk you can cut the included carbon fibre gear doors so that they fit the cutouts in the wing. We recommend to permanently glue the U-shaped piece with hot glue to the gear frame and to bolt the strut cover with 2 M4 bolts to the strut (threaded holes in the strut are provided). The bottom part of the cover, which spans over the wheel, we recommend to remove and keep the rectangular strut covers only.



There is no problem if you decide not to use gear/strut covers at all. If you want to keep it simple, just leave the gear area open.

A functionality check will be made once the nose gear is installed in the fuselage and all pneumatic connections are completed.

2. Stabilizer

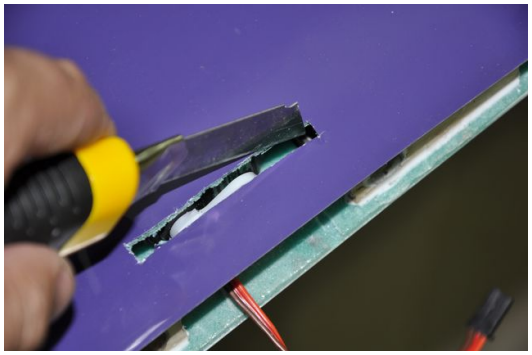
2.1 Elevator servo installation

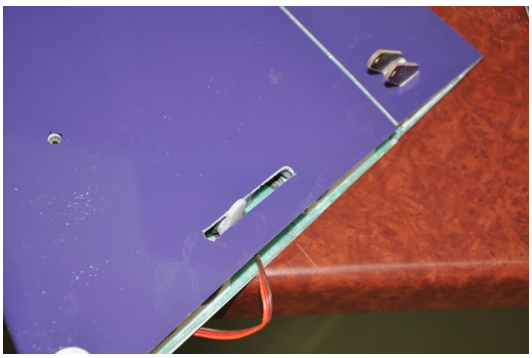
Installing the elevator servos is a little bit tricky because there is only very little room in the stab, between the two stab tubes. We opted for using the largest possible servo for safety reasons, even if this means a bit more fitting work.

Use a 3mm drill bit in a dremel to cut the wood bridges in the servo mount area. These bridges are necessary for production, to keep the rips in one piece while installing them in the open molds. They need to be removed before a servo can be installed. Depending on the servo to be used, some additional grinding might be necessary to fit the servo.

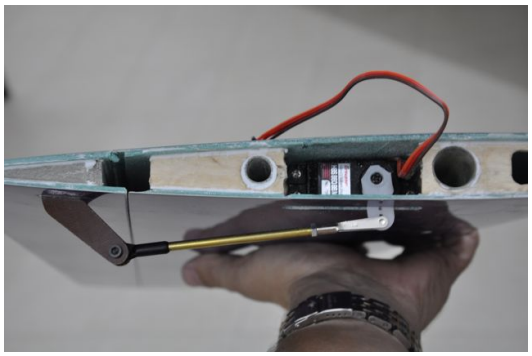
Even for the servo lead there's almost no room, so please create a loop as shown on the photo and use some clear tape to hold the wire in place. It should exit the stab at the front top corner of the servo. If it's done right, there are no sharp edges in the way, so the solution is safe, even if a bit uncommon.

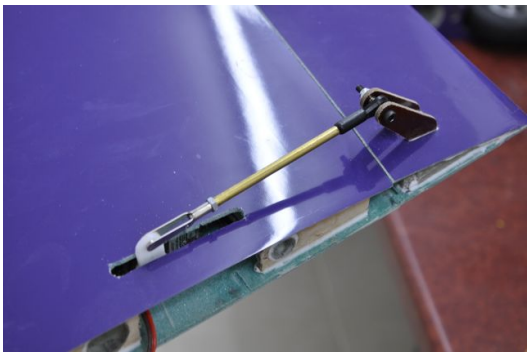
Make sure that the wire cannot intefere with the servo arm, which should be single sided and just long enough to give the elevators approx. 30 degree of deflection.





Measure carefully from the root rib the position of the servo arm and use an Xacto knife to cut the opening for the servo arm. After the slot is placed and widened, use a thin file and clearn it up nicely.



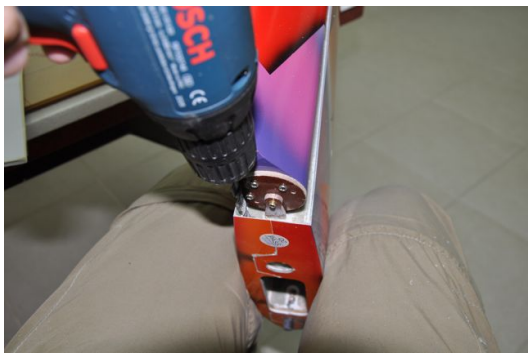


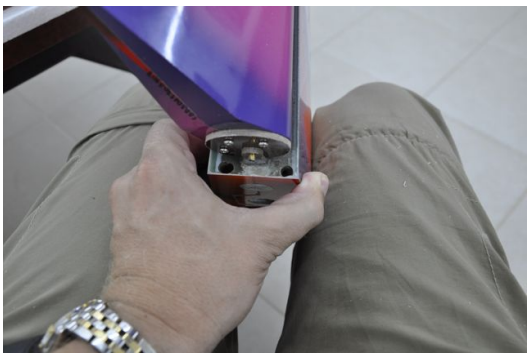
Assemble the linkage as used from aileron and flap, just add the brass tube as additional reinforcement of the all thread. Also at the elevators it is very important to have 100% symmetry between right and left elevator linkage. Make sure the servo arms are precisely aligned in the same angle when the elevators are in the neutral position. If there is some difference between right and left, it should only be adjusted by the length of the linkage. If necessary, the length of the brass tube needs to be slightly adjusted as well.

2.2 Rudder servo installation

The Push-Pull setup of our rudder linkage makes the system very strong and safe. Here, too, it is important to take care for 100% symmetry.

Mount the rudder to the fin by sliding the hinge tube all the way trough. Locate the position of the linkage and drill 2 6mm holes in the corners, allowing ehough clearance for the linkages to be pushed through.





Then assemble both push rods and slide them through the drilled holes. Put 2 M3x15 bolts through the balls and the phenlolic disk glued to the bottom side of the rudder. There is no threaded nut inside the rudder. The bolts are being glued with 30 min epoxy, once the system is moving without binding. Therfore, the servo should be installed first.

The servo wire can be fed through the hole in the servo rib, right in front of the rudder servo.

Once everything is installed and moving freely without binding, take out the two M3 x 16 bolts and apply 30 min epoxy on the treats and into the holes in the rudder. Then slide the bolts back in, clean off any excess glue and stand the fin on its tip, so that the glue would run down the bolt, and not back out of the hole.

Wait until the glue has set and then move the rudder slowly to reconfirm that there is no binding. Make sure you get the max. deflection geometrically possible, at the same time, keep the servo arms as short as possible to just reach this deflection. Do you electronically reduce the servo travel from 100%, in order to keep the maximum torque on the rudder.

Finally, slide the fin tube in, secure it with the M3 bolt and slide it on to the fuselage. Make sure the fin fits properly, the rudder is not binding when tightly pressed on to the fuselage. If it is, you can sand off the binding edges of the rudder slightly.

