FB Jets / Feibao

Dolphin Assembly Manual

Written By Rich Miller in Collaboration with Fei Bao Jets

Rev 0

Contents

DISCLAIMER:

THIS IS NOT A TOY

This is a high-performance miniature aircraft, capable of high speeds and damage to life, limb, and property. The manufacturer and its distributors and author of this manual cannot control how you assemble this model, what equipment you use to fit it out, or how you fly it, and can assume no liability whatsoever for any damages that may occur when you fly your aircraft. By assembling this model, you are agreeing to indemnify and hold blameless the manufacturer and/or his agents from any and all torts and liability associated with the use of this product.

Please inspect all parts before beginning assembly. If any part appears to be suspect, contact your dealer or the manufacturer for repair or replacement BEFORE you begin.

Once you have assembled the aircraft, you are the pilot in command and assume any and all responsibility for the use of the model and any damages that might occur by flying or attempting to fly this aircraft.

R/C model jets require a high level of skill in both their assembly and their flying. If you do not feel confident in either your building or flying skills, PLEASE seek assistance from more experienced modelers. It is a wise idea, no matter what level of skills you possess, to have a second experienced modeler go over your installation after assembly. A second set of eyes may spot a problem you have missed. If you have not flown a high performance model like this before, it is HIGHLY recommended that you get an experienced turbine pilot to do your maiden flight. Very often, the first few seconds of a maiden flight are critical until the aircraft is trimmed out, and having an experienced pilot at the controls can make the difference between a wrecked aircraft and once that enjoys many hundreds of flights. Be sure to select a suitable field for flying...take the time to find a large paved runway if at all possible, especially for test flights, until you feel comfortable getting the aircraft in and out of smaller grass fields.

Note: In the USA it is mandatory that you belong to the Academy of Model Aeronautics and hold a valid Turbine Waiver, please check the local governing rules for operation of R/C model jets of your location before flying.

Congratulations on your purchase of the FB Jets Dolphin

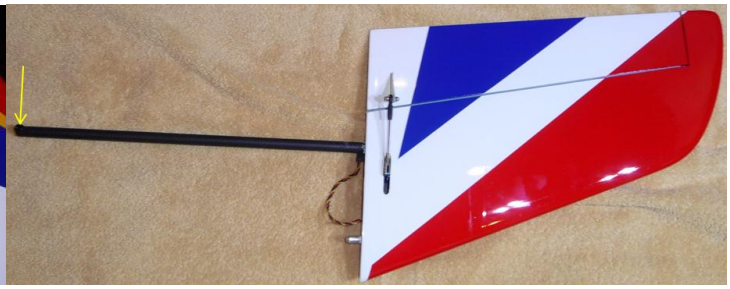
Introduction

You have chosen a model that represents the pinnacle of ARF technology and factory testing with the new manufacturing processes implemented by FB Jets. While there is not a lot of building to do, there is enough to keep you busy for quite a few evenings. Even if you have assembled other ARF jets, we highly recommend following the assembly sequence and procedures presented in this manual.

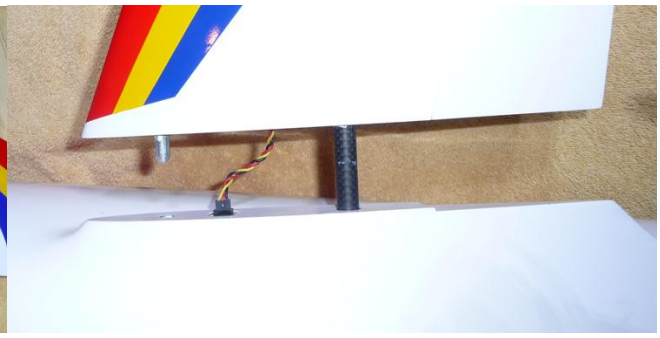
Please remember that just because the model is almost completely built it does not mean that you can rush through the final install / assembly. It is this authors recommendation that any factory installed systems such as hardware, linkages, fuel lines, retracts, wheels and brakes, be inspected for any possible defects, loose parts etc., and all fasteners should be secured with Loctite. Wheels and brakes should be checked for lubrication and for proper fit to the axel; threads on linkages should be inspected for tightness.

The Dolphin was designed to be modular to make for easy transportation, see “component size” in the specification section. The forward and aft fuselage sections bolt together with four bolts. The thrust tube (pipe) remains in the aft section of the fuselage when the halves are separated. When attaching the front and rear halves of the fuselage, the thrust tube can be slid towards the back to allow clearance to gain access to the four fuselage mounting bolts. After joining the two halves, the thrust tube can then be slid forward to allow the mounting tabs of the bell mouth to be screwed to the motor mount rails.

The Vertical fin is easily removed / installed utilizing the two internal clamping mechanisms that are easily tightened with hex (Allen) wrenches through the access holes in rear fuselage as shown.



The right horizontal stabs has an integral carbon fiber spar, the left has a built in tube socket. Both have an anti-rotation pin located towards the leading edge. The right stab is inserted into the integral tube in the aft section of the fuselage. Upon complete insertion, the spar will protrude through the fuselage allowing the other stab to be slid onto the spar tube. The stabs are then attached with one allen bolt into the CF spar, bolt location shown in photo.



The wings utilize a carbon fiber main spar and have two anti-rotation pins towards the front and rear of the root rib, they attach to the fuselage using a thumb screw that is accessed through the landing gear wheel well.

When the model is taken apart it will fit in a small area for transportation.

Specifications

Total Length: 104 1/8” (2645 mm)
Total Wingspan: 91 3/4" (2330 mm)

CG Location 28% MAC: 11 7/16” (291 mm) from LE of Wing
Prototype Dry Weight with all components: 35 lbs (15.9 Kg)
Thrust Class: 30 to 42 lbs (130N to 190N)
Servos for Flight Surfaces & Steering (8)
Servos for pneumatic controls (2) or pneumatic valves
Fuel Capacity Right and Left Saddle Tanks: 37 oz ea (1100 ml ea)

Prototype Supplied Center Tank* 47 oz (1400 ml)
Additional Builder Supplied Tank* 34 oz (1000 ml) for additional capacity
Total Capacity 155 ½ oz (4600 ml)
Main Tire Diameter 4.3” (109 mm)
Nose Tire Diameter 3.25” (82.5 mm)

* Factory to supply larger tank in production model

Component Size (Length)

Vertical Fin – 18 ¾” (475 mm)
Horizontal Stab (ea.) – 16 3/8” (415 mm)
Wing Panel (ea.) – 38 ¼” (971 mm)
Canopy – 45” (1143 mm)
Forward Fuselage – 70 3/8” (1787 mm)
Aft Fuselage – 33 5/8” (854 mm)
Thrust Tube (Pipe) Length: 37” (940 mm)
Pipe Diameter: 3 ½” (89 mm)
Bell Mouth Length: 2.75” (70 mm)
Total Pipe Length with Bell Mouth: 39 ¾” (1010 mm)

Construction

Preliminary Steps before you begin

Keep this in mind as you proceed

Look at EVERY assembly step you finish, and ask yourself:
“Could this cause a malfunction and crash my aircraft?”

A chain is only as strong as its weakest link, and this is a high-performance aircraft that will be intolerant of sloppy assembly techniques. Even the smallest component is important and can cause the loss of your airframe, so take the time to do things right, or redo them if they are wrong. Careful work will result in a long lasting aircraft that will give you years of pleasure, one loose component could resulting the complete loss of the aircraft and all of the component inside of it,

additionally someone could even get hurt. So please pause every once in a while when building and double check your workmanship.

- Clean and inspect all parts. Inventory them against the parts list at the end of the manual and notify the kit supplier of any missing components as soon as possible.
- If the paint scheme you have selected is glossy, it is recommended that you apply a coat of wax. This will help resist dirt, stains and fingerprints during construction, and will provide some limited protection against errant glue.
- Vacuum out the remnants of packing materials that remain in the fuselage.

Adhesives

The author prefers Loctite Hysol 9462 adhesive for all procedures. This is a very strong epoxy that is thixotropic. "Thixotropic" means it does not run at all, but stays only where you put it. It is superior to regular epoxy, even slow setting epoxy, because of this characteristic. Regular epoxy will run with gravity as it dries, taking it away from where it is supposed to be. The downside of Hysol is it takes overnight to dry properly. It is recommended that you only use a proper Hysol dispensing gun and only the long-type mixing nozzles.

Be careful if using adhesives such as "shoe goo" or Zap-a-Gap-a-Goo, as these contain solvents that may attack the fiberglass and could ruin the surface finish of your model.

Standard Pneumatic LG Systems

Pneumatic retracts typically are the number one maintenance issue with most models however with proper installation procedures and preventive maintenance this need not be the case. The Dolphin uses pneumatic retract and brakes. If you follow a few tips you should have a very reliable leak free operation. Factory installed systems should be inspected for kinked lines, proper insertion of hoses on fittings and the hose routings should be neat and secure. Special attention should be made to ensure that the length of tubing at "T" fitting is equal to both sides to ensure balance operation, epically in the brake system. Take special precautions to route hoses away from moving landing gear parts and hot engine areas. It is recommended that the factory valves, cylinders and brakes be dissembled, cleaned and lubed with a good O-ring lubricant to ensure reliable operation.

If installing your own pneumatic components it is important to make all cuts in the pneumatic tubing dead square before installing on the nipples, also make sure that the lines are pushed all of the way onto the nipples. They should not need to be secured otherwise however you can add fine safety wire for extra security.

Optional Electric LG Systems

At the time of writing of this manual it was announced that FB Jets will offer optional electric retracts for this model.

