3DHobbyShop.com Extra 300 SHP 87" Assembly Manual

Thank you for purchasing this 3DHobbyShop ARF RC aircraft. If you have any issues, questions, concerns or problems during assembly, please contact our tech department at:

Info@3DHobbyShop.com or 1-830-990-6978 10am-5pm Central M-F

SAFETY in Assembly
During assembly of this aircraft, you will be asked to use sharp knives, hot irons, and hobby adhesives. Please follow all safety procedures recommended by the manufacturers of the products you use, and always follow these important guidelines:

ALWAYS protect your eyes when working with adhesives, knives, or tools, especially power tools. Safety glasses are the best way to protect your eyes.

ALWAYS protect your body, especially your hands and fingers when using adhesives, knives, or tools, especially power tools. Do not cut toward exposed skin with hobby knives. Do not place hobby knives on tables or benches where they can roll off or be knocked off.

ALWAYS have a first-aid kit handy when working with adhesives, knives, or tools, especially power tools.

ALWAYS keep hobby equipment and supplies out of the reach of children.

SAFETY in Flying
ALWAYS fly your aircraft in a safe area, away from spectators.

ALWAYS fly your aircraft in a safe manner, within your control.

NEVER fly too close to yourself.

ALWAYS wear eye protection while operating your model aircraft.

ALWAYS keep your hands and body clear of propellers.

ALWAYS observe lipoly battery safety procedures.

ALWAYS handle gasoline in a safe manner.

ALWAYS perform a ground test and range check of your radio system before flying.

REQUIRED ITEMS

30 Minute Epoxy Glue (**NOT** 5-minute Epoxy)
Polyurethane Glue for hinging if desired
Hobby Knife
Soldering Iron
Phillips Screwdriver
Set Metric Allen Wrenches
Small Pliers
Wire Cutters
Rubbing Alcohol
Paper Towels
Blue Loctite thread-locking adhesive
Dremel-type rotary tool
Small adjustable wrench or wrench set

Developer's Notes

I'm exceptionally proud to be able to introduce the new 3D Hobby Shop 87" 50cc Extra 300 SHP. It is the culmination of over a year of in depth aerodynamic, airframe, and component development. From the beginning our primary focus was creating not only a World-Class 50cc sized aerobatic model, but arguably the premier 50cc aerobatic model on the market today.

The development process began concurrently with the development of the 3D Hobby Shop 55" electric Extra SHP. As it turns out, the development process for the 55" SHP led both us to the conclusion that the airframe's aerodynamics were so close to perfect that we absolutely NEEDED a bigger version. As is obvious comparing the two models, very few aerodynamic changes were required to tap into the 55" SHP's superior traits in the larger 87" SHP. In fact, it is very nearly a direct scale up externally.

So what makes this model different from the competition? From my perspective it can be distilled down to one word – compromises, or rather the lack of any. From drawing number one, we refused to compromise on aerodynamics, components, or assembly. On the aerodynamics front, the SHP uses our thin 10% "Stoops" 3D airfoil to offer incredible pitch responsiveness, rock-free harriers, clean snap performance, and superb tracking. We spent the time to precisely tune each airframe component's (wing, stab, fin/rudder) area, moments, and location to eliminate airframe coupling allowing arrow straight KE performance right out of the box. With nearly pattern tail moments, the SHP tracks exceptionally well making it a superb IMAC performer on lower throws. 3D performance is enhanced by super deep control bevels allowing 75+ degrees of throw on the elevators and 45+ on the ailerons and rudder. Additionally, our focus on light but strong construction created a model that is 75cc sized, in a 50cc weight range. It has the lightest feel of any 50cc model I've ever flown. In all, the SHP offers excellent precision traits blended with superior 3D performance available with the flip of a dual rate switch.

During the process, we also made the commitment to offer the highest quality component package and build experience possible. This includes pin-point hinges, a full hardware package including ball links, control rods, a preinstalled canopy (no gluing!!), pre-assembled firewall, pre-mounted internal fastener cowling, and super strong phenolic control horns. We've done our absolute best to ensure not only a simple assembly process, but also one that eliminates many of the harder or less "fun" steps (think canopy glue!).

Another area we chose to up the ante a little over the competition is our landing gear and spars. We know you like carbon (we certainly do!), so we've given you carbon – lots of it. Both the wing spar and tail spar tubes are carbon, as are the sleeves in each wing and stab half. The biggest piece of carbon on the airframe, however, is the main landing gear. Unlike most manufacturers layered carbon gear that delaminates easily, our carbon landing gear is a curved airfoil shaped molded CF unit that is far more durable. After many rough harrier landings, the prototype landing gear units are holding up incredibly well. Rounding out the carbon is our CF tailwheel assembly that bolts into preinstalled blind nuts. Like you, we think carbon fiber offers superior rigidity and weight savings. Sure it costs a little more to produce, but we think the SHP is worth it.

For the IMAC crowd, we've also included a preinstalled can tunnel and all of the hardware to attach an MTW 75K canister muffler to get the dB's you need – no user engineering required! Also in the box are several motor mount drill templates to precisely locate the mounting holes for a variety of different motor selections. We also include an in-depth electric "conversion" guide and motor mount/selection guidance section for the giant-scale electric enthusiasts in our midst.

At a recent event the 87" SHP found its way into the hands of renowned World-Class aerobatic pilot Andrew Jesky. After his flights on the model, I asked him what he would change about the model. His response? Nothing - don't change a thing. In fact, he liked it so much that one went home with him. I feel the same way about the model. If I had to fly one model , and only one model for the rest of my life, the 87" SHP would be it.

Scott Stoops

IMPORTANT NOTE: 3DHS Recommends ONLY High-Torque, Digital, Metal-gear Servos for this aircraft. Suitable part numbers include Hitec HS-5955TG, JR 8611A, and JR 8711A. DO NOT attempt to use nylon-geared servos on this airplane.

Assembly Instructions

UNPACK

Unpack your airplane and examine the components. Check for damage of any kind. If you find any damage, contact 3DHobbyShop and report the damage.

COVERING SEAMS

There are many seams in the covering on this aircraft where one color meets another. We recommend using a covering iron or trim sealing tool to go over all of the covering seams on your Extra. This will help to prevent any peeling of the covering. Repeat this periodically.

WRINKLES

Your Extra was packed at the factory without any wrinkles in the covering. You may notice some wrinkles now; more likely, you will notice a few in a day or two or the first time you take the plane out to the flying field. These wrinkles are the result of wood shrinkage and/or expansion. Balsa wood changes size and shape slightly as it is exposed to varying humidity in the air. This is a natural property of balsa wood. As your airplane adjusts to the weather in your part of the world, wrinkles may appear and disappear. Wrinkles may be removed with the gentle application of heat to the covering material on your airplane, using an iron and/or heat gun. Apply the heat gently: the covering material will shrink as you apply the heat, and this will remove the wrinkles. BE CAREFUL! Too much heat applied too quickly can damage the covering, either by causing it to pull away from the wood at seams and corners or even by melting it. Wrinkles do not affect flight performance.

COVERING MATERIAL

Your Extra is covered with genuine OraCover material, and we have included repair sections in your kit. If you need to repair larger sections, matching covering is sold at most hobby stores under the “UltraCote” brand.

Hinging

Your Extra uses hinge-point type hinges. The airplane has all of the holes drilled in its surfaces and the hinge points are in those holes, but they need to be glued. We suggest working with one surface at a time, because this job needs to be done properly and it is very difficult to fix a mistake made in this step.

Start with an elevator half. Remove the elevator from the stabilizer, being sure to keep all of the hinge points organized according to which hole they came out of. **Because some of the elevator hinge points are shortened to clear the internal structure, you will need to re-install these hinge points into exactly the same holes they came out of.**

Although the holes are already drilled, you may need to open up the end of the hole slightly, using either a drill bit or a grinding stone on a dremel rotary tool. This is to allow the center section of the hinge point to fit easily in-between the stabilizer and elevator. In this photo, we have used tape as a depth-gauge to keep from going any deeper than 1/4 inch.



Open each hole with the drill bit, and then use a cotton swab to apply Vaseline to the center hinge portion of the hinge point to protect it from the glue.



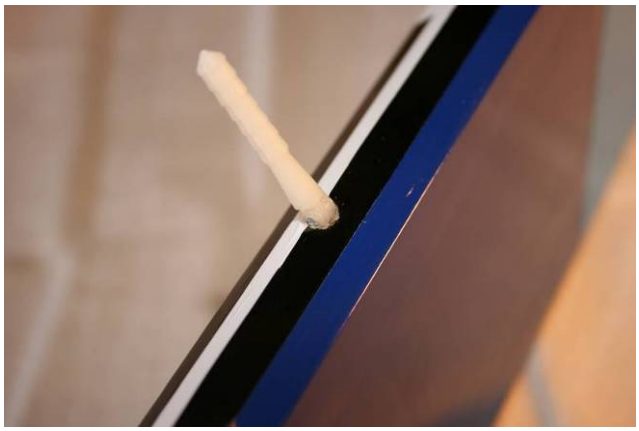
Apply the Vaseline only to the center of the hinge point where the two halves hinge together. We have also used oil applied with a syringe, but the Vaseline stays in the center of the hinge point better than oil.

Apply 30 minute Epoxy glue to the inside of the holes in one surface. In the following photo, we are using the end of a nylon zip-tie to apply the epoxy inside the hole.



Insert the hinge points into one side, and carefully align them so that they sit perfectly centered in their holes.