As you can see, the bottom end of the tube gets secured with the same M3 x 12 mm bolt, therefore one stab root rib has a hole for the allen key needed to tighten this connection.

3. Rear fuselage

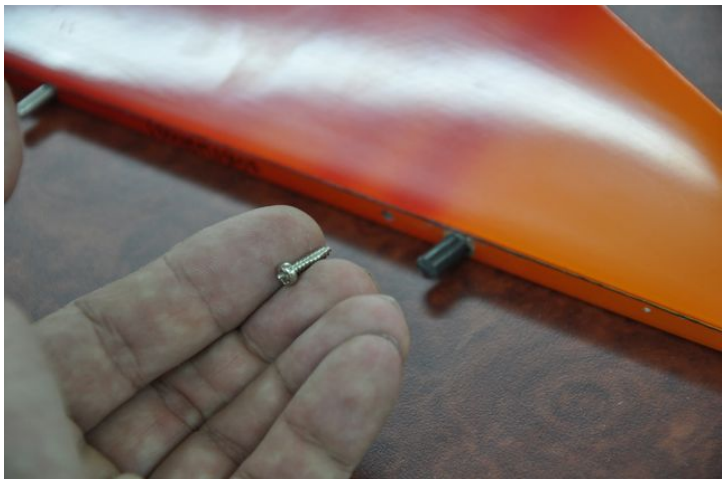
3.1 Bottom fins:

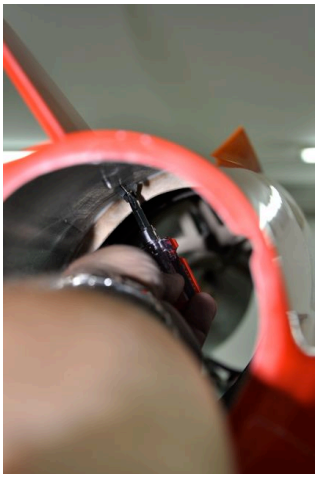
Bottom fin installation is easy. Between the first delivered kits and the final version there are a few differences, but none is significantly better than the other...

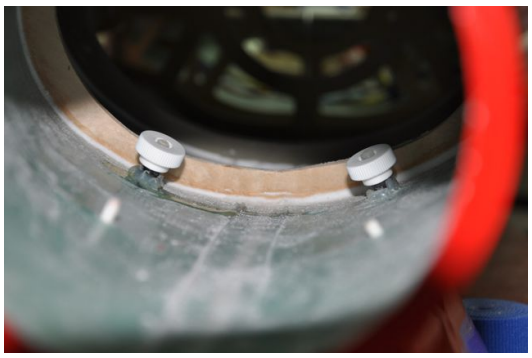
Later kits have a 6mm plastic threaded stud glued into the fins, which are held from the inside with 2 plastic nuts.

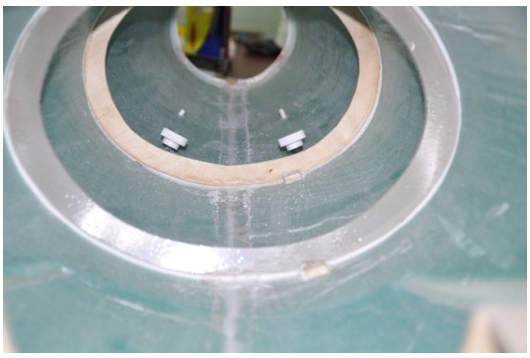
Earlier kits have a carbon dowel instead of the plastic stud and are held on the fuselage with a 2.9 mm sheet metal screw from the inside.

The photos describe both versions.









Above the solution with the 2 M6 knurled nuts tightened from the inside of the fuselage. There will be no clearance issues to the thrust tube at all.

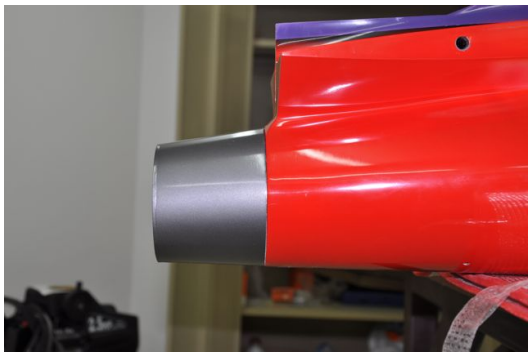
3.2 Engine installation

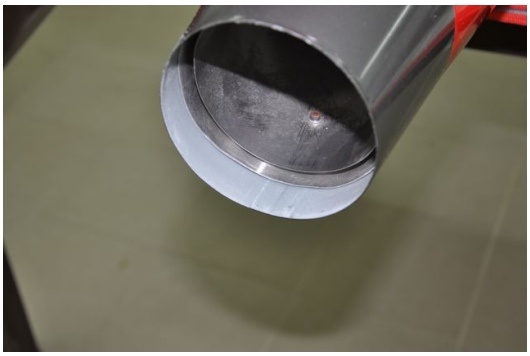
The CARF ViperJet is designed to hold engine, carbon duct and thrust tube as one unit, having it removable for service as one unit as well. We describe the installation of a JetCat P-180RX, which is really the top end of any power solutions for this airplane.

First use a dremel tool with a grinding drum to adjust the diameter of the rear opening so that it just fits the outer thrust tube tightly. The exaust nozzle needs to be fit just the same way on to the outer tube of the thrust tube. Make sure that the 3 notches clear the bolt heads of the thrust tube.

Then slide the stainless tube on to the carbon duct (8-10 mm) and drill 4 2mm holes. Use a long steel ruler to align carbon duct and thrust tube. Then screw four 2.9mm sheet metal screws in to hold everything permanently in place.

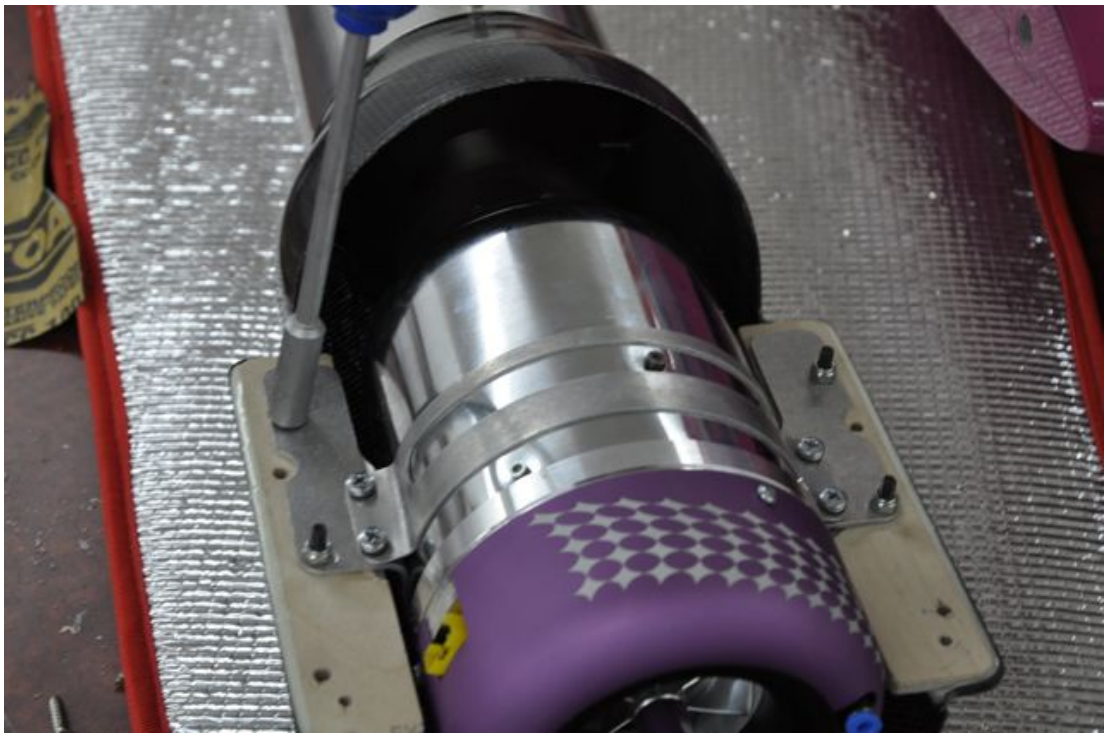
Temporarily slide the thrust tube/carbon duct unit from the front into the fuselage and have the thrust tube extend the fuselage approx. 15mm less than the length of the fiberglass nozzle. Do not glue the nozzle yet. Mark the position of the carbon duct mounting tabs on the wood rails and remove everything again.