Parts List:

Major components

- Fuselage front Section with nose retract installed
- Fuselage aft section
- Canopy
- Forward and Aft Equipment trays
- Right and Left Wing panels with main retracts installed
- Right and Left Horizontal Stabilizer
- Vertical Stabilizer
- Tail Pipe with Bell Mouth
- Right and Left Saddle Tanks
- Center Tank
- Tank Hardware/Heavy Clunks/Aluminum Bung Fittings
- Linkages / Hardware kit
- Air Kit: Tanks, Lines, Valves
    - 79” (200cm) Blue Air Line
    - 79” (200cm) Red Air Line
    - 79” (200cm) White Air Line
    - 79” (200cm) Yellow Air Line
    - 3 Three port valves (Gear & Doors)
    - 1 One Port Valve (Brakes)
    - 2 Air Tanks
    - 1 Fill Fitting
    - 6 Three port Y’s
    - 4 four port Tees
    - 4 Disconnects

Optional Equipment

- Sport Scale Cockpit
- Electric Retracts Optional

Additional Equipment

While the kit is comprehensive, there are additional parts required as follows:

- Turbine – Thrust Class: 30 to 42 lbs (130N to 190N) The Prototype was powered with the Jet Central Rhino SP
- Radio System (Users Preference of Manufacturer)
- Servos (See List on next page)
- Servo Extensions Various Lengths depending on equipment locations
- Servo lead bulkhead connectors (ideal for fuselage junction and wing connections)
- Batteries / Regulator / Switch / Power system
- Adhesives (Thin CA, Medium CA, Hy-Sol, Loctite Red/Blue)
- 3/16” Tygon fuel line
- 3/16”(5 mm) Brass Fuel Line (K&S P/N 1147) 5 mm (K&S P/N 3923)
- S.S. Tie wire

- Ty-Raps
- Bulkhead fittings
- Festo Fuel Valves
- Miscellaneous small screws
- Sullivan 4-40 Gold-N-Clevises or equivalent
- BVM UAT or equivalent (optional / but highly recommend) Users Preference of Manufacturer
- Air Pressure Gauge

Optional Equipment (Builders choice)

- (Optional Internal Finishing) Grey Primer and Paint such as RUST-OLEUM Stone Textured Paint (Grey)
- Optional fuel tank Nalgene™ HDPE auxiliary tank Mfg. P/N 2007-0032
- Fittings for optional fuel tank
- DB-9 Connector Male & Female
- Wiring harness

Servo List (Hi-Tec) based on 6V torque specifications

- Ailerons: (1) HS-5625MG or HS-7985MG
- Elevator: 2) HS-7955TG
- Flaps: (2) HS-7955TG
- Rudder: (1) HS-7955TG
- Nose Steering: (1) HS-645MG or HS-5645MG
- Mechanical Retract Valve: (1) HS-225 (MG) or Electronic Pneumatic Dual Action Valve
- Mechanical Brake Valve: (1) HS-225 (MG) or Electronic Pneumatic Single Action Valve

Servo List (JR) based on 6V torque specifications

- Ailerons: (2) DS8411
- Elevator: (2) DS8611A or DS8711
- Flaps (2) DS8611A or DS8711
- Rudder: (1) DS8611A or DS8711
- Nose Steering: (1) 4721
- Mechanical Retract Valve: (1) 351 or Electronic Pneumatic Dual Action Valve
- Mechanical Brake Valve: (1) 351 or Electronic Pneumatic Single Action Valve

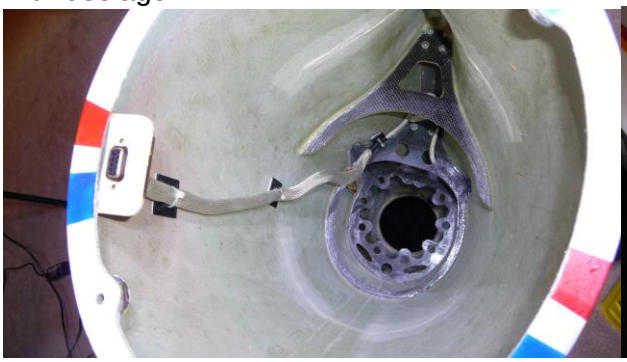
Construction

The order of construction may be changed to suit your personal preference; however, due to the size of the Dolphin it is recommended to complete as much of the work as possible on the individual components before the final assembly. The majority of the assembly takes place in the forward fuselage section. It is recommended installing a servo lead bulkhead connector at the fuselage junction; this will allow easy disassembly for transportation.

The prototype used for the creation of this manual utilized a standard DB-9 “D-Type” connector (See photo); however, any connector system could be utilized including standard servo extensions.

Note: If using individual servo extensions, it is a good idea to mark each lead with an identifier to aid during re-attachment.

Aft Fuselage



Front Fuselage

The wing connections also utilized DB-9 D-Type connectors for the connection of the servos, when the wing is slid onto the spar and mates with the fuselage the servo connections are made..

Fuselage Center Root section

Wing Root section

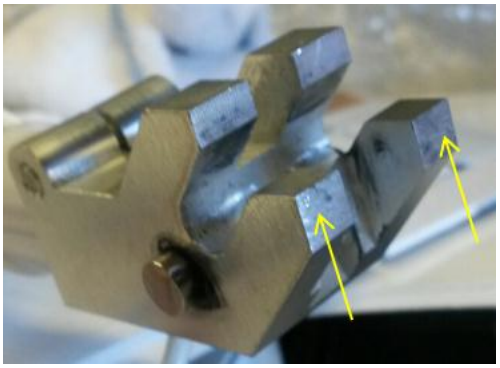
Note: any fiberglass surfaces on the inside of the airframe that requires components to be bonded should be cleaned with mild detergent and water to make sure that any mold release agent is removed, and then scuffed with medium grit sandpaper in the area of the intended bond to promote adhesion prior to applying the adhesive.

Pneumatic Landing gear

General

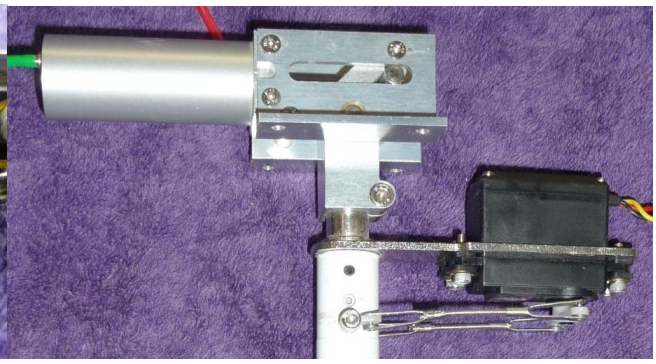
The landing gear are pre-installed from the factory; it is recommended that the all retract units should be removed and inspected for air leaks. This is easily done by submersing the retract unit in a pan of water and applying pressure to each of the cylinder inlets while maintaining pressure see if any air bubbles are detected. If leaks are detected they should be corrected by disassembling the cylinders, cleaning, and applying O-ring lube, then reassemble and re-test.

Check the function of each gear with a hand pump or other suitable air source while they are removed from the airframe. Make sure the extension and retraction of the gear is smooth before final installation. The prototype unit needed some slight adjustment “filing” of the trunions” to remove interference fit, see photo. Additionally check for free rotation of the wheels on the axels, the wheel bushing will require lubrication or even may require reaming of the I.D. of the bushings to create a better fit.



Step 1: Nose Gear

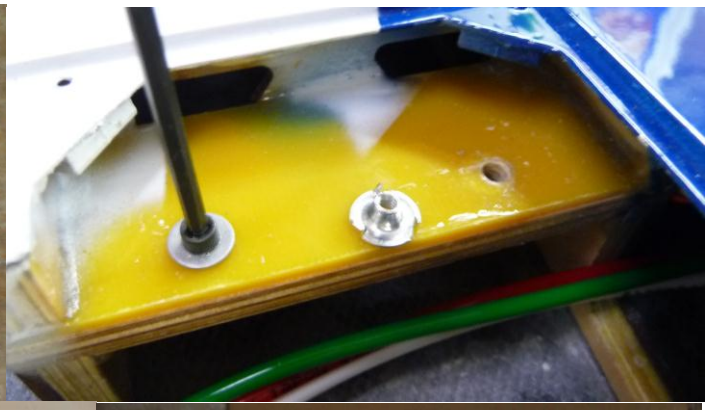
- ☐ Remove nose gear from fuselage and perform leak checks as describe above.
- ☐ After performing the above checks, assemble the steering servo into the nose strut steering bracket as shown using the supplied mounting hardware. The output shaft is mounted away from the strut.



- ☐ Using a receiver or servo driver find servo neutral and attach a suitable double sided servo arm perpendicular to the servo making sure to tighten the servo arm screw.
- ☐ The threaded rod supplied with the kit was 2-56 style all thread and clevises as shown in the photos, it recommended to change these to 4-40 parts.

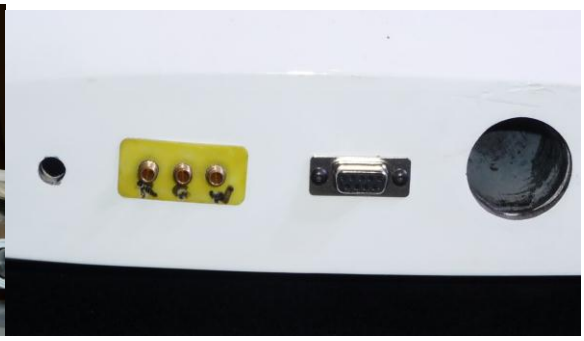
Step 2: Main Landing Gear

- ☐ Remove main gear from wings and perform leak checks as describe above.
- ☐ After performing the above checks, reassemble the main gear back into the wings using the supplied screws or replace with builder supplied optional allen head bolts and blind nuts.

Step 3: Forward Fuselage

- ☐ Once the nose gear and servo assembly is completed, install the retract unit back into the fuselage , prior to installation place a very small dab of thin CA into the mounting screw holes first if using the factory provided sheet metal type screws.
- ☐ Airline routing should be neat; it is recommended that the pneumatic valve equipment be installed as far forward in the fuselage as possible. The prototype was built utilizing a Jet Central electronic dual action valve for the retracts and a Jet Central electronic single action valve for the brakes. Remember to keep equal lengths of air lines when creating the right and left side run to the retracts and brakes to ensure even operation.
- ☐ The Dolphin is supplied with brass airline connectors, the prototype used the male end of the fittings glued into the fuselage at the wing junction for easy wing connections. The female ends were left loose with extra length of tubing protruding from the wing halves. A 1:1 scale drilling template and C.C fixture was created to locate the male connectors in the wing root area of the fuselage and can be found in Appendix A of this manual.



Battery Mounting

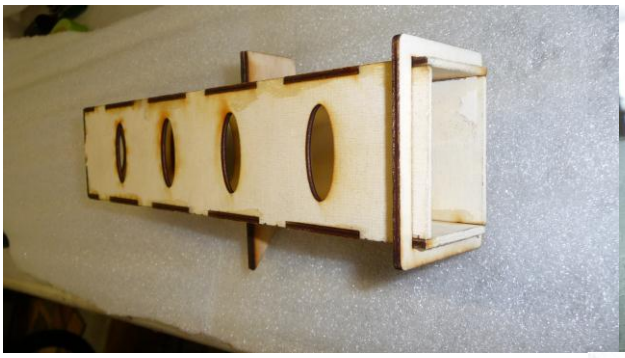
The choice of the battery technologies to be used is up to the builder's discretion. The goal of the build was to achieve proper G.C. without the need to add dead weight. The prototype model required that weight needed to be located as far forward as possible to achieve the proper C.G.