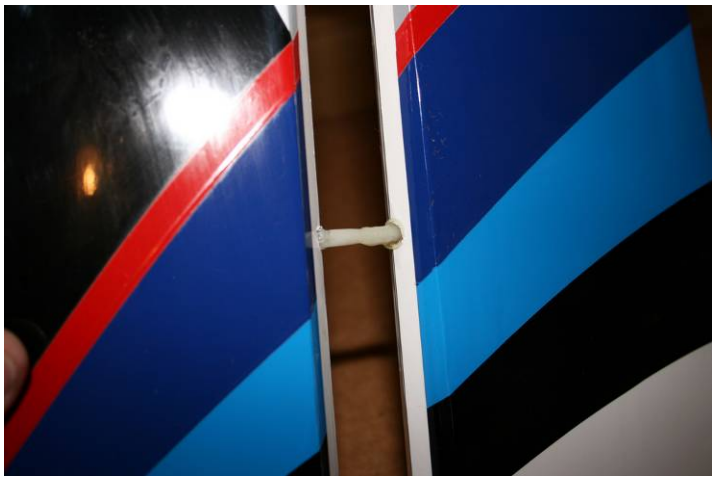


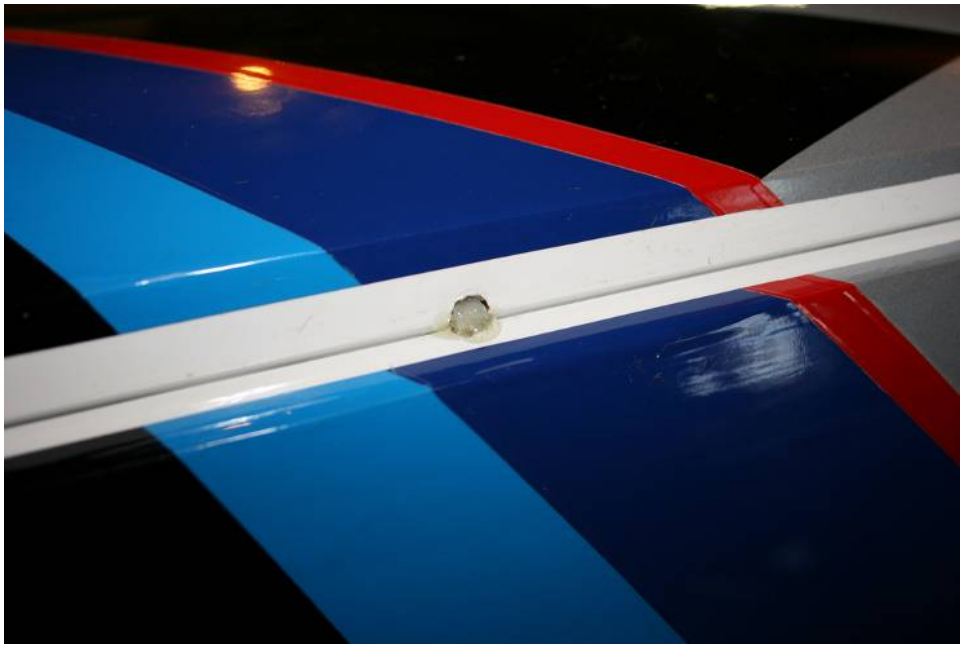


Clean up any excess epoxy which comes out of the holes with a paper towel and rubbing alcohol.

Make sure the hinge points are properly centered and aligned, and set the surface aside to allow the glue to cure.

Once the glue has cured, repeat the procedure to install the opposite surface. Push the other surface up tight against the first one; they should almost touch. Please see photos. Use paper towel and rubbing alcohol to clean up any excess epoxy.





Sumo Glue for Hinges

While we recommend the use of high-quality Epoxy during hinge assembly, another good alternative is Sumo brand water activated adhesive. It dries clear, dries quickly, and doesn't need to be mixed prior to use. Here are a couple of hints for using Sumo glue in hinge assembly applications.

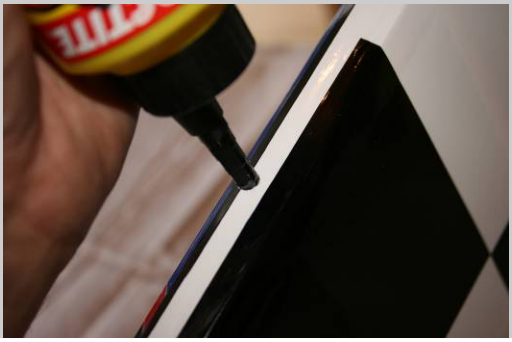
1. The glue tip nozzle needs to be sanded to fit into the hinge pocket to avoid a mess when inserting the adhesive.
2. Lightly wet each hinge pocket with water prior to inserting the hinges. We find a wetted "Q-tip" works best.
3. After all hinges are installed and the surfaces joined, be sure to clean the hinges several times. Sumo adhesive expands in the hole and needs to be cleaned from the hinge area with denatured alcohol. Most of the foaming occurs in the first hour.

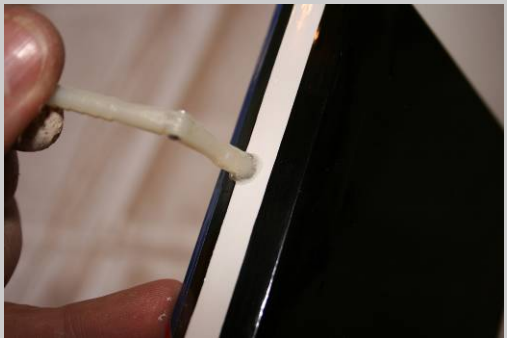












Install all of the rest of the hinge points on the airplane using the same procedure.

Elevator and Aileron Control Horns

Your Extra features phenolic CNC-cut control horns. The slots for the horns are pre-cut into all of the control surfaces.

You will need to remove the covering over each of these locations.

The best way to trim covering on this aircraft is with a hot pencil-tip soldering iron. This method gives a clean cut and also seals the edges of the covering at the cut line. You can also use a hobby knife if you cannot use a soldering iron for this job, but the iron is recommended.

1. First, locate the control horn location in each control surface.

2. Cut away the covering over the two slots.

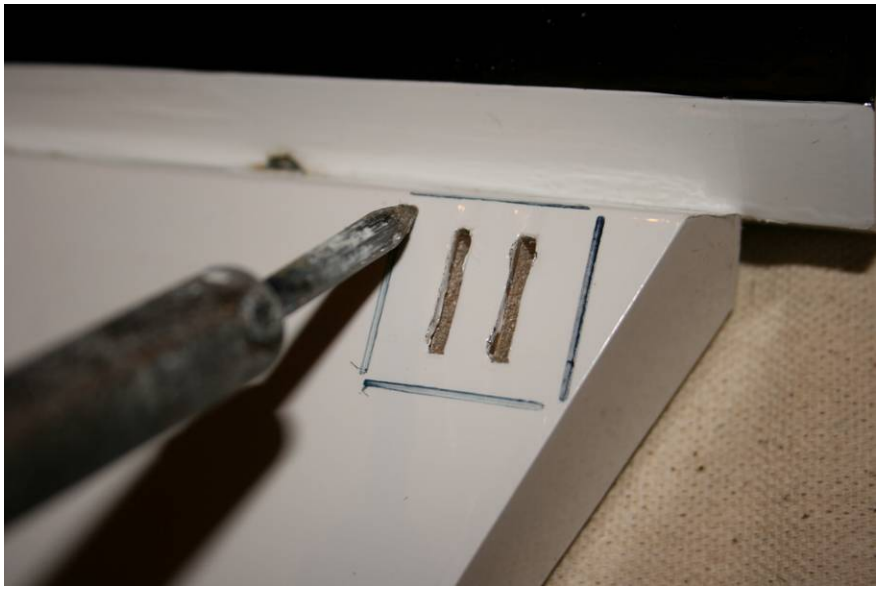
3. Assemble the control horns as shown, and temporarily push the horn into the slots in the control surface (do not use glue at this time).

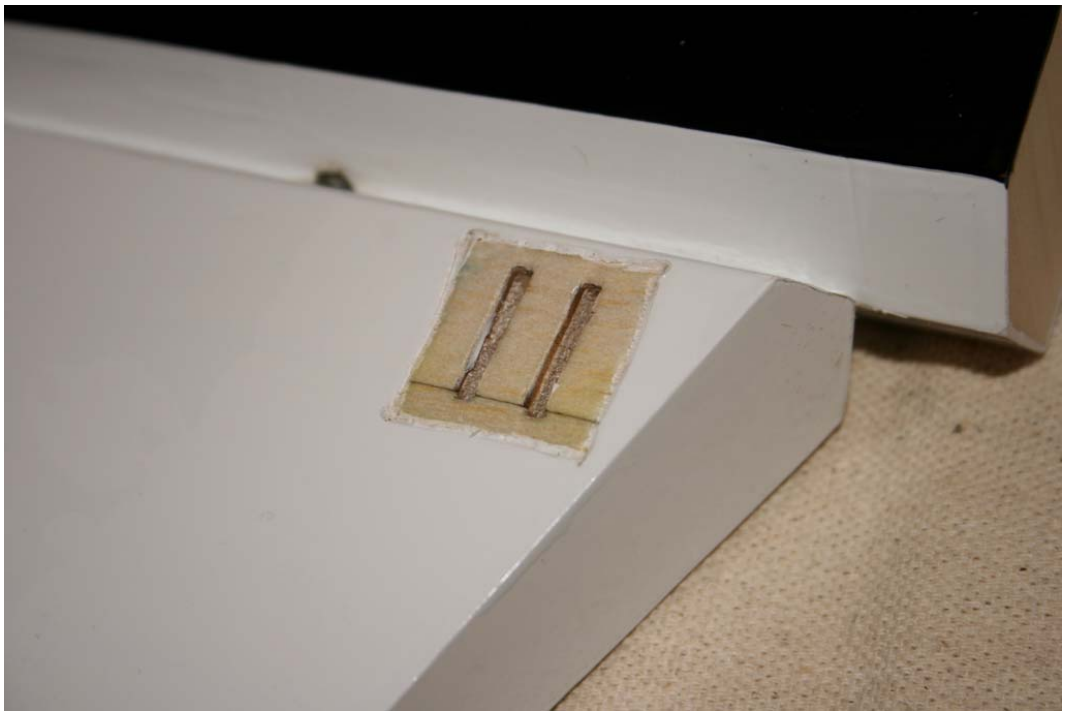


4. Using a pencil, mark around the outside of the square base of the control horn.

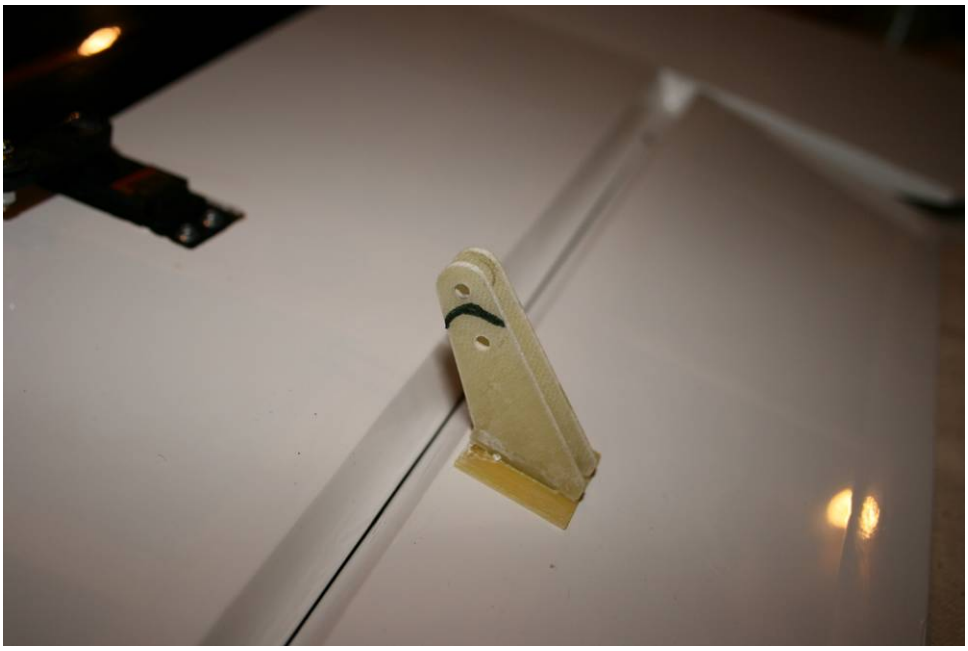


5. Remove the horn and use the soldering iron to trim the covering just inside the square mark you made with the pencil.





6. The control horns will need to be trimmed as shown. Use a dremel tool with a sanding drum attachment. Do this work in a well-ventilated area and use eye protection!