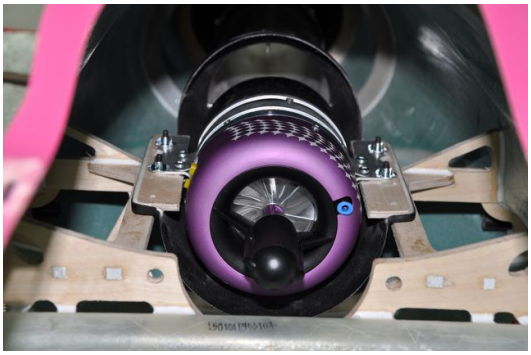
Identify the wood engine mount rails in the milled wood package, glue two 3mm plywood pieces together with CA glue and then glue with 30 min epoxy thickened with some microballoon or milled fiber into the carbon bypass. You will need to round the wood edges to fit the carbon duct nicely. Tack glue some scrap plywood across both rails to keep them aligned parallel. After the glue has set, this little stick can be removed.

Install the aluminum engine mount into the carbon bypass. JetCat recomments a distance from the rear edge of the exhaust nozzle to the beginning of the stainless thrust tube of 15-20 mm. See photos for reference.



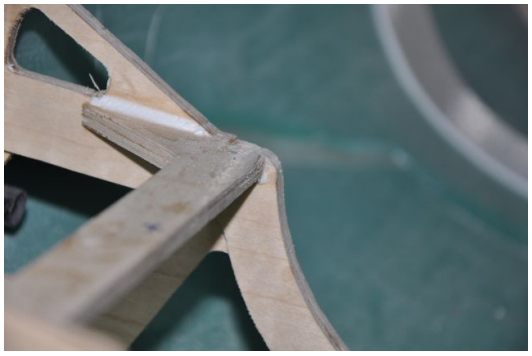
Mount the engine with the top part of the aluminum mount and have a look through the pipe towards the front. Make sure that the engine is perfectly centered in the duct. Since light reflexes can be confusing, find a good spot in the work shop where such reflexes are as neutral as possible.

It depends on the engine and its standard mount whether or not it centers right away in the duct. If necessary, use thin plywood strips to lift the mount up. The mounts of the various engine manufacturers rather place the engine lower than higher inside the duct, so that lifting it up with spacers will correct in the right direction.



The wood rails have 4 holes, they should be used to mount the complete unit inside the fuselage. The forward holes might be a little to far on the edge of the mounting rails inside the fuselage, if so, please drill new holes a bit further back and towards the outer edge of the carbon bypass. The JetCat aluminum mount also needs a little notch in the rear mounting hole area (see photos above).

Drilling the holes to mount the carbon bypass is very easy if you have a dremel with an 90 deg. gear drive. But even if not, you can create easily a tool to drill the four necessary 3mm holes. Use the handle of a cheap small screw driver (cut off and drill with the 3mm drill bit) and glue the drill bit in with a drop of CA glue. It won't take you longer than 5 minutes to drill these 4 required holes into the plywood.



Once the holes are drilled, you can permanently mount the bypass/engine/thrust tube assembly with four M3 x 20 mm bolts and self securing nuts. You can access the nuts easily from the bottom side through the wheel cutouts.

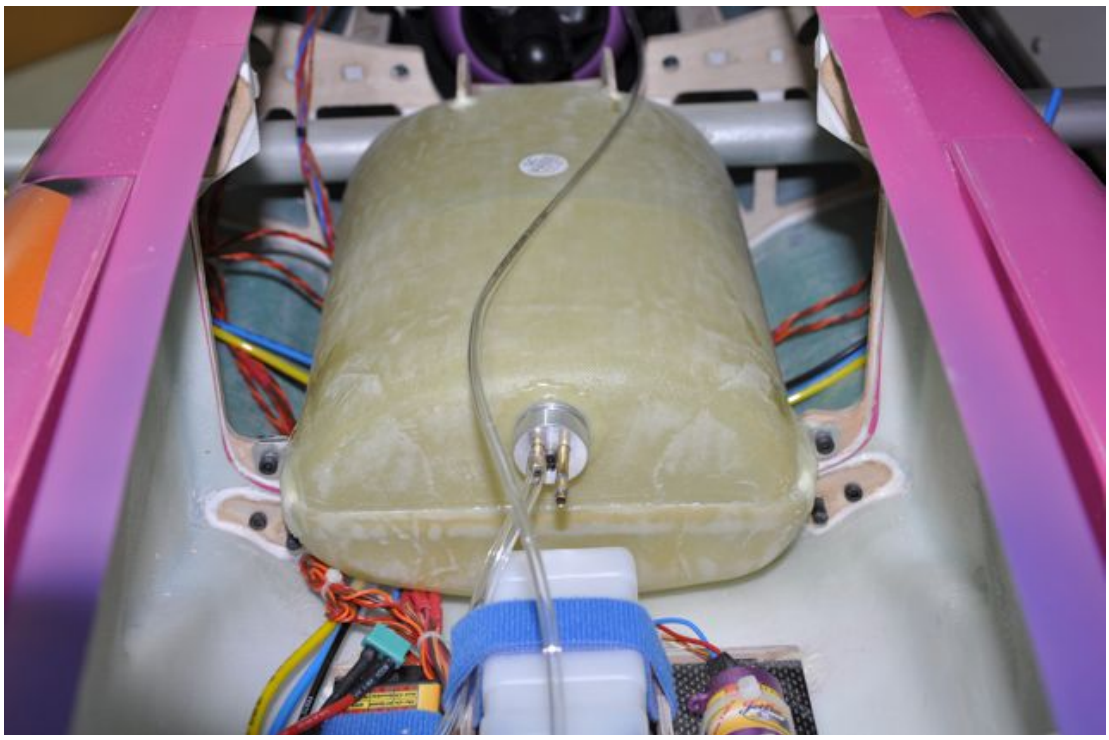
Finally, remove the engine assembly for easier handling of the rear fuselage during the rest of the build.