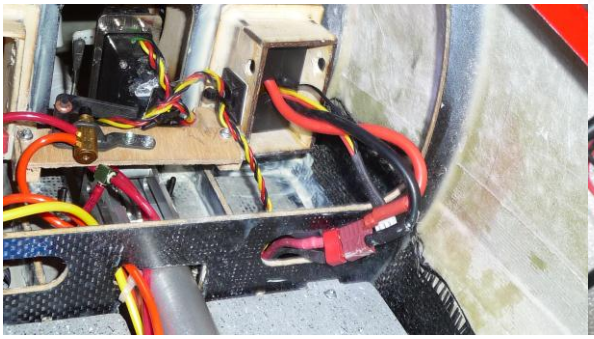
To achieve proper balance, two 5000 mAH LiPo hard case packs were used; one for the ECU, and one for the receiver. A voltage regulator was used to create the required voltage level for the radio system.

It is recommended that the batteries are mounted in a position to allow for easy removal for charging and maintenance no matter what technology is used. There are many methods available to secure the batteries, a few include mounting with adhesive backed Velcro™ or using zip ties such as ty-raps on removable mounting plates etc. It is the builder's discretion to provide the proper securement method to ensure safe operation, maintain proper C.G., and allow quick access in case of battery emergencies.

Optional Battery Box

- ☐ The prototype was constructed using two lite plywood battery boxes; these allow quick removal of Li-Po batteries for charging and maintenance and provide a method for achieving correct C.G. balancing without the need for added dead weight. The battery boxes are longer than the LiPo battery's, this allow adjustment for the C.G. by placing foam spacers in the box to set the battery position.
- ☐ The components can be cut from the templates in Annex A from 1/8" lite plywood. Lite-ply is very strong when constructed into shapes such as the box.
- ☐ Assemble the battery boxes using CA, see photo for detail.
- ☐ Trial fit the battery box through the front former, if there is interference open up the area using a Dremel tool or file.
- ☐ After establishing a good fit, Hysol the battery boxes in place.
- ☐ The batteries are held in place with a ¼" wood dowel that is positioned in the front of the battery box, the dowel is held in position by servo screws, see photos below.





Step 4: Fuel Tanks

If your model is provided with a factory plumbed fuel tanks it is recommended that you disassemble and inspect the tank hardware. The process used to cut the tubes at the factory may leave behind a ridge that constricts fuel flow and could result in excess tank pressure / restriction and leakage.

The author recommends that the factory supplied brass tubing should be replaced if it is not at least 3/16" (4.76 mm) in diameter. Additionally fuel line barbs should be soldered to the tubing and this can be achieved by cutting ¼" (6mm) lengths using the next size of telescoping brass tube, i.e. 7/32 (5.5 mm), this will prevent the fuel line from sliding off of the brass tubing. This change will require that the supplied metal tank fittings to be drilled to accept the larger brass tubing or can be

upgraded to the Sullivan Aluminum stopper kit #S478 which includes the larger 3/16" tubing. It is also recommended to use 3/16" Tygon™ tubing or equivalent for all of the interconnections of the fuel system. Finally perform a leak check on each fuel tank prior to installation; this short process up front could save a lot of time later.

The prototype model fuel system was assembled connecting the three factory supplied tanks and the one auxiliary tank in series, in this configuration it is imperative that the larger diameter tubing be used to reduce the restriction developed in the fuel system. All fuel system lines should be properly inserted onto the tubing and safety wire tied to prevent unwanted and potentially harmful leaks.

Note: Restriction in the fuel system may cause performance issue with your turbine such as not allowing proper full speed RPM, abnormally high pump pulse width numbers and or excessive stress placed on the tanks while fueling the model. Stress on the tanks is due to expansion caused by air not venting out of the tanks fast enough during fueling. Additionally fuel restrictions or leaks on the suction side of the fuel pump can cause cavitation, leading to air ingestion in the turbine fuel supply, ultimately causing a flame out.

Total Fuel System Volume of the supplied tanks with the prototype was 122 oz (3600 ml)

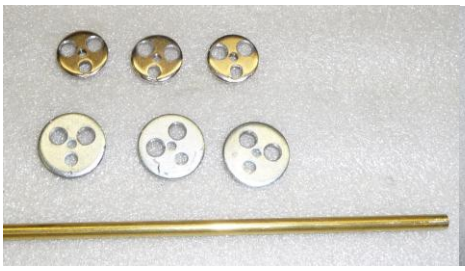
Saddle Tanks ea. : 37 oz. (1100 ml)

Main Tank: 47 oz. (1400 ml)

An additional 34 oz. (1000 ml) Auxiliary tank was added to bring the total volume up to 155 oz (4.6L).

Note: the user supplied Auxiliary tank could also be used for a smoke tank if desired.

Larger diameter tubing and drilled out tank hardware, Fuel line barbs soldered onto the tubes



Tanks for Production Model

Optional builder supplied 1 liter auxiliary tank; Nalgene P/N 2007-0032

Tank Assembly

When working with brass tubing components please follow the steps outlined below:

- ☐ Use a small, round file or a #11 X-acto knife to remove the excess metal inside of the cut ends of the tubes. You will need to inspect the ends of all tubes. Another good method is to use a countersink tool to de-burr the tubing, as you want to create an internal chamfer.
- ☐ Make sure to install fuel line barbs, checking the ends of the brass tubing to make sure any sharp edges are removed that could potentially cut the Tygon tubing causing leaks.
- ☐ When finished, make sure to blow out any metal fragments that may have been left behind and clean up any sharp edges.
- ☐ While the components are apart, or re-fitting with new larger tubing, check the fuel pickup line for equal lengths in both saddle tanks. They should be long enough to reach the back of the tanks without being so long as to restrict their ability to move to the top of the tank when the aircraft is inverted.
- ☐ Make sure the bends created for the vent tubes have not restricted airflow to any significant extent.

- ☐ Check the Tygon for any nicks or cuts, secure to the tubing with safety wire to the fuel clunks and the pick-up tube.
- ☐ If the aluminum tank bung fittings have not been fitted to the tanks, the tanks will need to be prepared. Make sure the entrance hole is large enough for the bung. Sand the tank in the area where the bung will be fitted. It is a good idea to drill a series of small holes around the periphery of the aluminum bung flange to promote securement of the adhesive. Finally using Hysol, glue the bungs to the tanks allow time for a complete cure before proceeding with the completion of the tanks.
- ☐ Once the tanks are back together, they should be leak checked before installation in the aircraft. Connect extra lengths of fuel tubing to the fuel and vent lines and submerge the tank in water. Pinch off one line and gently pressurize the tank by blowing into the other, looking for signs of air bubbles. If the tank shows evidence of air leakage around the vent cap, tighten the screw and check again. If the fiberglass weave is leaking; repair with Hysol or epoxy or apply a layer of glass cloth and epoxy resin.

Tank Mounting

It is recommended that the fuel tanks are mounted to allow for removal for future maintenance. There are many methods available to secure the tanks, a few include mounting with adhesive backed Velcro™ or tack glue using a few dobs of RTV.

Saddle Tanks:

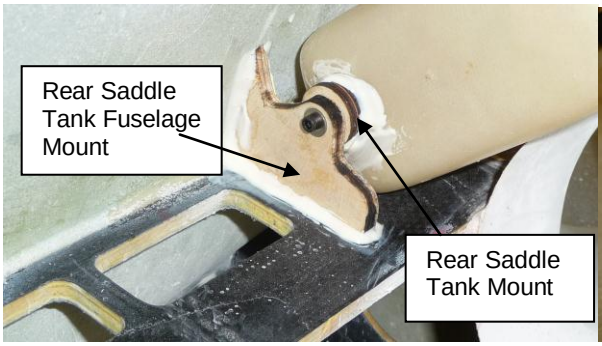
- ☐ The saddle tanks are located as shown; it is the builder's discretion to provide the proper securement method to ensure safe operation.

Optional Mounting:

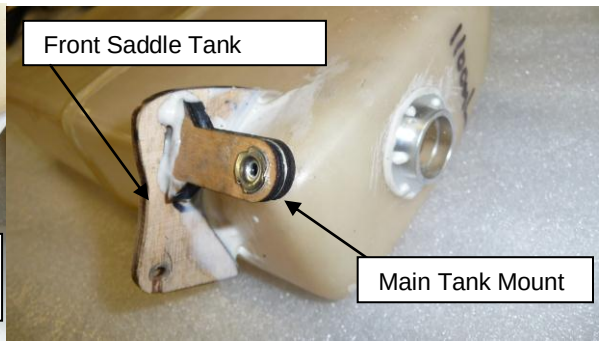
The method used for the prototype utilized plywood mounting brackets; templates shown in Annex A may be used to fabricate them if this mounting method is desired the following will guide you through the steps.

- ☐ The plywood tank holders shown can be fabricated from the supplied template in Annex A utilizing 1/8" (3mm) plywood. The saddle tanks use both a rear and front mount to secure them. The front mounts also serve as a securement location for the main tank retaining plate.
- ☐ The circular mounts that bond directly to the rear of the saddle tanks utilize a blind nut that is inserted on the back side of the mounts prior to gluing the mounts to the tanks. The rear circular tank mounts are in two pieces to make a thicker section, joint the two sections together, let dry.
- ☐ Repeat this step for the other circular mount.
- ☐ Once the tank mount assemblies are dry, bolt the rear circular tank mount to the rear fuselage former mount. **Note**: make sure that the bolt does not protrude past flush with the blind nut when tightened, if so grind to fit flush. There is a front and rear mount for each tank.
- ☐ Trial fit the saddle tanks as shown in the following photo sequence, mark the area on the front of the tanks where the front plywood mount attachments will be positioned, and also mark the area on the fuselage where the front fuselage tank mounts will be positioned. Sand the areas with medium grit sand paper.
- ☐ With the fuselage mount in place use the hole in the saddle tank mount to mark the position of the hole in the fuselage mount, drill hole and install a blind nut to the back side of the fuselage mount.
- ☐ Now the saddle tank mounts can be bolted to the fuselage mount.
- ☐ Glue the main tank mounts to the front saddle tank mount as shown in photo, install blind nut on bottom of mount, let dry.
- ☐ Bolt the main tank bracket to each saddle tank mount; this will hold everything in place during the gluing stage.
- ☐ Once the surfaces are prepared, apply Hysol to the fuselage former tank mounts and to the tank where the mounts will make contact.
- ☐ Repeat step for the other saddle tank, let dry.