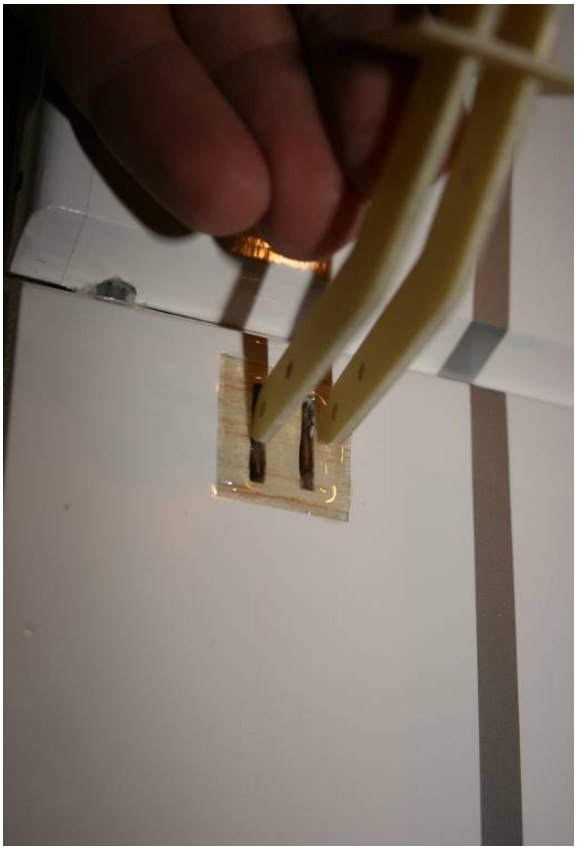
7. Apply 30-minute epoxy liberally to the bottom of the horn and to the wood of the control surface. Install the horn. Wipe up excess epoxy with a paper towel and alcohol. Temporarily install a 3mm bolt through the bolt holes to ensure proper alignment of the two horn halves. Allow the epoxy to cure.

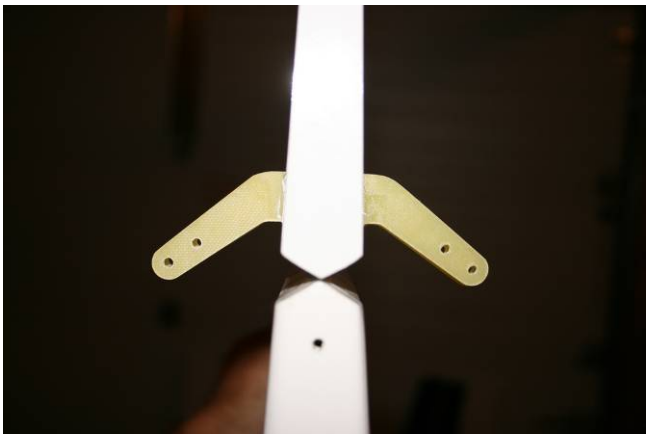


Rudder control horn

The rudder control horn is installed in a similar fashion, except that it is double-sided. Remove the covering on both sides of the rudder over the slots as you did for the elevators and ailerons, apply epoxy

to the center of the two horn pieces, and install into the rudder. Use alcohol to clean any excess epoxy and temporarily insert two 3mm bolts through the holes in the horn to ensure alignment while the glue cures.





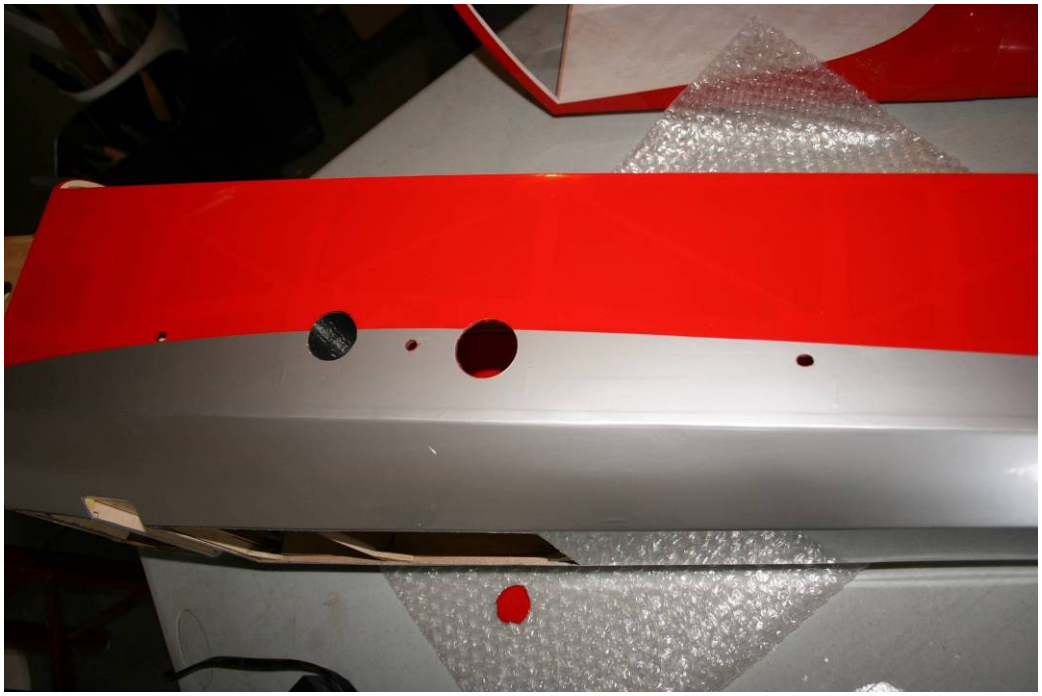


Trim the rudder horn outer holes away (as on the other horns) if necessary to match the width of your rudder servo horn.

Fuselage and Landing Gear

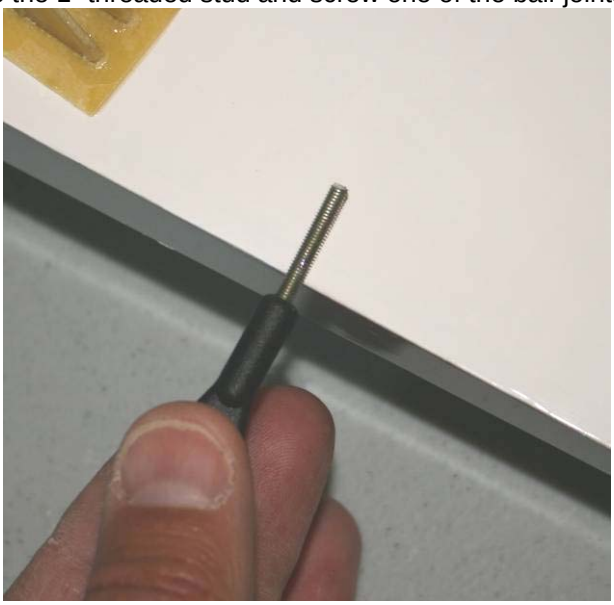
Take your soldering iron and remove the covering over the necessary locations in the fuselage as shown:





NOTE: The large holes in the bottom of the fuselage are for the canister exhaust outlet and cooling cover. You do not need to remove this covering for electric power applications, and it is optional for gas engines with stock or pitts mufflers.

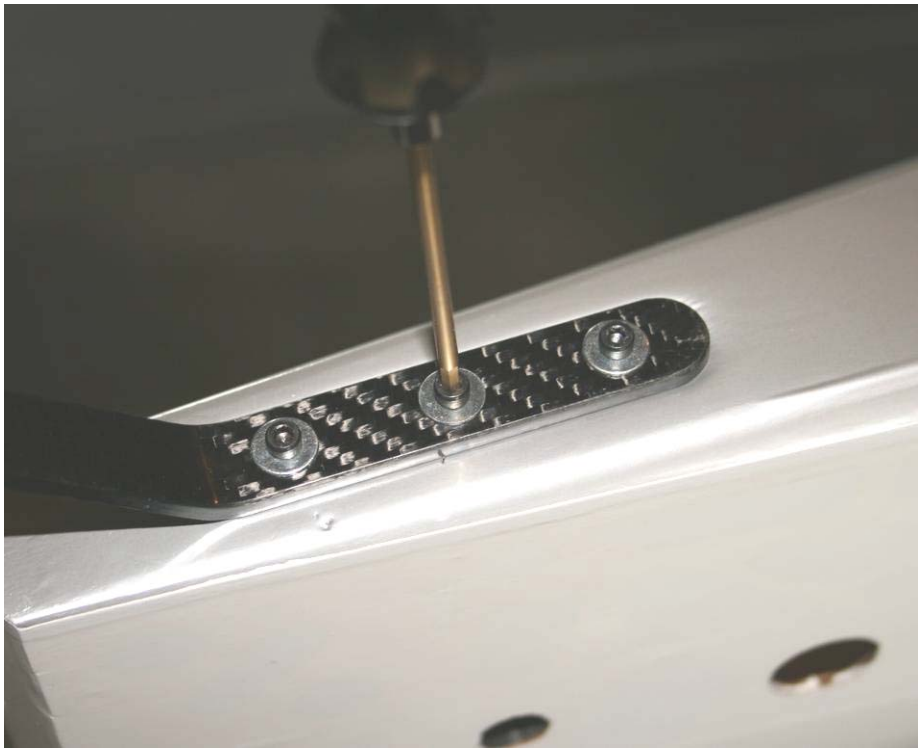
Measure back 2 inches on the bottom of the rudder from the hinge line, and drill a 3/32” hole into the bottom of the rudder. Take the 1” threaded stud and screw one of the ball-joints onto the stud as shown.



Place epoxy or sumo glue onto the stud and screw the stud and ball-joint into the rudder as shown. Allow the glue to dry.