3.3 Fuel tank installation

The fuel tank is available as optional part from CARF-Models. It can carry 4.2 l of fuel and comes with a hopper tank and full plumbing material.

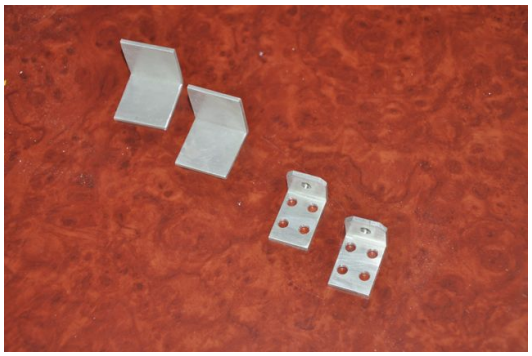
Since the same fueltank is also used in our CT-114 Tutor and our 1/5th scale BAE Hawk , all milled wood mounting accessories are included in the aircraft kit and not in the fuel tank kit.

The Viper fuel tank is mounted with a wood "claw" over the wing tube sleeve and two aluminum angles to the front former of the rear fuselage. The aluminum angles are included in the fuel tank hardware.

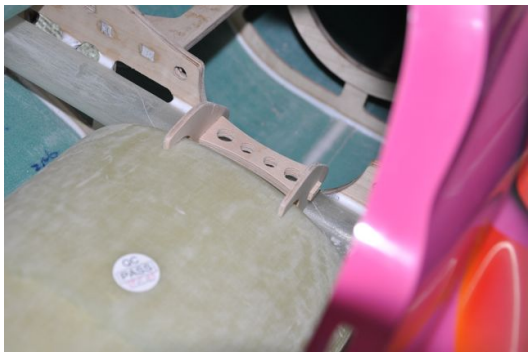


The above photo shows the final installation with completed plumbing.

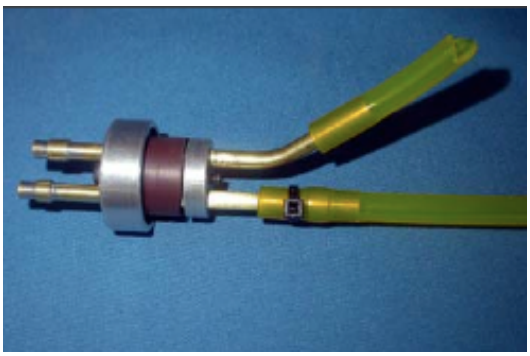
To start the installation, prepare the included standard aluminum angles as shown on the photo below. They have to be narrowed a bit and holes need to be drilled. Besides the necessary mounting hole for the M4 bolt some holes in the opposite flange will increase the strength of the glue joint to the fuel tank.



Assemble the milled wood mount, fit it to the fuel tank and use thick CA glue or 3m min epoxy to glue everthing together.



Install the fuel tank in its final position and tack glue the aluminum angles to the sides of the tank. After the tank is once more removed, fill the joints with 30 min epoxy and add a small piece of fiberglass cloth over the aluminum brackets, as shown on the photo below.



For the plumbing of the fuel tank use the included brass tubes and the short tube pieces. They will help that the fuel tubing won't slip of and need to be soldered on to the 4mm tubes. For the clunk line, at least the front part, you should use a highly flexible Tygon fuel line. The brass tube in the center of the clunk line is mandatory due to the fact that this fuel tank has a fiberglass baffle (you can see the position from the outside of the tank). This baffle would cut the fuel tubing over time, causing an engine flameout for sure one day.

Once the length of the clunk line and the position of the brass tube is determined, the plumbing can be completed. Make sure that all fuel lines sit tightly on the brass tubes. If you use cable ties to secure them, use the thinnest and most flexible ones available and wrap them around TWICE before you tighten them. Also the felt clunk, for safety reason, should get a thin and flexible tie wrap, to prevent the felt tube from sliding off the clunk over time.

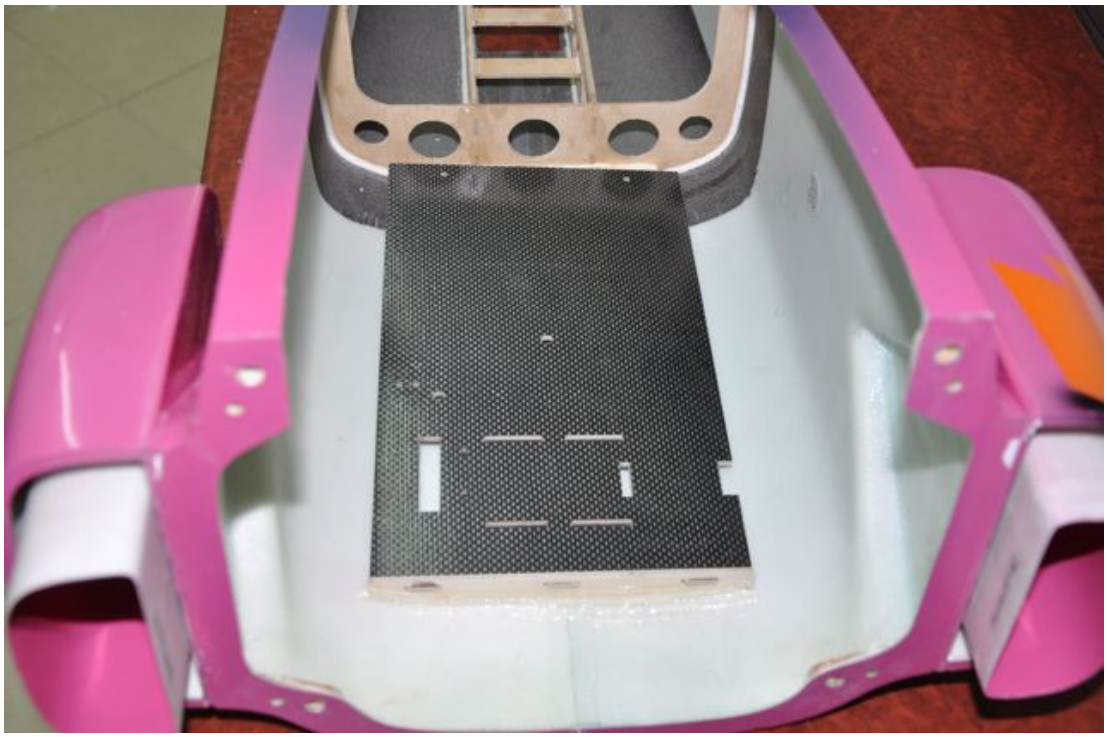
After installing everything permanently, make sure that when turning the fuel tank upside down, you can see and hear the clunk fall all the way to the fuel tank walls.