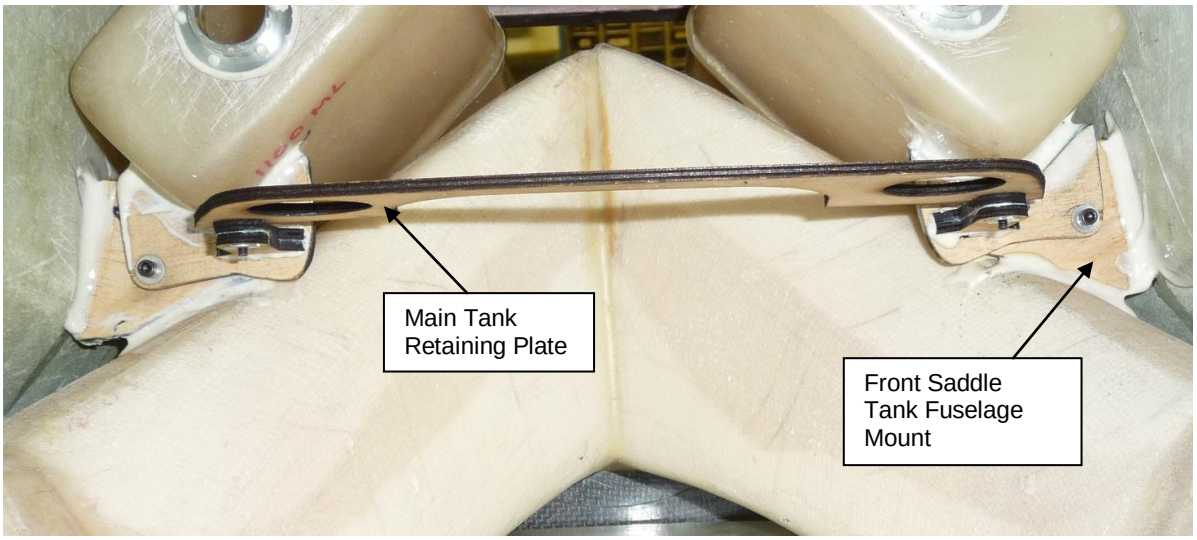
Rear Saddle Tank Mount



Front Saddle Tank Mount with Main tank mounts



Front saddle tank mounts and main tank bracket



Main Tank & Auxiliary tank:

- ☐ The main tank is located as shown in the photo; it is the builder's discretion to provide the proper securement method to ensure safe operation.

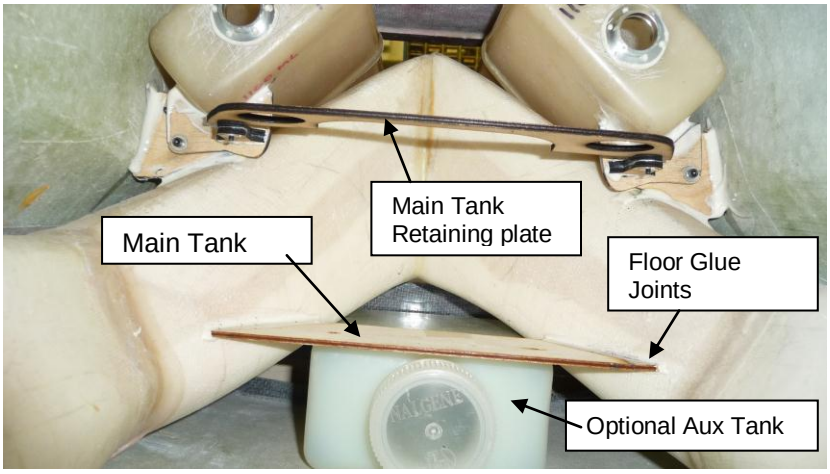
Optional Mounting:

This step was developed for the prototype which was supplied with a 1400 ml Main tank that was made to fit between the inlets. The author considered that this fuel capacity was insufficient for a model with the require thrust class turbine of this size, so it was found that an additional 1000 ml rectangular auxiliary Nalgene tank would fit nicely under the inlets and the main tank could be position on top of it. A main tank floor was developed to be positioned above the auxiliary tank. The auxiliary tank could also serve as a smoke tank if the builder decides that the factory supplied tanks have enough capacity.

Since the development of the prototype and based on the feedback from this process, the factory has developed a larger main tank; however, it was too late to include photos or the steps for mounting in this manual.

If you choose to use the mounting system developed for the prototype; the following will guide you through the steps and may be adapted to the larger main tank supplied by the factory, however it would need to be determined if the optional 1000 ml rectangular auxiliary Nalgene tank would fit.

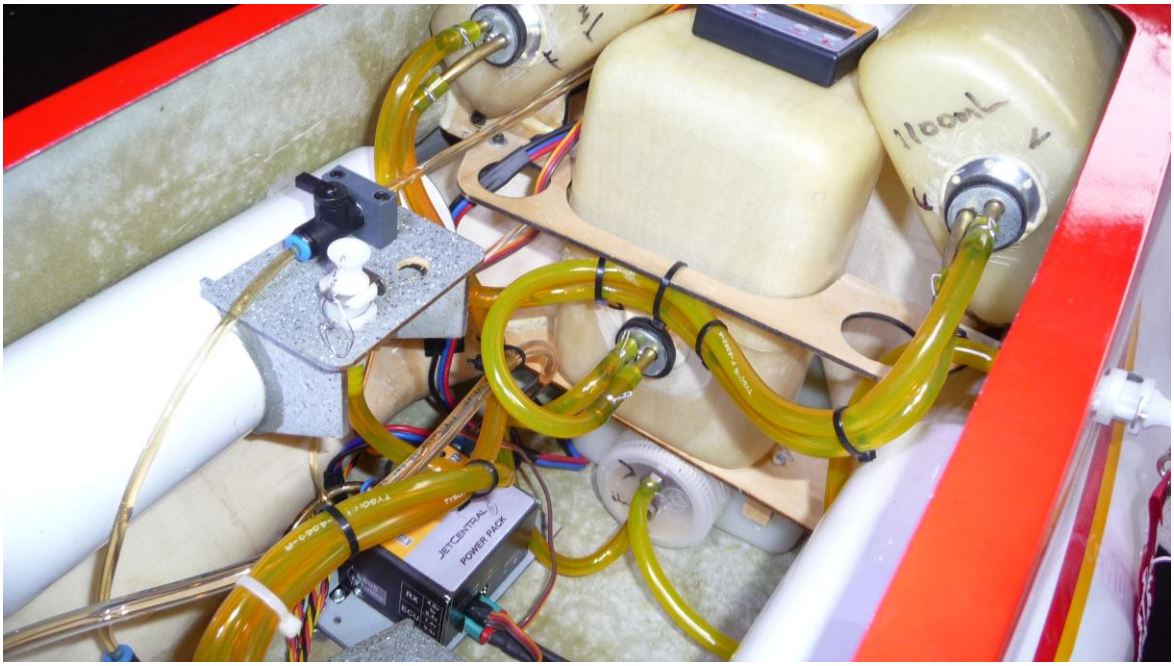
- ☐ The plywood main tank retaining plate and main tank floor shown can be fabricated from the supplied templates in annex X utilizing 1/8” (3mm) plywood. The saddle tanks use both a rear and front mount to secure them. The front mounts also serve as a securement location for the main tank retaining plate.



- ☐ If using the optional (Builder supplied Nalgene tank) trial fit the tank into the fuselage, this will be used as a position guide for the main tank floor.
- ☐ If not using the auxiliary tank skip the step of mounting the main tank floor, and set the main tank directly on the fuselage floor.
- ☐ Position the main tank floor on top of the aux. tank; mark the inlets where the floor will be bonded, sand the inlets for a good glue joint bond.
- ☐ Hysol the main tank floor between the two inlets as shown in photo and let dry.
- ☐ The main tank retaining plate can now be bolted to the saddle tank bulkhead mounts as shown in photo. Note the main tank retaining plate will also work if the aux. tank is not used, it is recommended to use Velcro on the bottom of the main tank to the fuselage floor if omitting the aux tank setup to prevent the main tank from sliding forward at the bottom.

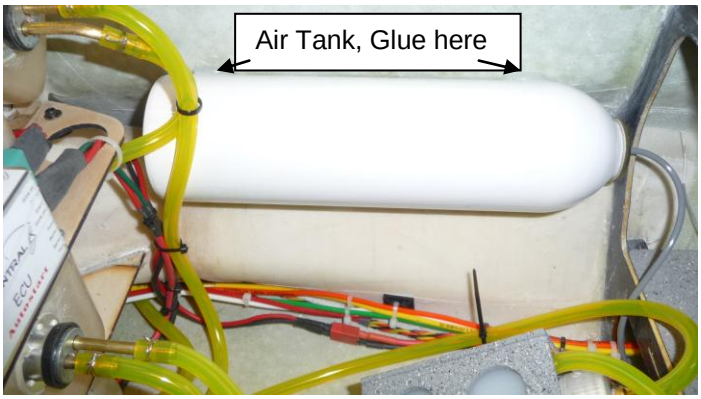
Step 5: Final Fuel System plumbing:

- ☐ Starting with the UAT, the supply line to the UAT is connected to the clunk line of the right saddle tank,
- ☐ The vent line from the right saddle tank is connected to the clunk line of the left saddle tank,
- ☐ The vent line of the left saddle tank is connected to the clunk line of the main tank,
- ☐ The vent line for the main tank is connected to the clunk line of the aux. tank,
- ☐ The vent line from the aux. tank is connected to the vent fitting that exits the fuselage.
- ☐ Safety wire all connections at this time.
- ☐ If you use plastic wire ties (Ty-raps) to bind the fuel tubes together for a neater installation, make sure not to over-tighten and pinch down on the flexible fuel tubing.



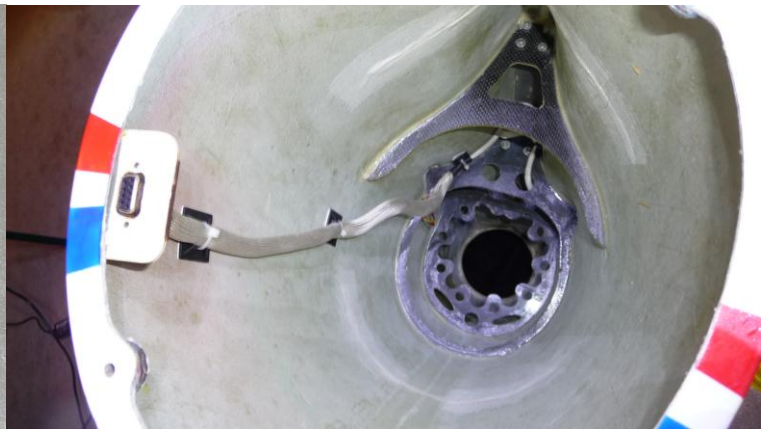
Step 6: Air Tank Installation

The air tanks can be installed in various locations in the airframe, the location used in the prototype was in the area above the intakes along the fuselage sides, see photo. There are many methods available to secure the air tanks, a few include mounting with adhesive backed Velcro™ or tack glued in place with RTV, RTV was used in the prototype and can be cut in case the tanks need to be removed for service.