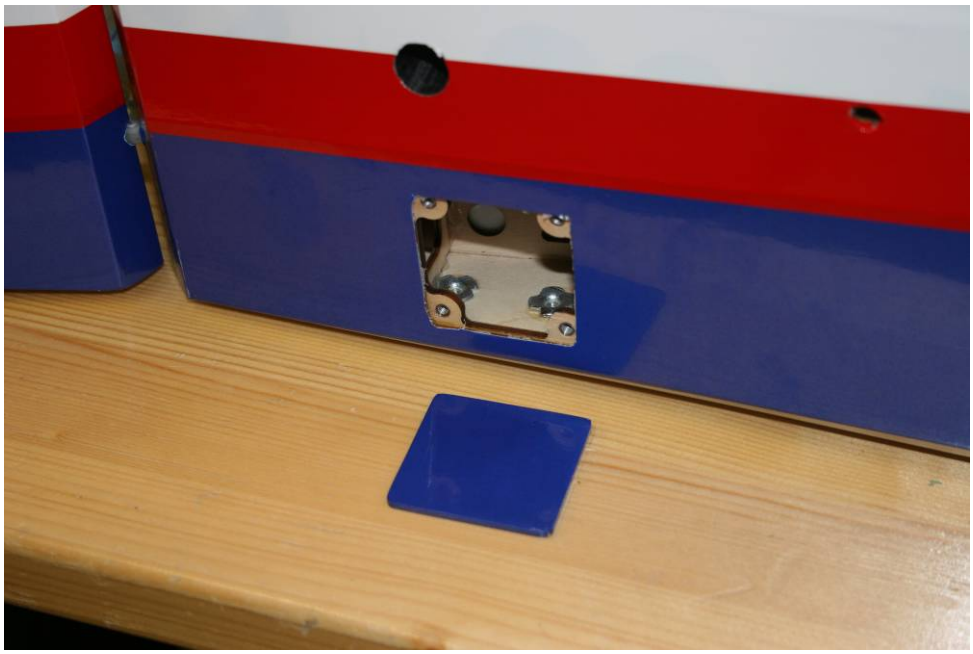
Take the tail-wheel assembly, tighten all set-screws on the assembly using blue Loctite to lock the threads. Attach the tail-wheel assembly to the bottom of the fuselage as shown, using the supplied 3mm bolts. 3mm nuts are already installed inside the fuselage, open small holes in the covering as needed. Bend the tiller-wire as shown to fit.





NOTE: Tailwheels can be easily damaged by rough fields or rough flying. Replacement tailwheel assemblies are available, and we have provided a hatch on the airplane, as shown below, for access to the tailwheel mounting plate. This hatch is also useful if you wish to add tail-weight to your aircraft.

Access this hatch by removing the covering as shown, the cover is included and is retained by four 3mm screws.



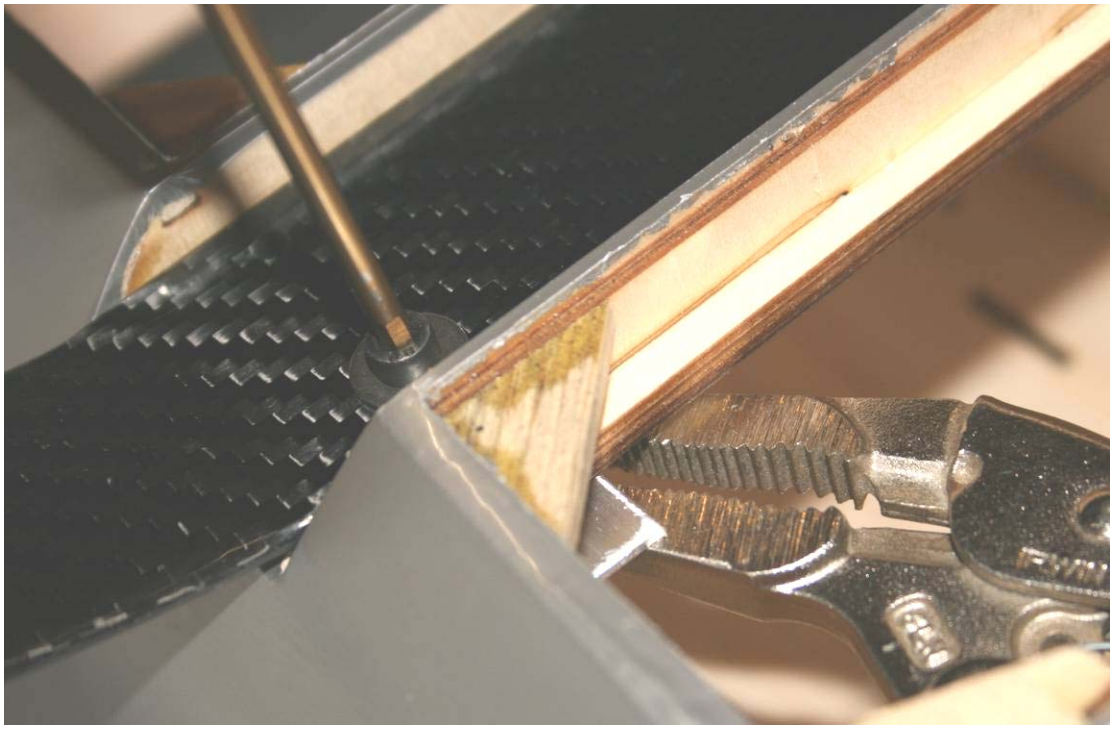
Locate the wheel axles and nuts and attach to the landing gear as shown.



Install the inner wheel collar, wheel, and outer wheel collar. Use a dremel tool with cutoff wheel to trim away the excess axle length as needed. CAUTION! Protect your eyes with safety glasses while using the dremel tool.



Install landing gear onto the bottom of the fuselage using socket-head bolts, washers, and locknuts as shown. Afterward, use epoxy or CA glue to install the landing gear cover-plate onto the bottom of the landing gear mounting area.



The wheel pants are molded with a narrow axle slot. We suggest widening the axle slot in the pant with a dremel tool as shown. This allows the pant to slip over the axle, and you can undo the 2 pant mounting bolts to easily remove the pant for transport or rough-field operation.

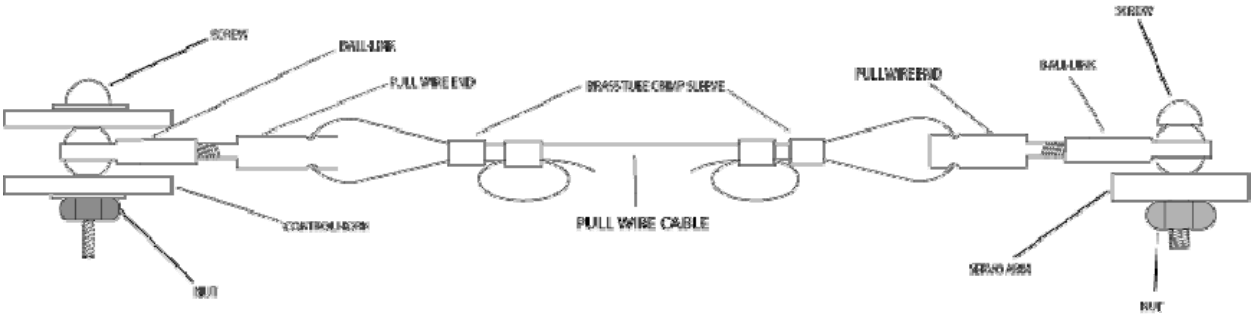


Slip the pants down over the wheels and axles, fasten to the landing gear legs with 2 3mm bolts.



Pull-Pull cables

The pull-pull cables for the rudder are assembled as shown in the following diagram:



Scott's Tip –

There are a lot of different opinions on the correct sequence for this step, so I'll add that this is just my technique: I prefer to use two crimps per surface attachment at both the servo and rudder. I've always had a hard time trying to get the line tight and also run through the initial link a second time. Instead, I tighten and crimp the initial crimp, then run the second crimp doubled. This is especially helpful when rigging the final two crimps while setting tension.



Assemble the pull-pull cables at the rudder end first, as shown, and feed the cables through the slots in the fuselage and pull them to the front of the fuselage.

Center the rudder servo. Install the rudder servo as shown.



Assemble the pull-pull ends and ball joints onto the rudder servo arm as shown, and attach the pull-pull cable using the same technique as before.



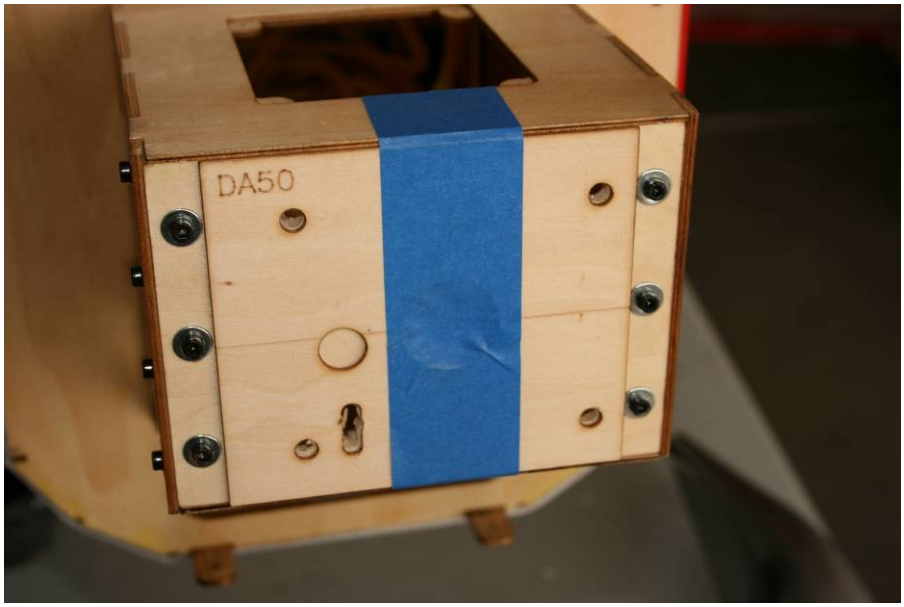
Adjust the lengths of the pull-pull cable to get good tension (just snug, with no sag, and no play in the rudder – “banjo-string” tight pull-pull wires will not make your plane fly better, but they will wear out your servo).

When you are finished adjusting the pull-pull cables, apply thin CA glue to each of the crimps.