4. Front Fuselage

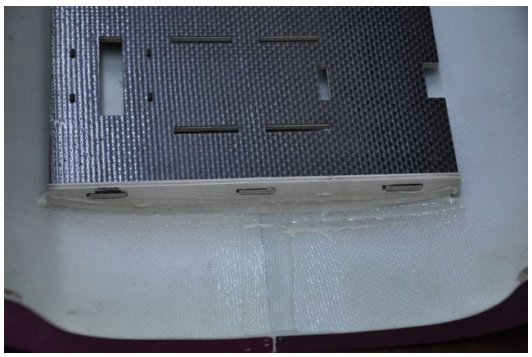
4.1 Equipment tray installation

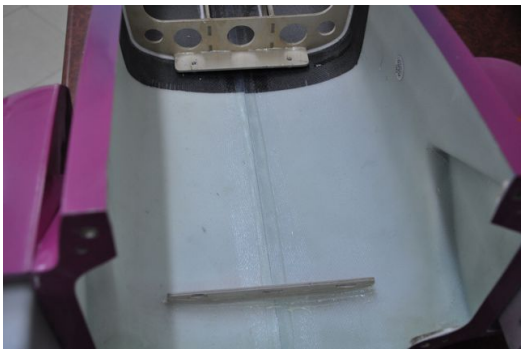
The equipment tray is a milled plywood part. Early ones are carbon sheeted, later ones are plain plywood (due to some concerns of customers regarding RF interference, which we don't necessarily share)

In the front it mounts with two M4 bolts/T-nuts on to a mounting rail, which itself is glued with 3 tabs into slots in the rear gear mount former. Don't forget to press the T-Nuts in before you glue the rail in place with CA glue or 30 min epoxy.

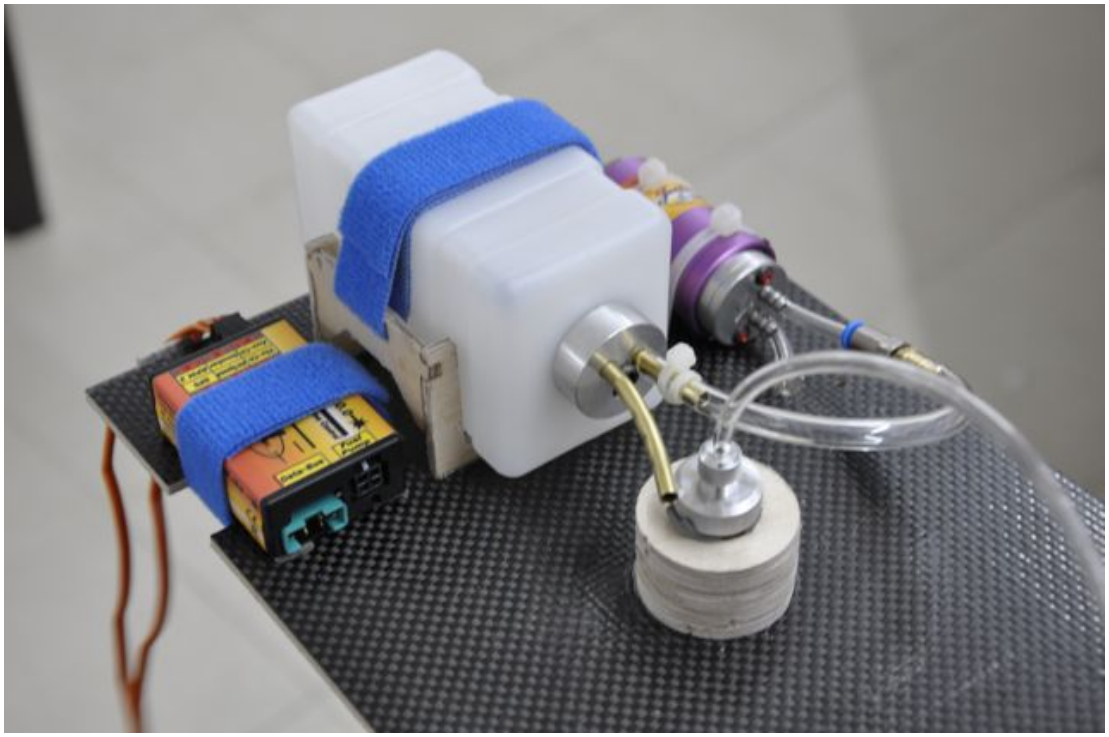


In the rear it mounts with 3 tabs into 3 slots of a small false former, to be glued to the bottom surface of the front fuselage. Glue with CA glue while everything is assembled, then take the tray off and fill the joint with 30 min epoxy nicely.





4.2 Hopper tank / fuel pump installation

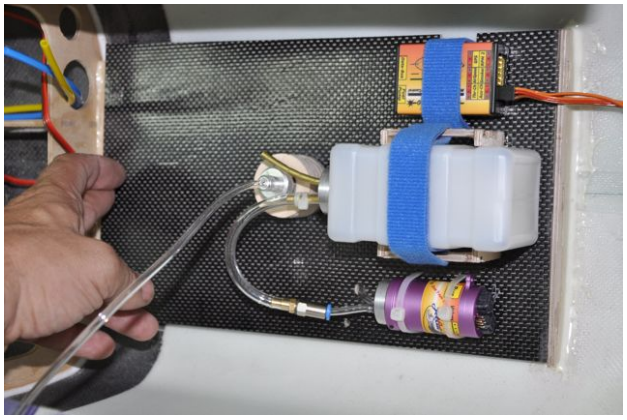


A hopper tank plywood mount is included in the tank kit. Assemble and install with thick CA glue or 30 min epoxy.

The fuel filter should be installed vertically, so that any air bubble cannot be trapped in the system, causing an accidental flame-out once released in flight during aerobatic maneuvers. You will find 6 plywood rings included in the kit, which will give you an idea how to accomplish that.

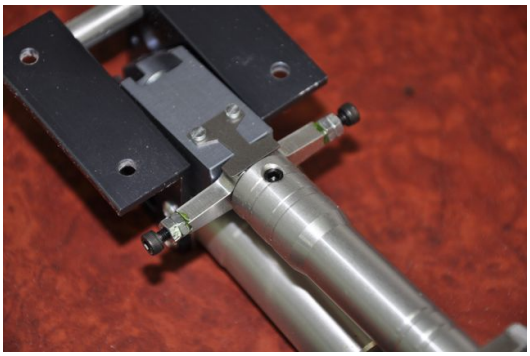
Depending on the shape of the fuel pump and the ECU, you can modify the cutouts and holes in the tray accordingly. The above photo is an example of how things fit well together. But a lot of different, individual installations are possible with the large tray provided. **Always follow the plumbing advice of the engine manufacturer!**

Make sure that you plug all tubes and fuel lines so that no dirt can get in during the further building process.