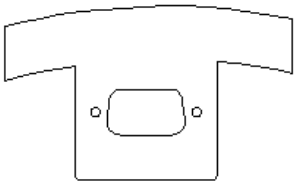


Step 7: Aft Fuselage

The aft fuselage section is complete from the factory with all of hardware installed, the only item left to the builder is the installation of the builder supplied wiring harness and if desired an optional connector bracket, see photo, the template for the bracket is in Annex A.

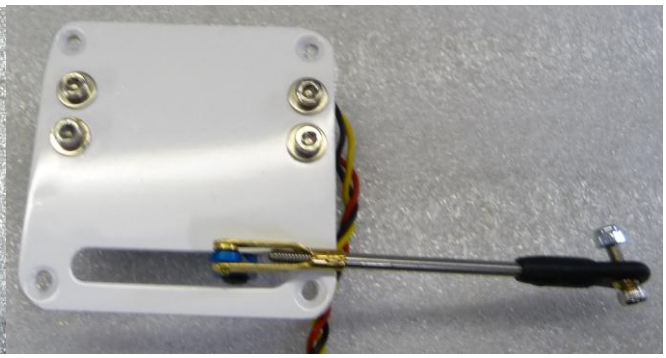


Fuselage Connector Mount

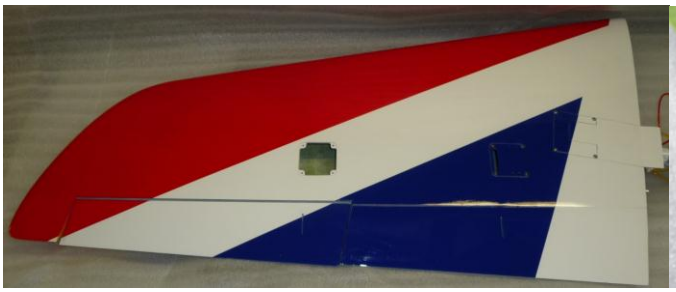


Step 8: Wing – Servo Installation

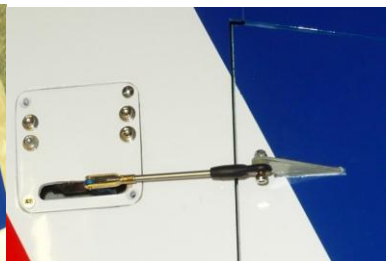
- ☐ The two wing halves are supplied with two pre-slotted servo hatches, eight “L” mounting brackets, and mounting hardware.

- ☐ The Flaps and Ailerons have slots pre-cut into the surface for the fiberglass control horn. The horn should be glued in with Hysol, before doing so make sure to use medium grit sand paper or dremel tool to roughen up the area on the horn where the adhesive will make contact.

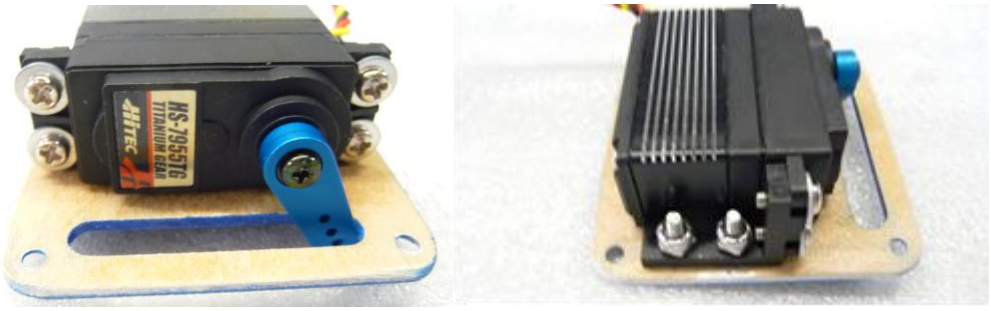



- ☐ A uniform adhesive fillet should be created around the control horn and the control surface. It is helpful to use masking tape around the periphery of the control horn slot. Any extra adhesive should be removed. Let the control horn adhesive setup undisturbed before proceeding.

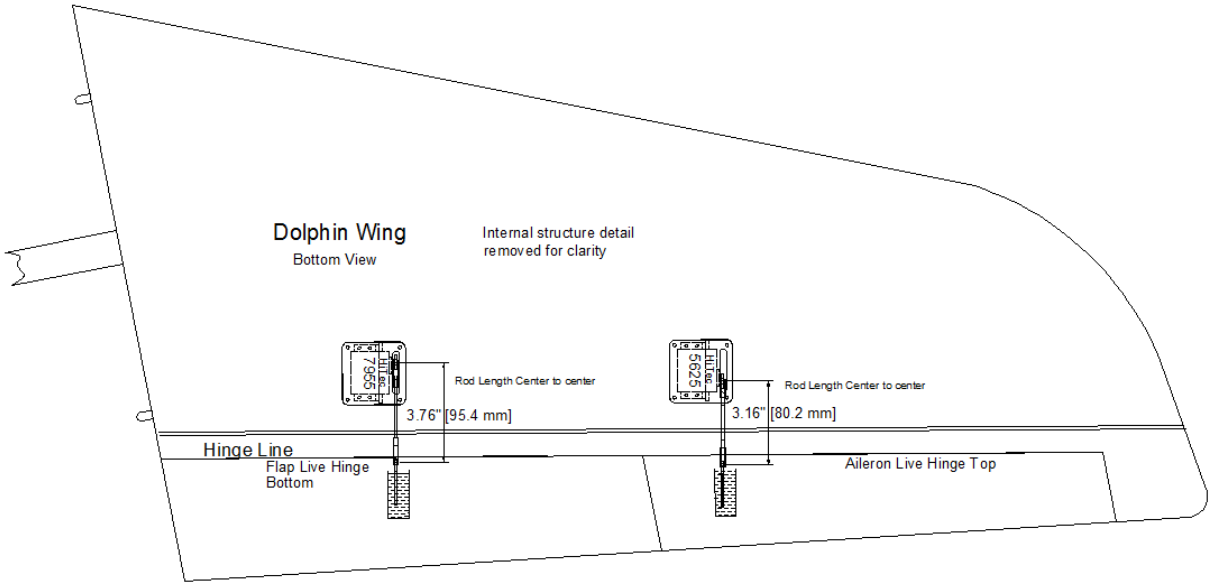
- ☐ The spline of the aileron servo will face towards the wing tips and closest to the trailing edge of the wing, see Figure 1.
- ☐ The spline of the flap servo will face towards the wing tips and closest to the leading edge of the wing, see Figure 1.

- ☐ It is not recommended to use the rubber grommets supplied with the servo for the mounting into jet airframes as vibrations typically associated with reciprocating power plants are not an issue.
- ☐ Using a receiver or servo driver, find servo neutral and attach a suitable single sided servo arm perpendicular to the servo making sure to tighten the servo arm screw.
- ☐ Attach the L brackets to the servos, and then bolt the assembly to the hatch using the provided hardware, making sure to follow the orientation described in the above steps.



- ☐ Assemble the Aileron linkage; the linkage should measure 3 5/32” (80 mm) in length from center to center of the ball link and clivis.
- ☐ For the Aileron servo, the clevis should be connected to the hole in the horn that is closest to 25/32” (20 mm) from center of the spline.
- ☐ Assemble the Flap linkage, the linkage should be 3 ¾” (95mm) in length.
- ☐ For the Flap servo, the clevis should be connected to the hole in the horn that is closest to 13/32” (10 mm) from center of the spline. Make sure to use keepers on the clevis.
- ☐ Pull the servos extensions through the wing to the roots; label the servo wires for Ailerons and Flaps. It is recommended to use servo keeper clips when make connections to the extensions.
- ☐ Repeat procedure for the other wing.
- ☐ When completed check the operation of the ailerons and flaps to make sure that there is no binding.

Figure 1- Wing servo layout

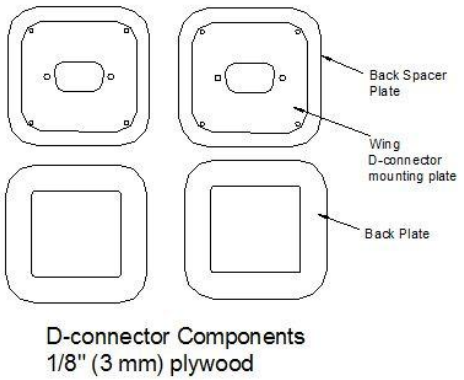


Optional wing servo connector Components

The wing servo connector was designed to fit the existing cutouts in the root rib, see figure 2.

A full size template can be found in Annex A

Figure 2 – Optional servo connector mounting

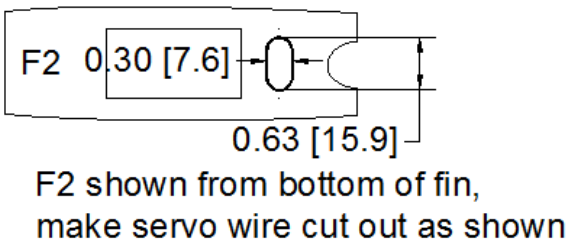


Step 9: Vertical Fin and Rudder servo installation

The vertical fin does not have the servo arm slot precut from the factory.

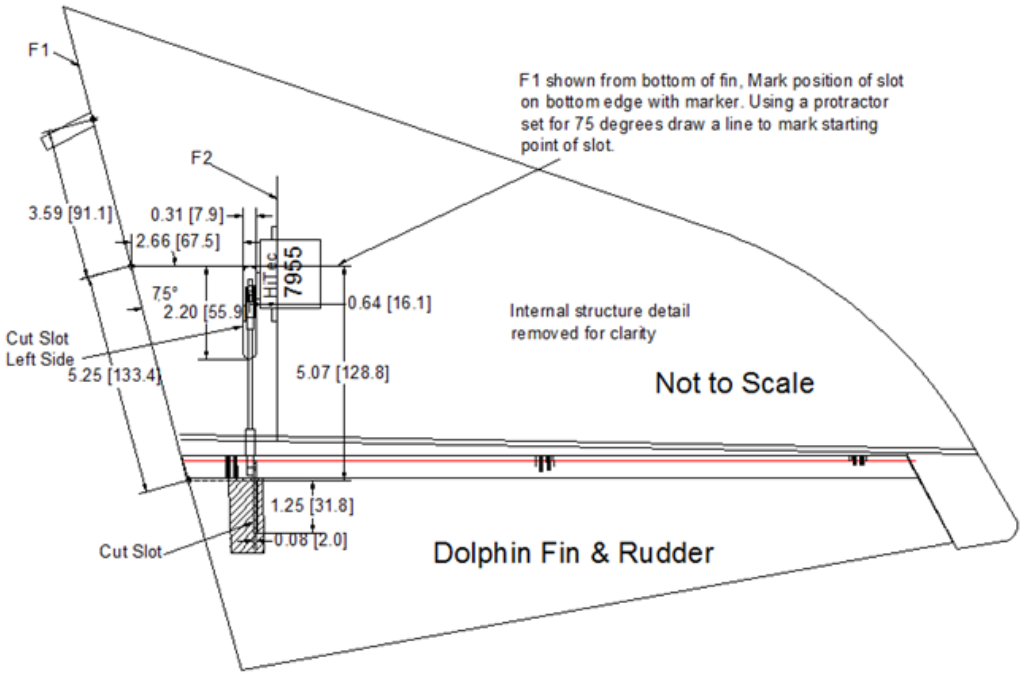
- ☐ Create an access hole for the servo wire in former F2 as per figure 3 if one is not provided by the factory.