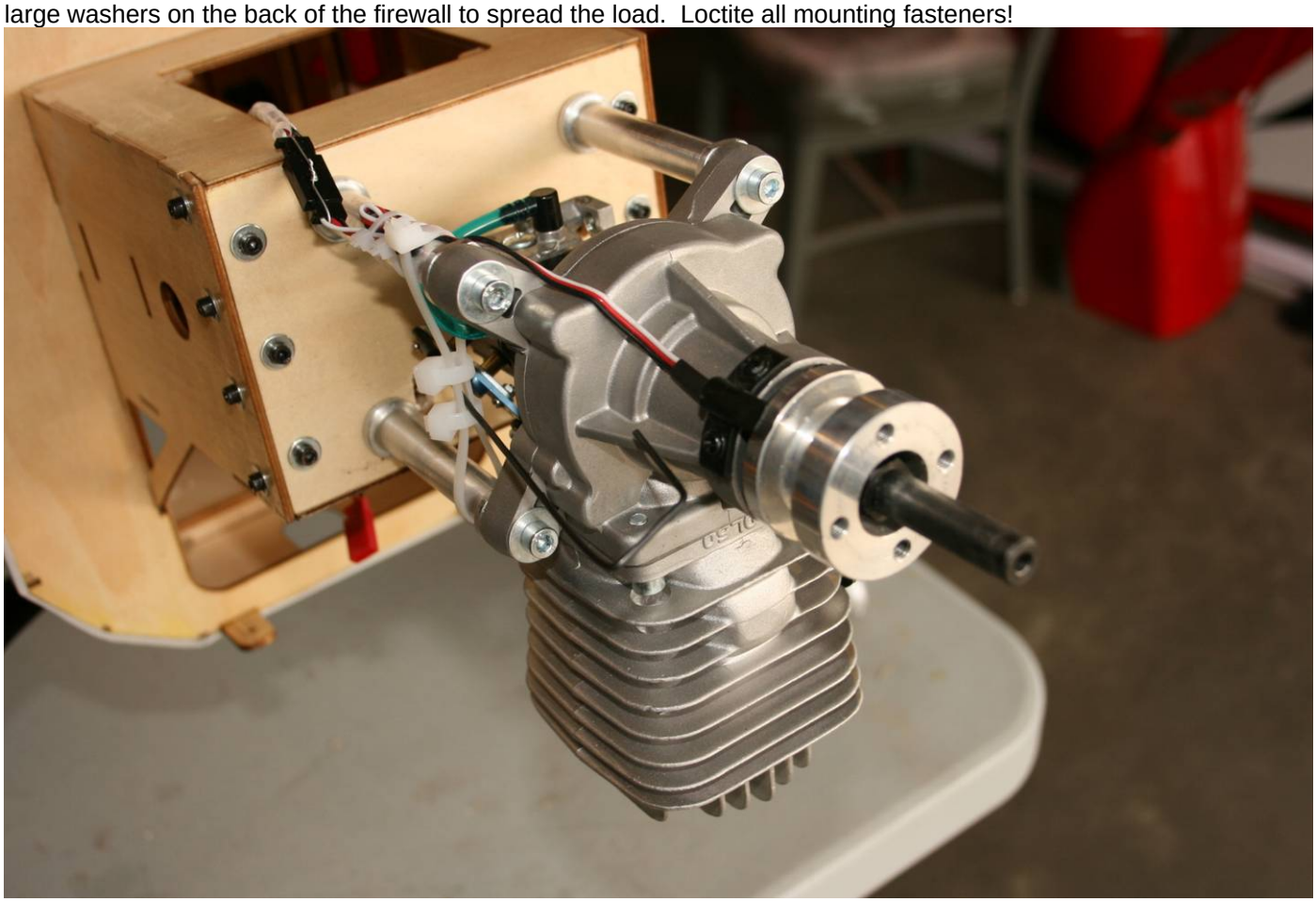
Engine Mounting

The Extra can use a variety of 45-55CC single cylinder engines. This manual shows the installation of a DL-50. Other engines are similar. Templates are included to locate the mounting holes for the DA-50 (same as DL-50, although you may need to very slightly slot the holes to fit the DL) and 3W engines.

The correct distance between the firewall mounting surface and the prop mounting surface on the front of the engine is 6 and ¾” inches. Tape the pattern in-place on the firewall as shown and drill the engine mounting holes. Included on the pattern is the location for the throttle-pushrod slot for use with the throttle-servo location in the bottom of the motor box. Note that this may require you to flip the carburetor over on some 50CC engines. Remove the pattern after drilling.



Using threadlocker on all mounting hardware, attach your motor to the firewall. It is a good idea to use large washers on the back of the firewall to spread the load. Loctite all mounting fasteners!



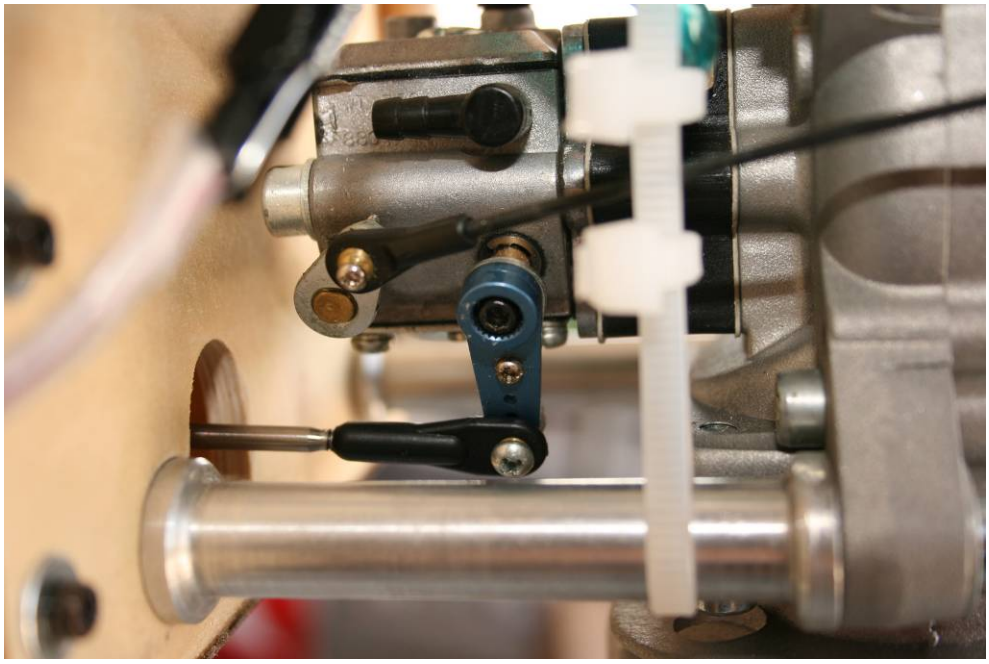
We have provided more than enough fasteners to secure the firewall to the engine box, if one of your engine-mounting bolts interferes with one of the firewall attaching screws, remove the firewall attaching screw if necessary – the engine-mounting bolt will take over its job, provided that your washer overlaps the aluminum angle-iron bracket.

Scott's Tip –

We used the DL-50 engine on this build, and although the DL includes a phenolic add-on throttle arm, I found that a Hitec aluminum control horn worked very well to extend the throttle arm.





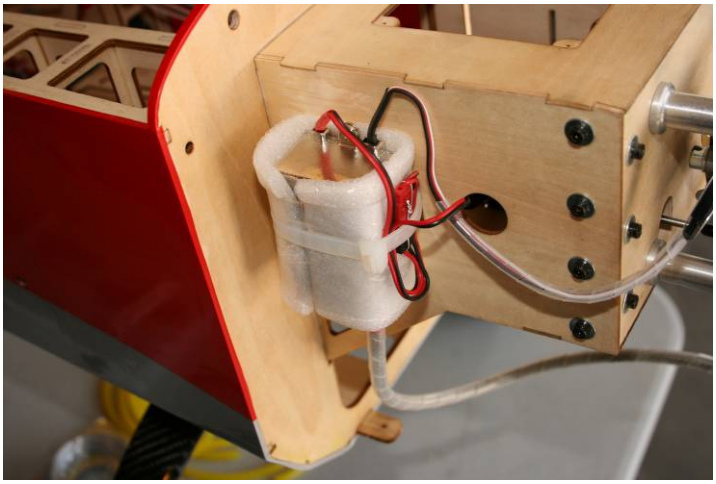


Scott's Tip - I can't lay claim to this technique, but I prefer to avoid using a choke servo and rig the choke manually on a pushrod that can be accessed through the cheek cooling air inlet on the cowling. I used a small ball link, steel pushrod, and three medium length zip-ties. The zip ties create a housing of sorts for the pushrod to run in. Very simple and bullet proof.

You have several options for mounting your throttle servo. We have provided a location in the bottom of the engine-mounting box behind the firewall. This hole is cut for a full-size servo. We have also provided adaptor plates you can glue over this hole to fit Hitec or Futaba mini servos. The throttle linkage is provided in the kit. Note, this installation may require you to flip the carburetor over on your engine as shown above to line the throttle arm up with the servo arm.

We have also included two servo mounting boxes for full-size servos. These can be used to place throttle and choke servos anywhere you need within the engine mounting box. The choke linkage is provided in the kit. Use good epoxy glue to attach these servo mounting boxes to the airframe.

Mount the ignition box using a piece of foam rubber between the box and airframe to isolate the box from vibration.



Fuel Tank

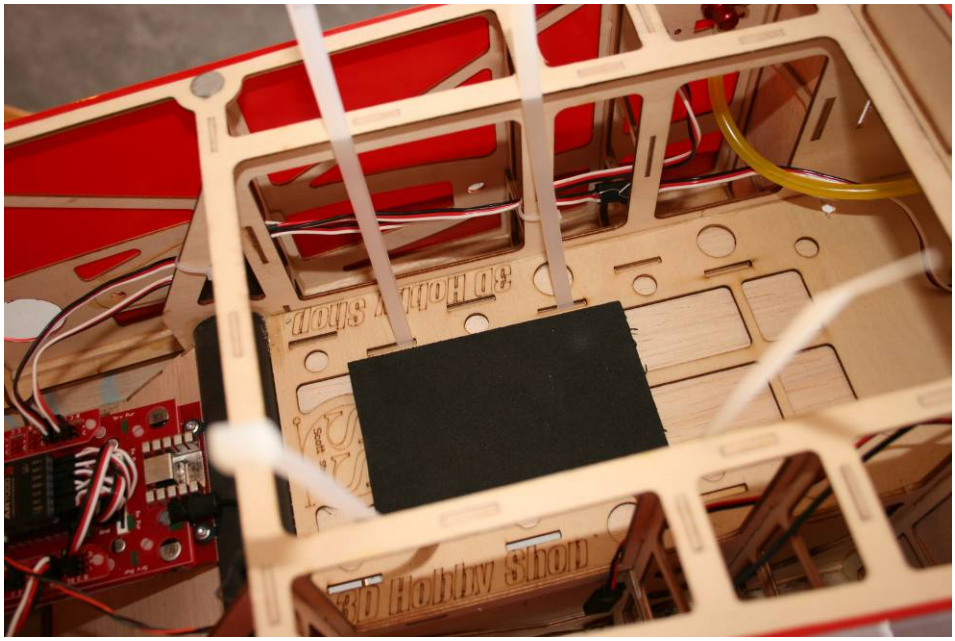
We recommend a two-line system for fuel, installed as follows:

Assemble the fuel tank as shown, using small nylon zip-ties as hose clamps to retain the flexible fuel tubing onto the rigid metal tubing. Place a piece of foam rubber under the tank to isolate the tank from vibration, and install the long nylon ties through the slots in the tray as shown.