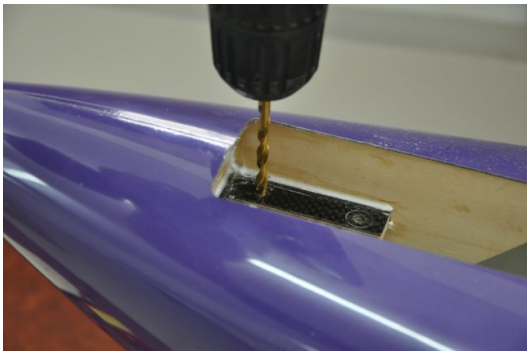


4.3 Nose gear installation

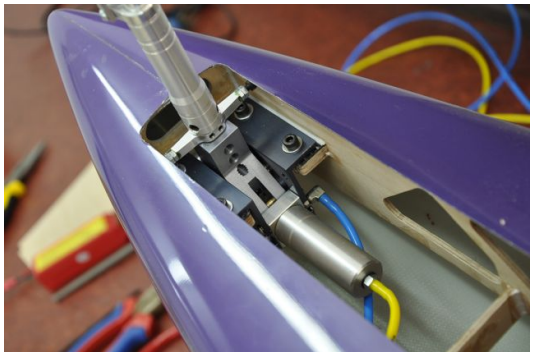
First install the steering horns to the nose gear. At that time, check the small set screws which hold the steering arm to the strut and make sure that they are fully tightened. Then use Loctite to secure the bolts and nuts and counter nuts on the steering horn. Leave just enough clearance between the bolt head and the first nut for one loop of the included pull/pull wire. (1.5 – 2 mm).



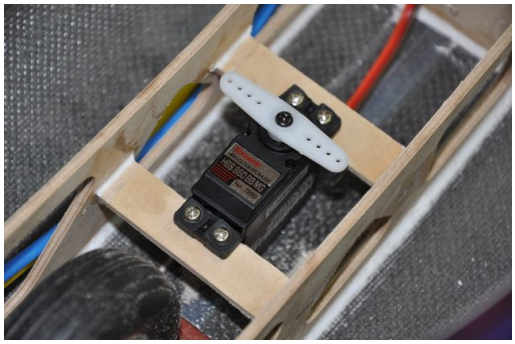
Trial fit the nose gear to the mounting rails. The rear edge of the aluminum frame should be placed at the rear edge of the carbon reinforced wood mount. In order to drill the mounting holes, you might have to extend the rectangular gear cutout slightly towards the front.

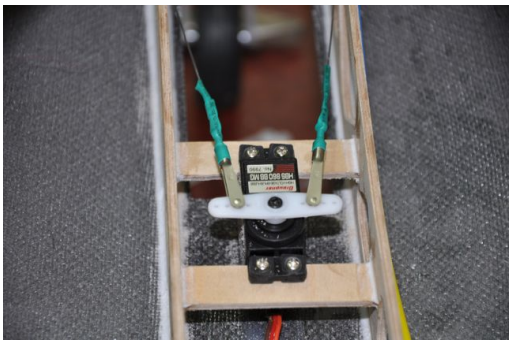


Mark the position of the holes, remove the gear unit and drill the holes with a 5.5mm drill bit. Insert the T-nuts from the opposite side. You do not need to cut the sides of the T-Nuts, even though they might extend a bit over the wood edge. Pull the nut into the wood one by one, using a short M4 bolt. Then finally mount the nose gear with four M4 x 20 bolts and washers.



4.4 Steering servo installation

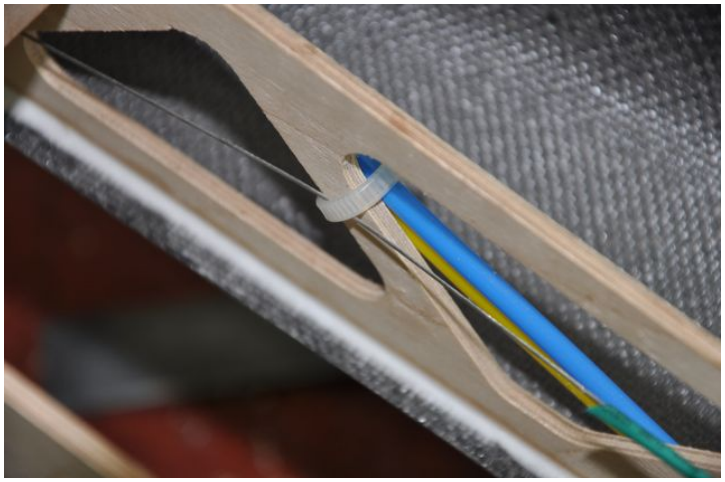


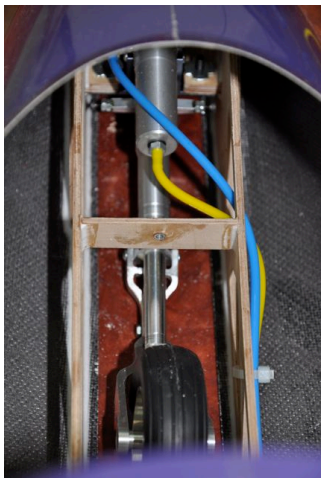


Install the steering servo on the wooden rails. As with all other servos, use the 2.9 mm sheet metal screws included in the hardware bag of the kit.

Make the pull pull wires with the crimp tubes. The front end will just loop around the M3 bolt of the steering horn and is crimped rather tightly. The rear end will feed through the eylet of the threaded end. Turn the threaded end with a counter nut M3 in the spring steel clevis. Slide a shrink tube or a piece of tygon tubing over the pull pull wire before you finally set the length and crimp the wires permanently. Make sure that the length of the pull/pull wires is close to perfect as there will be not much room for adjustment later.

The shrink tube or fuel line will prevent the clevises or pull/pull cables to loop around the servo horn accidentally, when the nose gear is retracted.





Hold the pull/pull wires with cable ties to the wooden formers so that they cannot intefere with the strut and nose wheel during the retracting process.

Install the air lines to the cylinder's air nipples. Please note that if you want to stay with the color coding of the main gears, the attachment on the nose gear must be reversed. This is due to the fact that the mains are inverted units (with the cylinder opposite of the strut when retracted), and the nose gear is a regular unit. So, where you connect blue on the mains, has to be yellow on the nose… and vice versa.

4.5 Air intake installation

First mate now front and rear part of the fuselage and temporarily both them together with the M4 x 20 mm allen bolts.

Then slide the air intakes on and check the fit. They should just fit without any further sanding.

Then sand the triangular surface on the front fuselage and the corresponding area at the air intakes with some course sand paper, apply thick CA glue and install both right and left air intake tightly against the rear fuselage. Use some easy to remove clear tape to hold it in place.

Note: The air intake is glued against the front fuselage, not the rear fuselage!

Be careful that no CA glue can get between front and rear fuselage or the joint surface between rear fuselage and air intakes.

Once the air intakes are securely taped against the front fuselage, remove the front fuselage and let the glue set. After a few minutes you can use further CA glue to run around the seam so that the joint becomes safe and secure.

4.6 Canopy Installation

As usual with any CARF Model, the canopy is glued into the frame from the inside. The canopy frame is already mounted to the fuselage. Double check the front pins and the rear tab and tighten the bolt to make sure everything fits without binding. You might have to extend the rear slots slightly to the rear in order to remove the canopy frame easily, after stiffened by the canopy glued in.

Cut the canopy to fit the rear canopy frame. Use sharp scissors and a hair dryer, to heat the clear canopy material slightly before cutting. Cut the rear end first fit it over the canopy frame and use a pen to draw the cut lines with sufficient excess material, which can be carefully and step by step be removed.

Do the same with the front part of the canopy.