Figure 3 – Hole placement in vertical fin



- ☐ The servo is installed in the fin with the spline of the rudder servo facing towards the fuselage and closest to the trailing edge, see figure 4.
- ☐ Cut the slot in the fin as shown in figure 4, if using Hi-Tec servos you can utilize the slot cut out Template from Annex A of this manual, if using other servo brands you might have to shift the template slightly based on the height of the servo arm from the mounting tabs. Note: the template was developed based on not using the rubber grommets supplied with the servo. It is not recommended to use grommets for servo mounting into jet airframes as vibrations typically associated with reciprocating power plants are not an issue.

Figure 4 – Fin and ruder servo layout

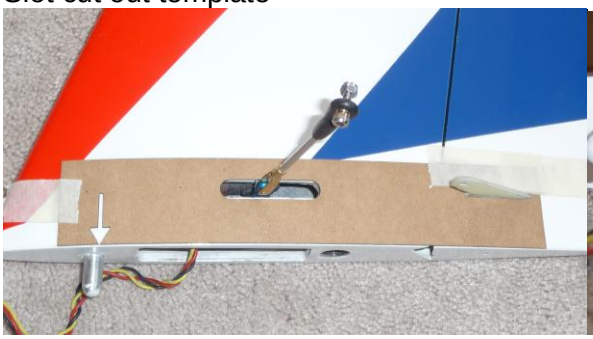


- ☐ Cut the control horn slot in the rudder as shown in figure 4, using the same slot cut out Template from the above step.
- ☐ After slotting the rudder to accept the fiberglass control horn, the horn should be glued in with Hysol, before doing so make sure to use medium grit sand paper or a Dremel tool to roughen up the area on the horn where the adhesive will make contact.
- ☐ A uniform adhesive fillet should be created around the control horn and the control surface. It is helpful to use masking tape around the periphery of the control horn slot. Any extra adhesive should be removed. Let the control horn adhesive setup undisturbed before proceeding.
- ☐ Using a receiver or servo driver, find servo neutral and attach a suitable single sided servo arm perpendicular to the servo making sure to tighten the servo arm screw.
- ☐ Use sheet metal type servo screws to mount the servo, after installing the screws, remove them and apply a drop of thin CA to each of the holes to reinforce them, reinstall screws after the CA sets up.
- ☐ Assemble the rudder linkage; the linkage should measure 4.3” (109 mm) in length from center to center of the ball link and clevis.
- ☐ The clevis should be connected to the hole in the horn that is ¾” (19 mm) from center of the spline. Make sure to use keepers on the clevis. If using the ball link on the control horn end, make sure to use the ny-lok type nut on the bolt.
  Note: you may need to enlarge the hole in the control horn with a .118” (3 mm) drill for the connecting bolt, do not oversize the hole as this will lead to linkage slop. Do not over tighten this bolt as it could cause linkage binding.
- ☐ Trial fit the fin to the fuselage, secure both of the clamp bolts on the fin.
- ☐ Check operation of the rudder to make sure that there is no binding.

Step 10: Horizontal Stabilizer and Elevator servo installation

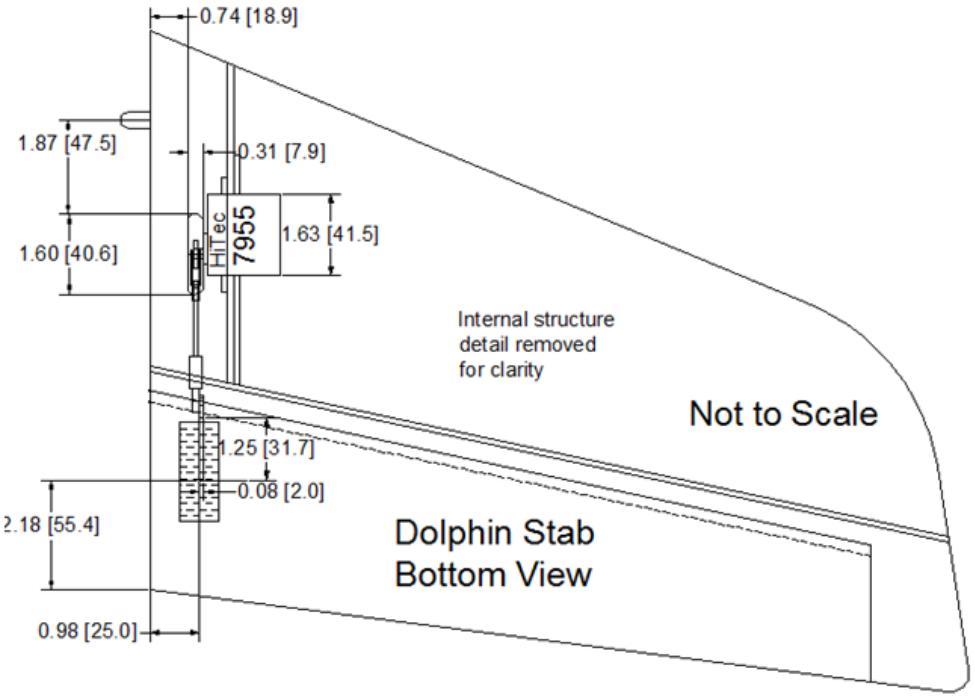
- ☐ The horizontal stabilizers are supplied in two halves; they do not have the servo arm slots precut from the factory.
- ☐ The servo is installed in the horizontal stab with the spline of the elevator servo facing towards the fuselage and closest to the trailing edge, see figure 5.
- ☐ Cut the slot in the stabilizer as shown in the photo, if using Hi-Tec servos you can utilize the slot cut out Template from Annex A of this manual, if using other servo brands you might have to shift the template slightly based on the height of the servo arm from the mounting tabs.
  Note: the template was developed based on not using the rubber grommets supplied with the servo. It is not recommended to use grommets for servo mounting into jet airframes as vibrations typically associated with reciprocating power plants are not an issue.

Slot cut out template



- ☐ Cut the control horn slot in the elevator using the same slot cut out Template from the above step.
- ☐ After slotting the elevator to accept the fiberglass control horn, the horn should be glued in with Hysol, before doing so make sure to use medium grit sand paper or a Dremel tool to roughen up the area on the horn where the adhesive will make contact.
- ☐ A uniform adhesive fillet should be created around the control horn and the control surface. It is helpful to use masking tape around the periphery of the control horn slot. Any extra adhesive should be removed. Let the control horn adhesive setup undisturbed before proceeding.
- ☐ Using a receiver or servo driver, find servo neutral and attach a suitable single sided servo arm perpendicular to the servo making sure to tighten the servo arm screw.
- ☐ Use sheet metal type servo screws to mount the servo, after installing the screws, remove them and apply a drop of thin CA to each of the holes to reinforce them, reinstall screws after the CA sets up.
- ☐ Assemble the elevator linkage; the linkage should measure 3.2” (81 mm) in length from center to center of the ball link and clevis.
- ☐ The clevis should be connected to the hole in the horn that is ¾” (19 mm) from center of the spline. Make sure to use keepers on the clevis. If using the ball link on the control horn end, make sure to use the ny-lok type nut on the bolt.
- ☐ Note: you may need to enlarge the hole in the control horn with a .118” (3 mm) drill for the connecting bolt, do not oversize the hole as this will lead to linkage slop. Do not over tighten this bolt as it could cause linkage binding.
- ☐ Trial fit the horizontal stabilizers to the fuselage; see photo xx, checking the fit of the securement bolt.
- ☐ Check operation of the elevators to make sure that there is no binding.

Figure 5 – Stabilizer servo layout



Step 11: Equipment Installation

There are many possibilities for mounting equipment into your airframe and it is up to the builder to determine the best installation technique for their application.

The pneumatic retract system in the model used to write this manual was operated utilizing the optional Electronic valves. The dual action valve operates the retracts, and the single action valve operates the brakes. The receiver is positioned on the main tray with the electronic pneumatic valve equipment mounted directly below the main tray on the fuselage floor.

The layout of components is shown in the photo. This arrangement allows easy access, provides good separation between the turbine and receiver electronics and sits low enough for the cockpit to easily fit on top.

Addition component locations for ancillary devices such as the ECU, fuel shut off valve, etc. to name a few can be accomplished using mounting plates glued to the fuselage in positions where space allows.