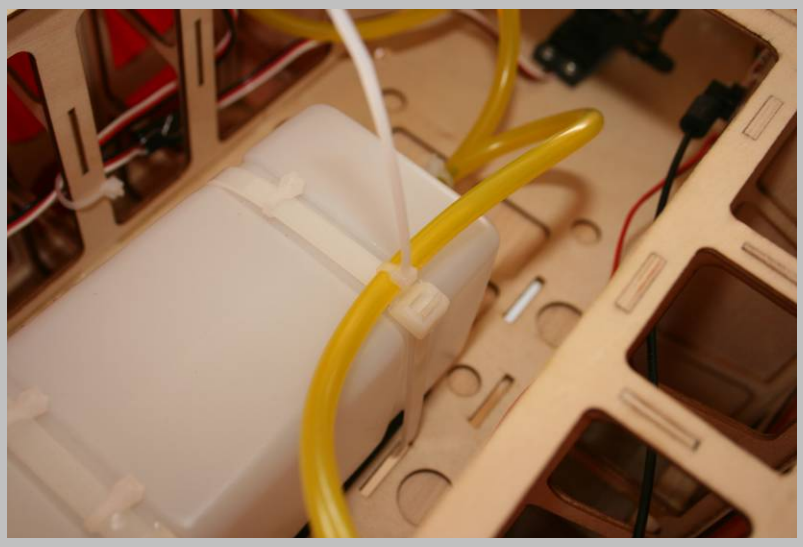


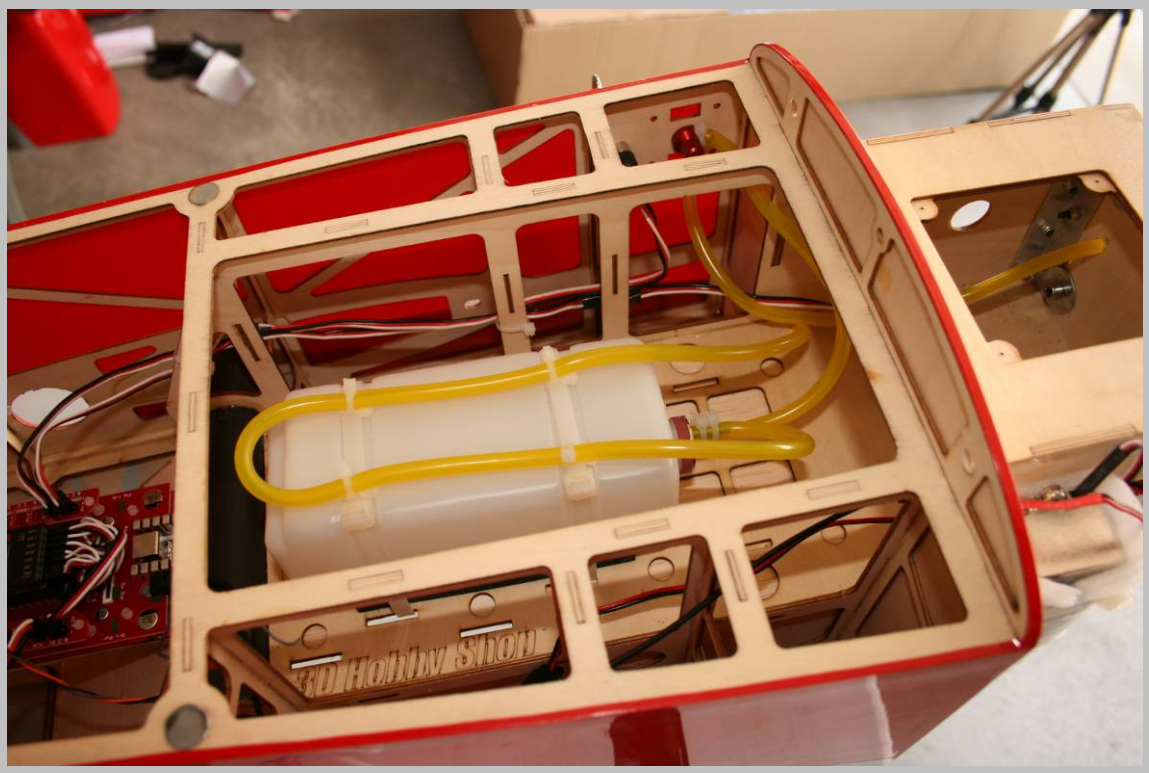




The fuel-feed line runs from the tank, to either a Du-Bro gasoline filler valve or a Y-connector and fuel dot, and then to the carburetor.

Scott's TIP - To eliminate fuel loss during aerobatics, I run the fuel vent line aft of the back end of the fuel tank. I've found the easiest method is to use small zip-ties to create a housing for the vent lines to run in. See photos:





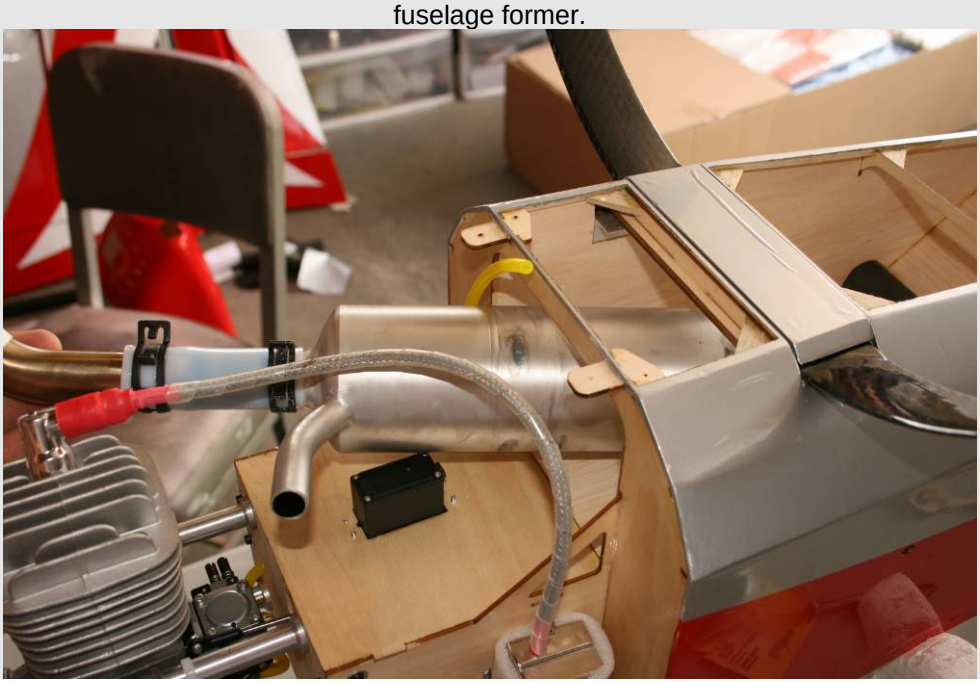
Run the vent line into the cowl and out the bottom as shown:



Exhaust Canister Muffler Installation

The Extra includes pre-fabricated mounts for the MTW TD-75K short canister muffler, available from Desert Aircraft. I

Slide the canister part-way into the canister tunnel, you will need to twist the can as it goes in to clear the fuselage former.



Slip the canister mounts onto the canister from the rear, F3 first, and then F4. Note that you will need to trim F3 to clear the landing gear braces as needed to allow F3 to slide fully forward into position.

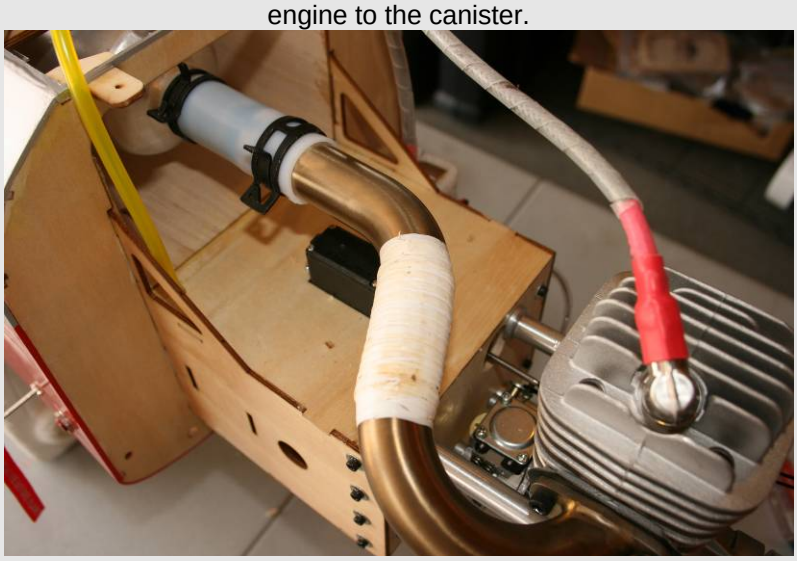


When you have F3 and F4 fully into position as shown, tack them in place with CA glue and then apply epoxy to permanently mount them.





In this installation, we have used a “Medium Drop” flex header from Desert Aircraft to attach the DL-50 engine to the canister.



Pre-drill the screw holes as shown, and use 6 wood screws to attach the canister-cover plate and 4 screws to attach the outlet plate.