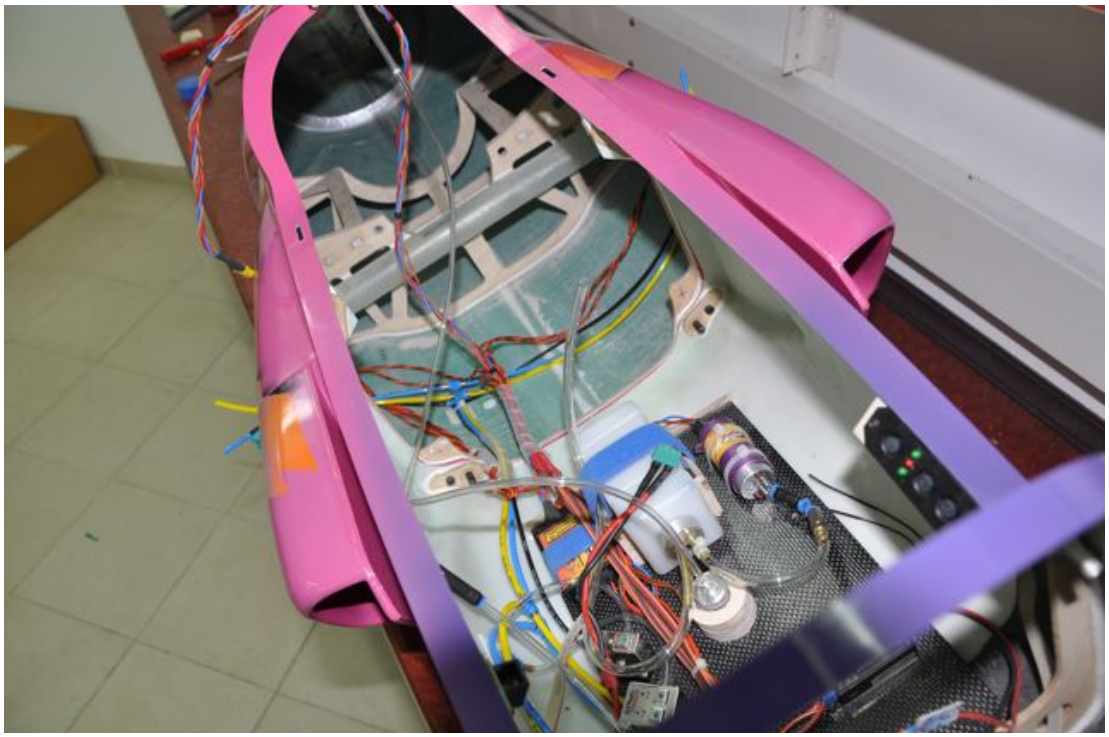
There are a few techniques to glue the canopy successfully. Tack glue with CA, so that the canopy frame cannot twist after removed from the fuselage. Then apply 30 min epoxy from the inside along the contact area and let it soak between canopy and frame. Some like to use small permanent magnets, some attach tape handles to the outside of the clear canopy to pull it against the frame while gluing.

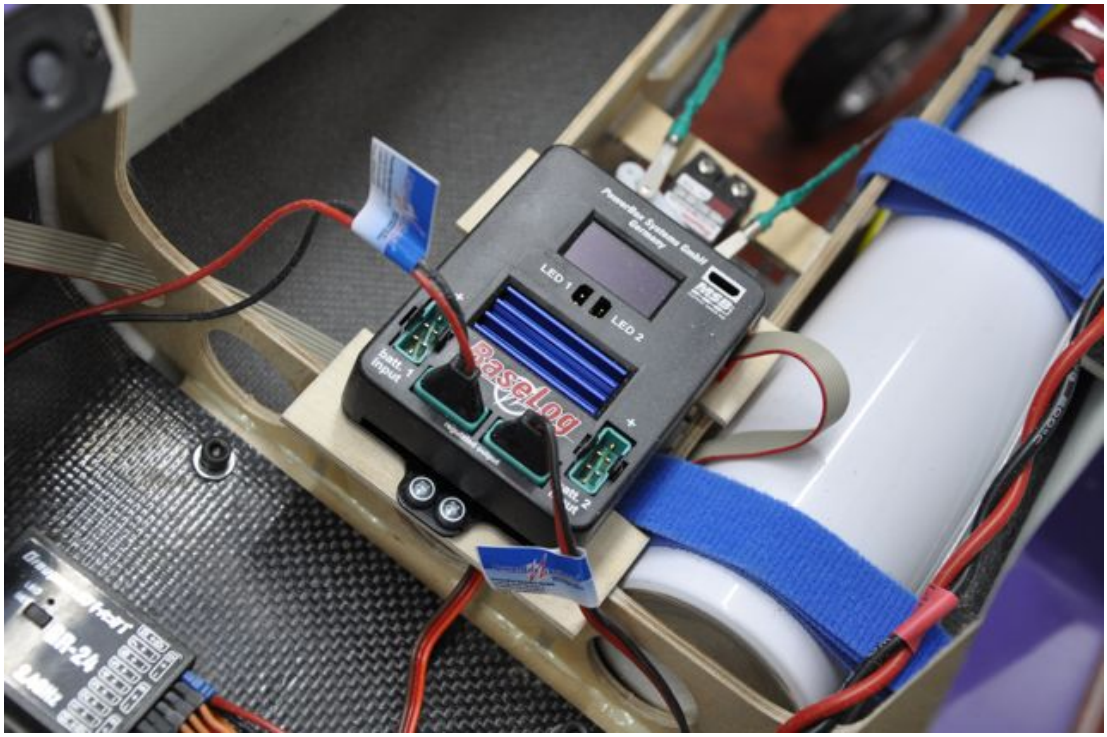
There are plenty of methods. One condition is crucial, though: Patience! Don’t rush and you will have a great result! Think twice before cutting and work in slow steps during gluing.

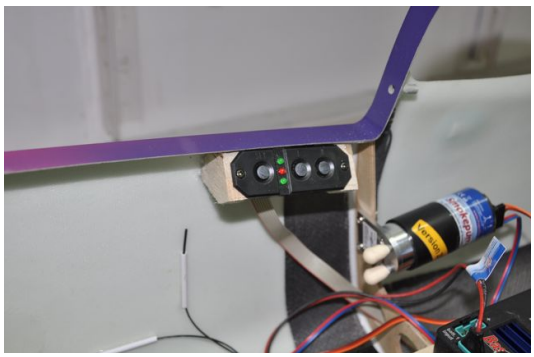
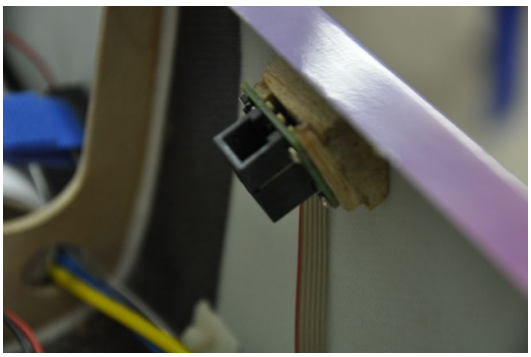
Finally, a bead of grey or black silicone can optically enhance the outside of the frame/canopy joint. Mask the clear canopy 3mm parallel to the frame before applying the silicone, wipe with your finger any excess off and create a nice fillet. Finally remove the masking tape. You patience will be rewarded for sure!