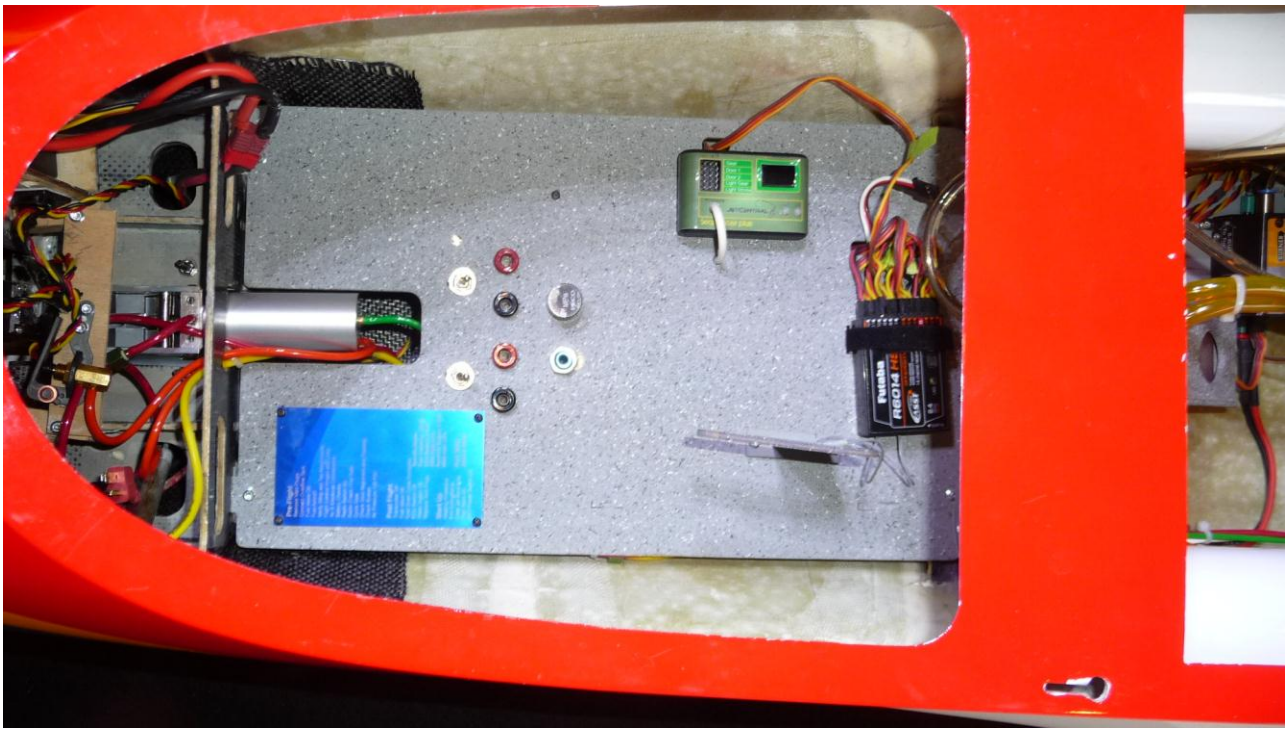
Now is a good time to complete installation of all servo extensions, airlines and turbine electronics through the fuselage.

The prototype used airline fitting supplied with the kit mounted in the wing root area of the fuselage, the airline connectors from the wing were left loose in the wing to allow connection to the ridged mounted fuselage connectors.

Fuselage Y harness shown

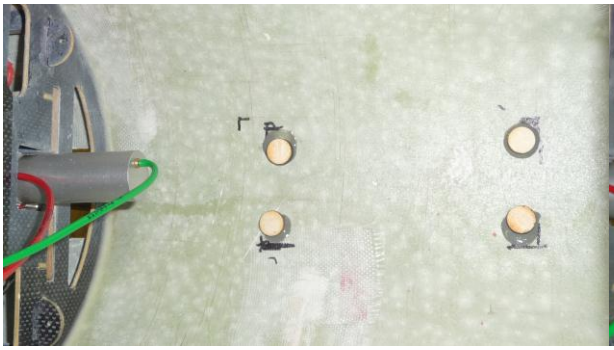
Airline connectors located in fuselage root section along with builder supplied D-type servo connector.

Front equipment tray

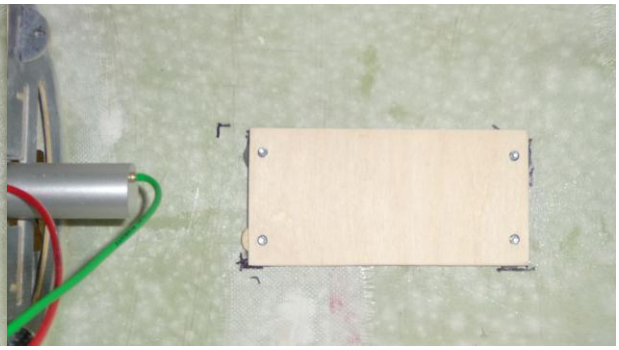


Location for electronic solenoid valves under front tray

Plywood pads glued into place



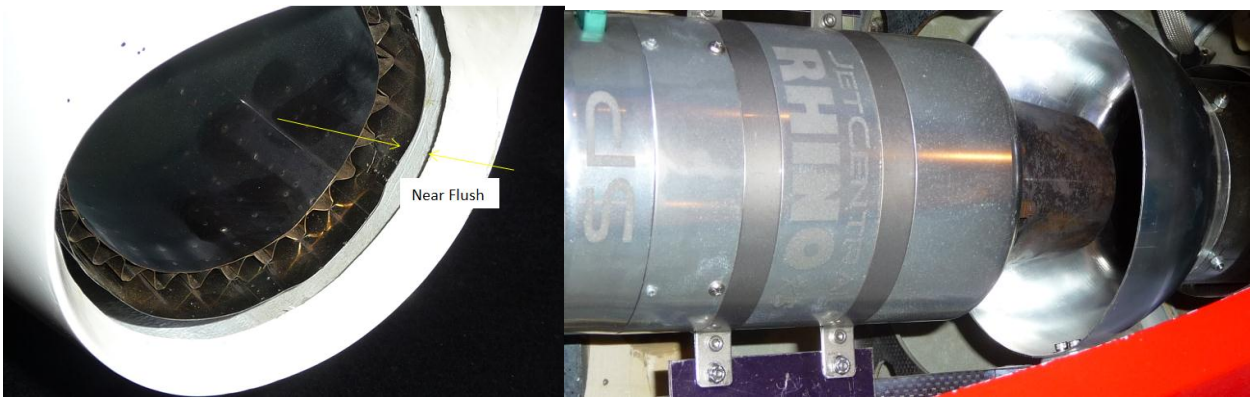
Tray secured to pads



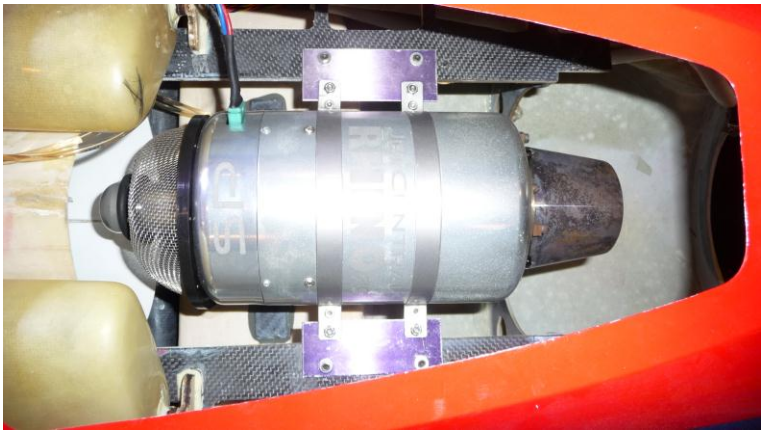
Step 12: Turbine Mounting Rails and Tail Pipe

Vacuum the fuselage thoroughly to remove any debris before installing the turbine. If you need to trim anything for turbine clearance, use a vacuum while you work. This will reduce the chance of having foreign objects finding their way into your turbine, remember to always use a FOD screen.

- ☐ The tail pipe was provided with the bell mouth and mounting tabs preinstalled, if not installed by the factory, then mount the bell mouth to the pipe using at least four mounting bolt point positions for securement. Use ny-lok type nuts on the mounting bolts.
- ☐ The mounting tabs are positioned just above the centerline of the pipe. Insert the pipe into the fuselage and position the aft end of the pipe flush with the fuselage exit.
- ☐ Position the Turbine on the mounting rails. Set the gap between the rear of the exhaust cone and the mouth of the pipe to manufacturer's specifications. This is typically around 25 mm, see photo.



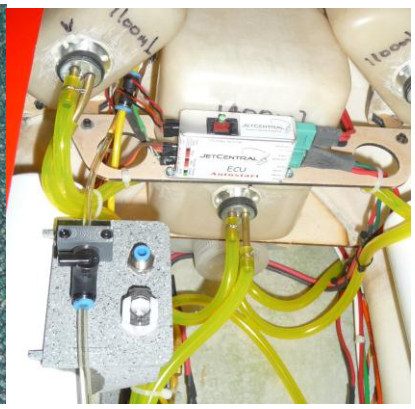
- ☐ When you are satisfied with the fit up, mount the turbine to the mounting rails; you can use appropriately sized wood screws or install builder supplied allen bolts and blind nuts. If using wood screws install the screws into the rails and then remove, coat the thread holes with thin CA. This will harden the wood around the screw holes themselves. Permanently reinstall the engine mounting screws. You may need to fabricate a mounting plate adapter depending on the width of the turbine mounting tabs. The installation shown used 1/16" (1.5mm) 6061 T6 aluminum sheet stock.

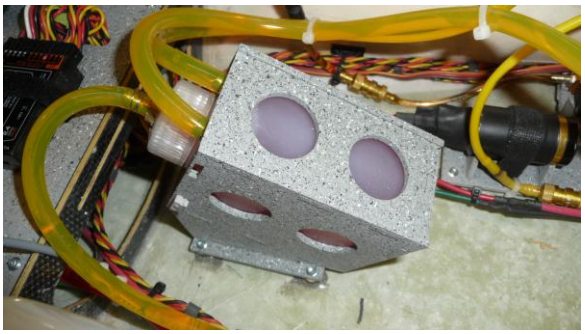


Step 13: Turbine Accessory Installation

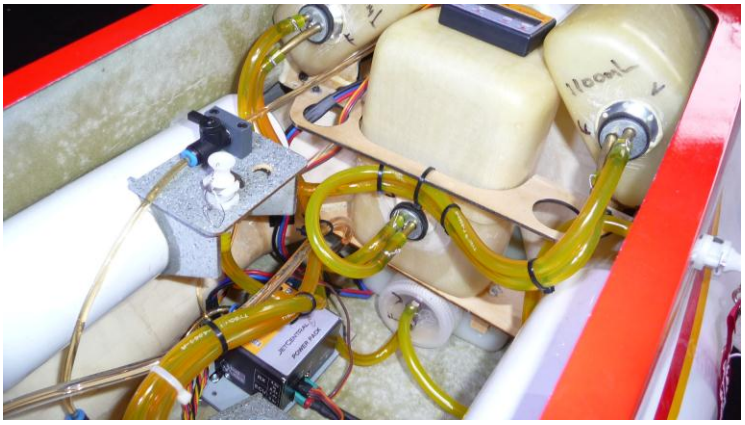
For ease of maintenance, especially for turbines that utilize separate components it is recommended that the major turbine fuel handling components such as the pump, & solenoids, should be mounted on a removable plywood plate. Also the ECU should be mounted on its own plate for easy access, see photos; follow the Turbine manufactures recommendations for equipment connections.