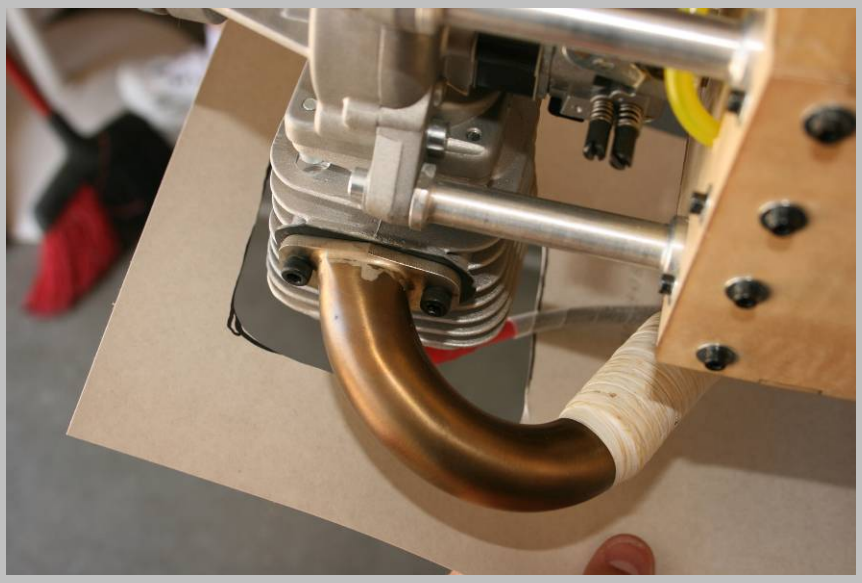
Cowl Installation

The Extra cowl must be cut to allow clearance for the cylinder, spark plug, and muffler (if canister is not used) of the engine. We recommend the use of a dremel rotary tool for this step. Use eye protection and work in a well-ventilated area.

Scott's Tip – I make a simple template from a piece of card stock to assist in cutting the cowl. First, take the card stock and hold it under the motor with the end against the firewall. Trace the shape of the cylinder head (and muffler if not using a canister) as shown, and also trace the alignment tabs to help align the pattern.



Use scissors to cut out this shape and adjust the cutout as needed.



Transfer your cutout dimension onto the cowl, as shown, use the tracing of the alignment tabs for alignment.



Cut out this shape with the dremel.

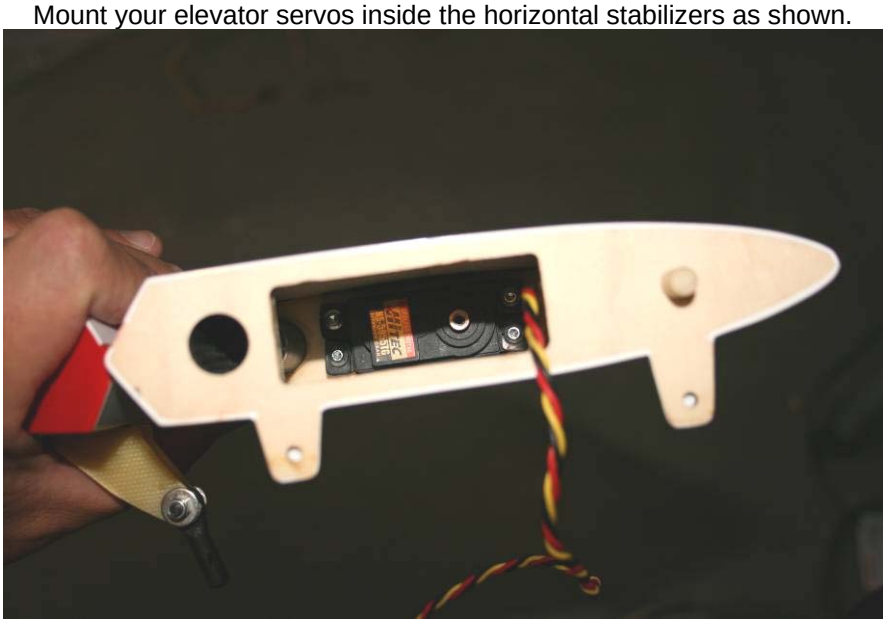


Attach the cowl to the fuselage using three 3mm bolts from the back of the fuselage former and 2 wood screws from the bottom through the alignment tabs. If you need to adjust your engine location to correct for cowl-to-spinner fit, this is accomplished by removing the engine-to-firewall bolts and using the dremel tool to slightly elongate the holes into slots. If you need to space the spinner forward for clearance to the cowl, use washers in-between the engine and firewall as necessary to achieve a 1/8" to ¼" clearance between the cowl and the spinner backplate.



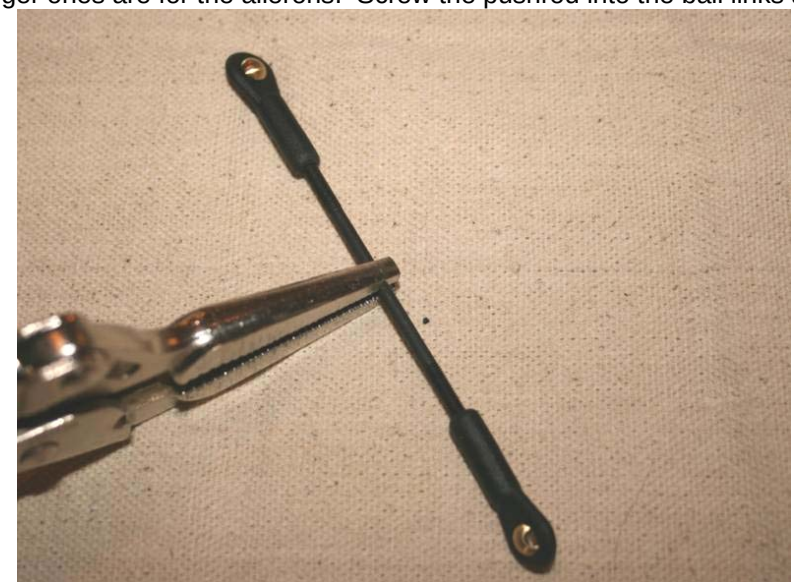
Elevator Servos and Horizontal Stabs

Mount your elevator servos inside the horizontal stabilizers as shown.

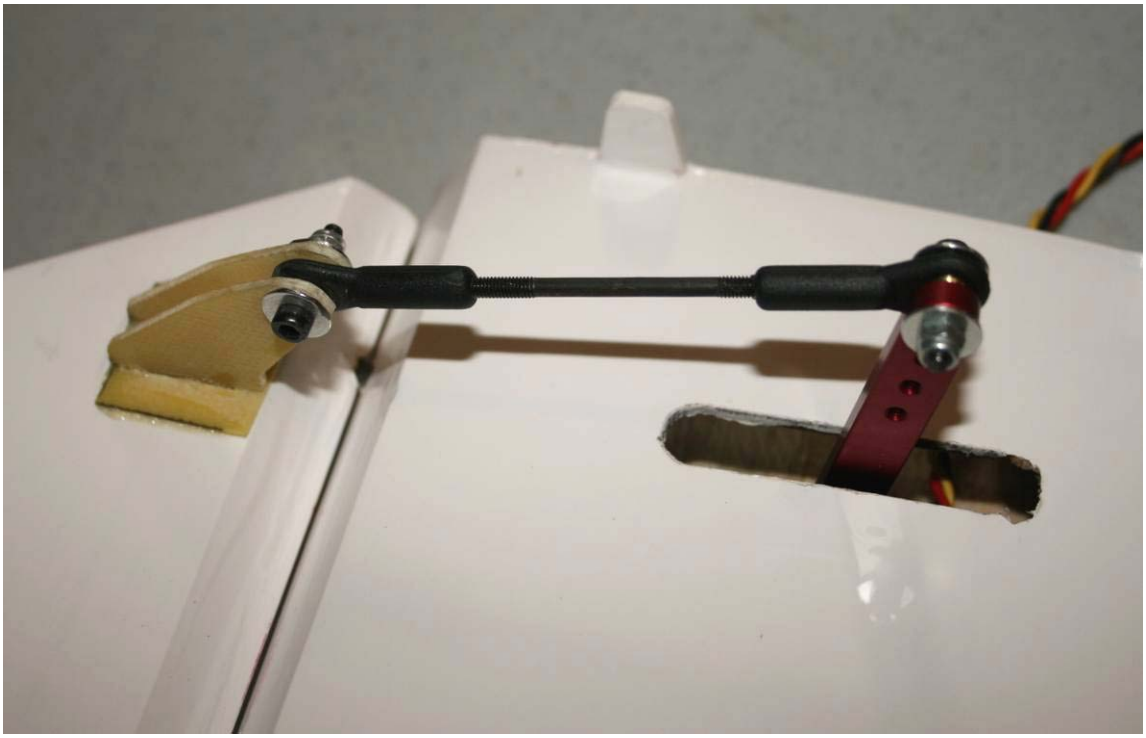


Center the servos, and slide your servo arms onto the servo output splines. NOTE: for full 3D throws, 2" servo arms are recommended for the elevators. Rotate the servos and arms as necessary to access all fasteners to lock the arms in-place. Use threadlocker if indicated by the servo-arm manufacturer. We also use a dab of silicone adhesive on the servo arm screw to lock it in place against vibration.

Assemble the elevator pushrod as shown. The elevator pushrods are the shorter of the included pushrods. The longer ones are for the ailerons. Screw the pushrod into the ball links at least 5-6 threads.



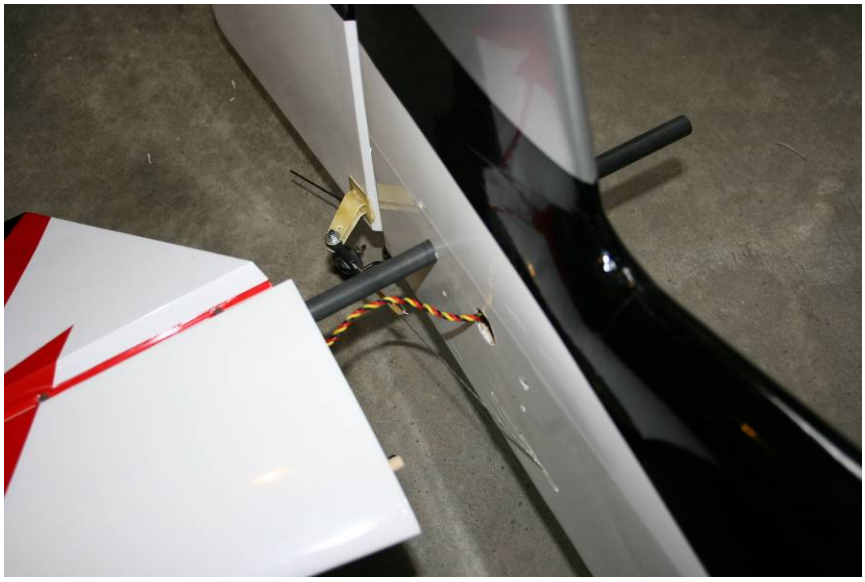
Assemble the pushrod onto the servo arm and control horn as shown using 3mm bolts and locknuts. In this case, our servo arms from SWB Mfg. were tapped to 4-40, so we drilled them to accept 3mm bolts. You can also re-tap the arms to 3mm if desired.