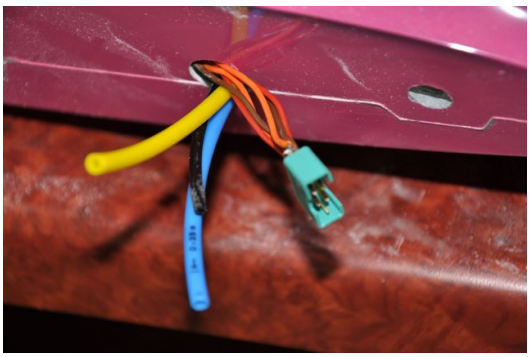
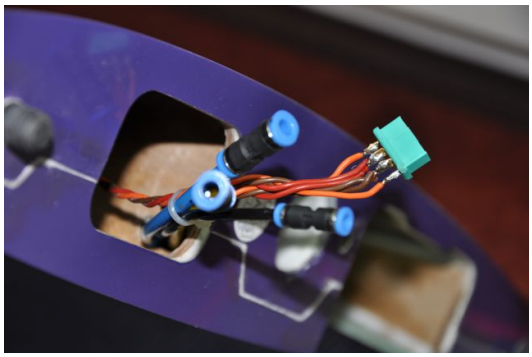
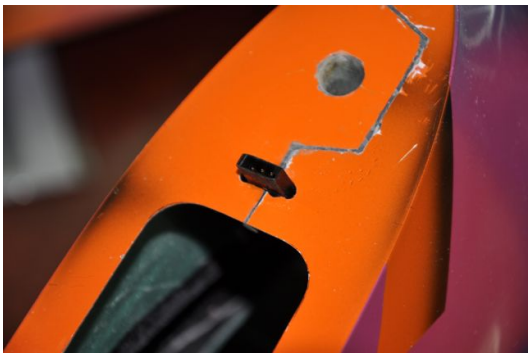
5. Final rigging and plumbing (temporary)

This part is a temporary one, to get this building manual on the way without further delay. Final installation is anyway very individual, so we hope that a few photos will answer eventually upcoming questions.





Receiver/Powerbox: Please follow the instructions of the equipment manufacturers. Keep wires suffiently dimensioned, but as short as possible. CAUTION: Make sure they can't rub on sharp glass or carbon edges. Use rubber grommets where applicable! Use the regular JR or Futaba connectors for elevator and rudder. However, on the wings, we recommend to use the 6 pole MPX type connectors.

Smoke preparations: Mount the smoke pump as shown in the pictures. We recommend to use our Rookie fuel tank kit, which will fit very well into the fuselage above the engine, right behind the canopy. Adjust size to your liking.

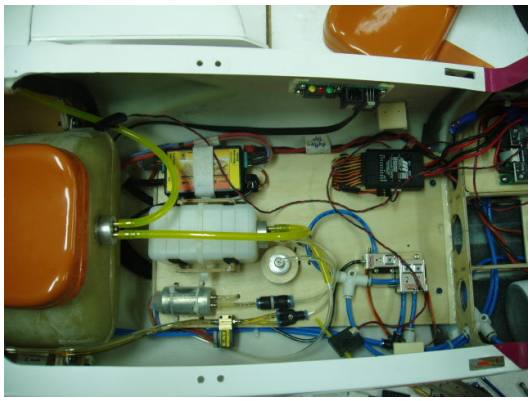
6. Cockpit (temporary)

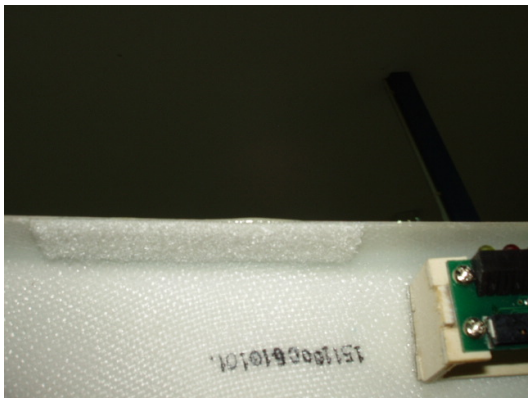
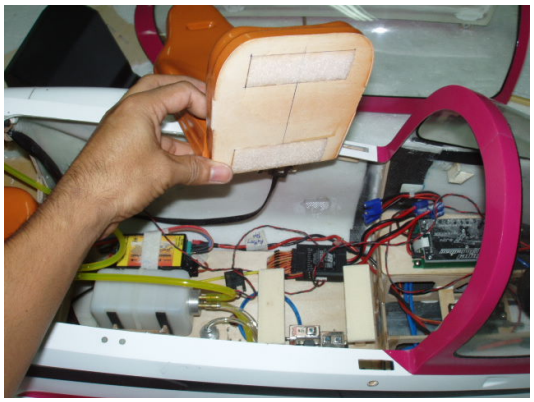
1) cut and assemble the vacuum formed plastic parts

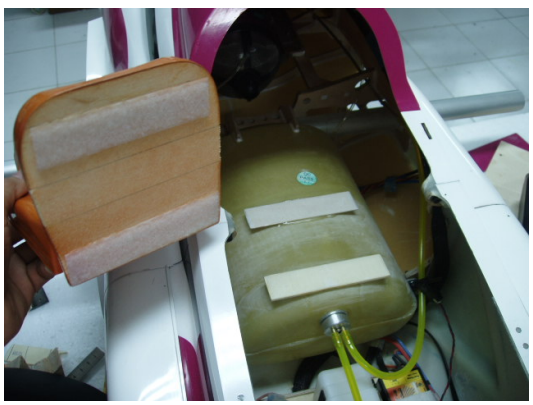
2) Install the mounting boards and brackets as shown on the photos
The rear seat is mounted directly on the fuel tank, the front seat gets a mount built from the 2 square 10mm foam blocks, to keep the distance to the equipment board and 2 plywood rails on which the Velcro gets glued.

3) Paint the seats and decks and use the printed instrument panels.

4) Install everything with the white Velcro (glue Velcro with contact glue to the according surfaces.





7. Flying preparations

Control Throws:

Aileron: +13/-20mm
Elevator: +/- 35 mm in take off and landing, +/- 20 mm in flight
Rudder: max rate, 65-70mm both sides
Flaps: max rate, 75-80 degree (use powerful servo!)

Center of Gravity: Front edge of wing tube.

Except the very first kits, we have included two milled plywood jigs for easy setting of CG. But even without these jigs, you can mark the front edge of the wing tube to the bottom wing and support the plane with your thumbs. This is done easiest on a model stand.

It depends on your flying preference. For 100% neutral knife edge you should move the CG another 10-15 mm forward. But this will give the plane a noticeable nose-heavy feel. Some like it that way.

If you want to fly rather tail heavy, you should not move the CG further back than the center of the wing tube.

For any of these settings, you might have to use several hundred gram of lead, which can easily be packed into the tip of the nose. Don't hesitate to balance the plane to your liking, even if you need lead to accomplish this. The plane feels extremely light in flight and even 400-500 gram (1lb) of weight will not cause any problems.

This manual will be completed within a few weeks at most and will then be available for download on our website.

Thank you for your patience and we wish you a lot of fun with your new toy!