The Extra includes a fiberglass tube installed into the fuselage to assist in cleanly routing your elevator servo extensions into the rear of the fuselage. It may be helpful to tape the extensions onto a piece of wire and feed the wire through the tube, as shown.



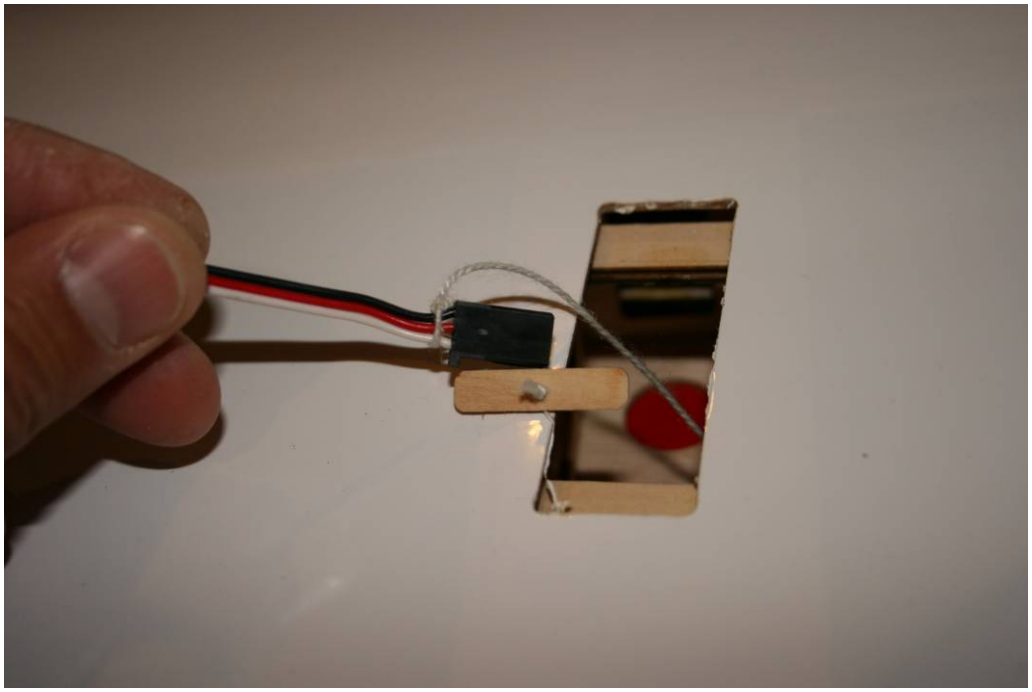
Install the horizontal stabilizers onto the fuselage using the carbon-fiber tube spar. The horizontal stabs are retained by two screws on each side, as shown. For a permanent stab installation, use threadlocker on these screws. If you wish to allow the stabs to be removed for transportation, you must inspect these screws frequently, as vibration will loosen any unlocked hardware.



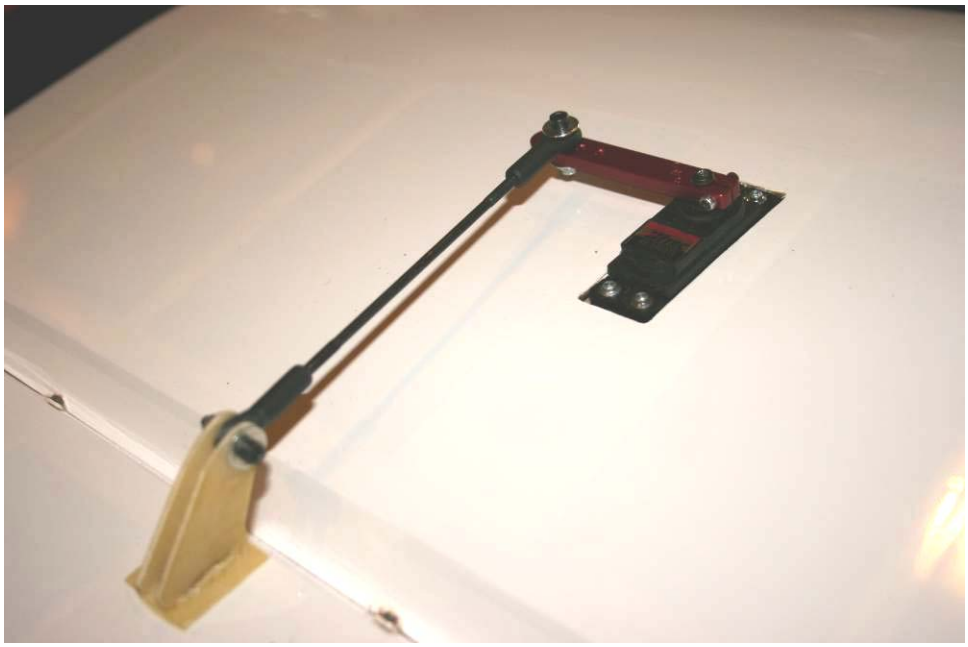


Aileron Servos

Remove the covering over the servo openings in the bottom of the wings. Attach an 18” extension to the aileron servo and secure the extension as before. A pull-string is provided to help guide the extension through the wing.



Install the servo with the servo head toward the front of the airplane, and attach the pushrod as you did for the elevator.



Wing Attachment

The wing attaches to the fuselage with two nylon thumb-screws per side. Extra, spare thumb screws are included in the kit.

Your carbon-fiber wing tube is a snug fit into the wings and fuselage. This provides additional strength and fatigue resistance. As a result, you may need to periodically lubricate your wing tube. We

recommend non-stick cooking spray or silicone spray-lube for this job. Your wings will be an especially snug fit onto the tube the first several times you install them. Go slowly and patiently to prevent damage the first several times.

Radio Installation Notes

We highly recommend Smart-Fly products (http://www.smart-fly.com/) to assist your radio installation. While not necessary, we have found the Power Expander Sport Plus unit to be perfect for this airplane.

We have provided switch locations for two full-size switch on each side of the fuselage, as well as a 6mm hole for a Smart-Fly flag-style safety switch if desired. We also mount our fuel filler or fuel dot in this area, as shown.

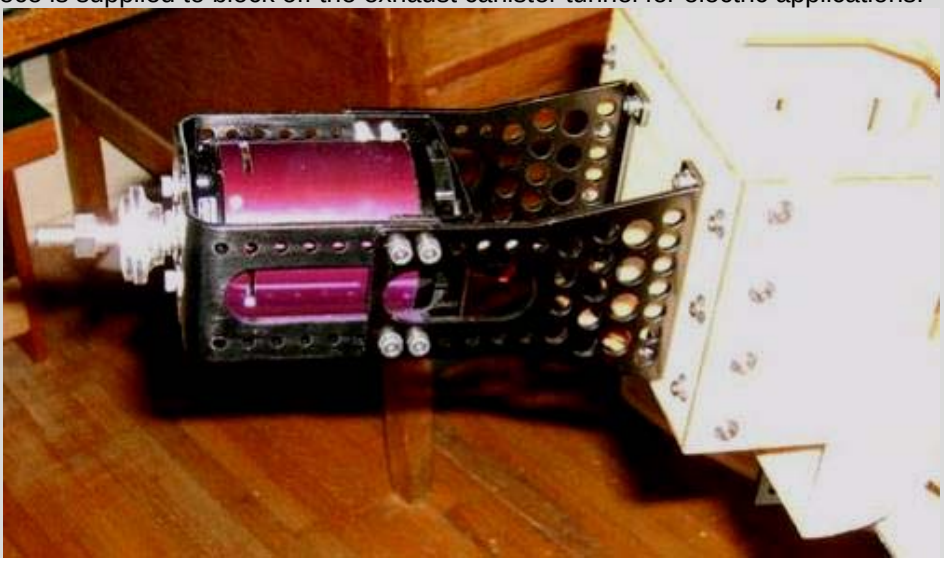


Electric Power Installation

The Extra flies extremely well as an electric. Recommended power system:

Hacker A60-18L motor
Castle Creations Phoenix HV 110 ESC (or Jeti Spin 99 ESC)
APC 24x12 or XOAR 24x12 prop
12S 5000mah 25C lipoly batteries

A plywood piece is supplied to block off the exhaust canister tunnel for electric applications.



To mount your electric motor, use one of the gasoline mount templates to mark the thrust-line center on the firewall, and then create a mounting template for your particular motor mount on paper. Match up the center of your template with the thrust-line center on the firewall, and mark your hole locations. Be sure to use blue Loctite on all of your fasteners. When assembling your motor mount, the correct distance from the firewall to the back of your spinner in 6 and ¾ inches.

You will need additional cooling air over your batteries. Leave the access plate on the top of the engine-mounting box open, and we recommend making another hole the same size in the bottom, by expanding the throttle-servo mounting hole, this will allow air to enter the fuselage. You will need an air exit, as well. Make this by removing some of the covering on the bottom of the fuselage behind the wing. We typically remove 2 squares, but you can remove more as needed to keep your batteries cool.

Your kit includes baffles to direct airflow inside your cowl onto your electric motor. Install them into the cowl as shown using epoxy glue.





The canopy hatch is supplied with the floor pre-installed. The rear of the hatch is left open so you can do any necessary work inside the cockpit area. When you have completed any work inside the cockpit, use CA glue to install the balsa rear plate onto the canopy hatch as shown.



The canopy hatch is held onto the fuselage with 3mm nylon thumbscrews. These thumbscrews require no tools to install or remove and are very convenient – but because they are plastic they will not last forever. Inspect them frequently – spares are included in your kit. You can also use a 3mm allen-bolt and washer if desired.

Control Setup:

CG measured at the root of the wing, from the leading edge:

170-190mm is preferred for maiden flights. For 3D flight, you may prefer to have it farther rearward. Note that, being a long aircraft, the 87" Extra is not very sensitive to small CG changes.

Throws are given in degrees (both directions, i.e. 45 degree means 45 degrees up and 45 degrees down) and millimeters (measured at the rear of the surface, 120mm means 120mm up and 120mm down).

Throws High

Ailerons – 50 degrees or 120mm	70% expo
Elevator – 70 degrees or 150mm	85% expo
Rudder – 45 degrees or 170mm	70% expo

Throws Low

Ailerons – 28 degrees or 65mm	30% expo
Elevator – 22 degrees or 70mm	30% expo
Ruder – 45 degrees or 170mm	70% expo

After balancing, you can install the optional Side-Force Generators (SFGs) onto the wing tips. Locate the spacers, these go in-between the SFG and the wing tip. The SFG and spacers are held onto the wing with 2 3mm allen-head screws each. The blind-nuts are pre-installed into the wingtips.





When flying with the SFGs installed, it is possible to scrape them if you dip a wing on landing. For this reason, we recommend protecting the bottom edge of the SFG with some clear packing tape. Spare SFGs are also available.