Original installation of individual components





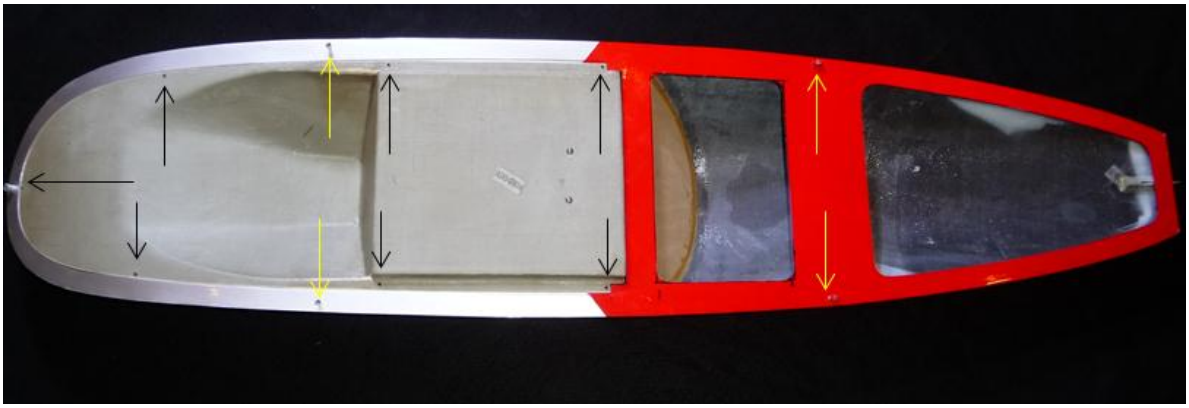
Updated Installation of Jet Central Power Pack



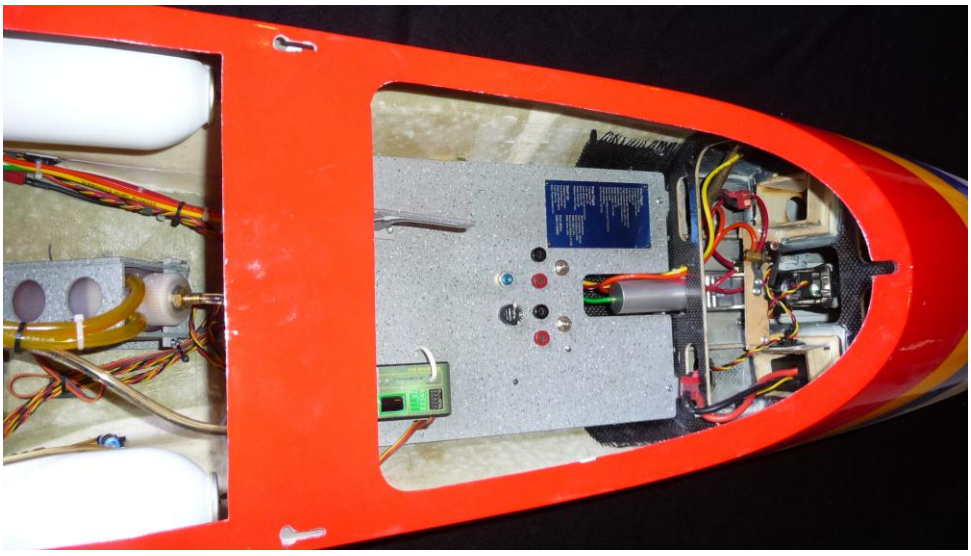
Step 14: Cockpit

The optional semi scale cockpit tub comes pre-trimmed and painted along with the preinstalled canopy glass to the frame.

- ☐ Check fit of canopy frame to fuselage, adjust fitment where required, the canopy latch should engage with little effort when fitment is correct.
- ☐ If not preinstalled, the cockpit should be screwed to the canopy frame using seven small screws shown with black arrows. The Yellow Arrows I the front point to the two allen head bolts used to key the canopy to the fuselage slots, the yellow arrows in the rear pint to the locating tabs that key into slots on the fuselage. The canopy latch is preinstalled and is located in the rear edge of the canopy.



- ☐ Bolt key slows shown in fuselage, these may require a bit of fitting, front slot may also require some fitting to make sure canopy sits flush. After fitting make sure rear latch engages freely.



Step 15: Radio Channel Assignments

The prototype was set up utilizing 11 channels as follows, many radio system and option exist, it is up to the builder's discretion to pick the equipment that best fits their particular needs:

Two channels for Elevators
Two channels for Ailerons
Two channels for Flaps
One channel for Throttle
One channel for Rudder
One channel for Nose wheel steering also Mixed with Retract channel; enabled with Retract Down only, low rate active with flap deployment
One channel for Retracts
One channel for Brakes mixed with Retract channel to be enabled with down Retract only

Step 16: CG

Set the Center of Gravity @ 28% of MAC which is 11.4" (291 mm) from of the leading edge of the wing panel at the root. The CG should be determined with the UAT filled with fuel and with the gear in the extended position. Battery positioning should be enough to achieve the correct CG location without adding dead weight.

Note: To simplify the process of determining the CG the author created two plywood fixtures that can be inserted between the wing panels and the fuselage, see photo xx. The Airframe then can be lifted with a strap on the GC point to allow easy adjustments, see photo xx.

Step 17: Setting of throws

- ☐ Elevator should be set values shown in table as measured from the center line of the outboard edge (Tip).
- ☐ Aileron should be set values shown in table as measured from the center line of the outboard edge (Tip).
- ☐ Flap throw set values shown in table as measured from the center line of the inboard edge (Root).
- ☐ Rudder throw set values shown in table as measured from the center line of the inboard edge (Root).
- ☐ Nose Steering should be setup with dual rates to the minimal movement to avoid over steer during takeoff and landings, the prototype was set with low rate with the deployment of flaps.

Surface Throw Table

D/R Throws	High Rate	Mid Rate	Low Rate
Elevators	0.87" (22) 20 Deg	0.67" (17) 16 Deg	N/A
Ailerons	0.6" (15) 12 Deg	0.53" (13.5) 10 Deg	0.47" (12) 9 Deg
Rudder	1.55" (39) 18 Deg	1.25" (32) 14 Deg	N/A

Throws	Flight	Take Off	Landing
Flap	0	0.5" (13) 15 Deg	2.25" (57) 45 deg
Crow (Up Air)	0	0.3" (8) 6 Deg	0.3" (8) 6 Deg
Elevator	0.15" (4) 3 Deg UP	0 Neutral	0.08" (2) 2 deg Down

Measurements in braces ( ) are millimeters

Elevator and Aileron measured at outer tip

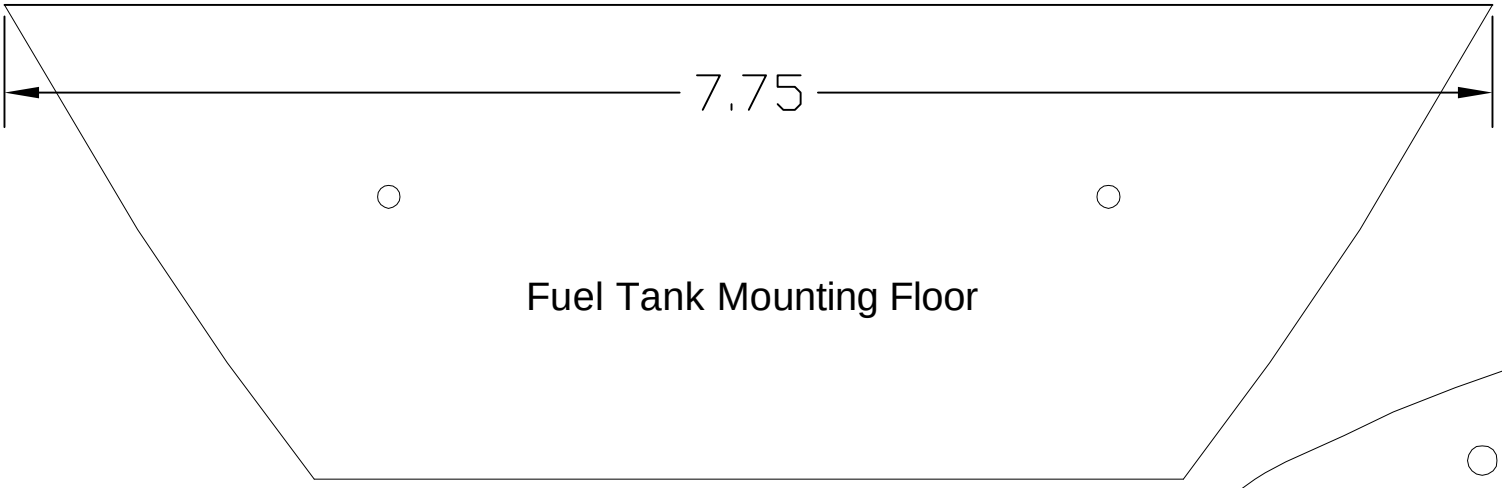
Rudder & Flap measured at base (root)

Maintenance Tips:

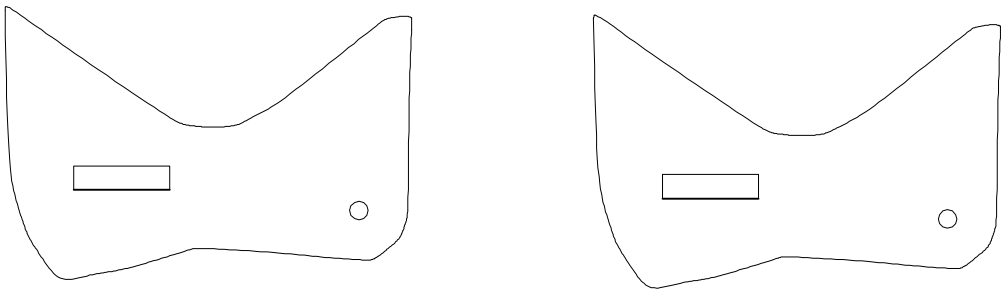
- ☐ When inverting the aircraft, put a short piece of fuel tube with a plug on the drain fitting.
- ☐ Cycle the gears before each flying session, checking for binding and proper operation.
- ☐ Check the struts for play, indicating the clamping set screw needs to be tightened, verify toe in on main wheels for reliable tracking.
- ☐ Check all hinged surfaces; i.e. pull on them before each flying session
- ☐ Check for proper radio operation, slowly cycle all surfaces with the transmitter making sure they are moving in the correct direction and proper deflection(**Note:** it is easy to lose a model due to a simple mistake of selecting the wrong model memory in the transmitter)
- ☐ Check all linkages, use keepers on the quick links
- ☐ Check wing mounting nuts for tightness
- ☐ Check Vertical fin clamp bolts for tightness
- ☐ Check Horizontal fin mounting bolts for tightness
- ☐ Check Fuel system for leaks
- ☐ Check all batteries before each flight, setup a routine maintained schedule on your batteries making sure that they cycle properly for capacity.
- ☐ Note do not charge LiPo batteries while installed in the airframe, the battery boxes provide easy removal of batteries for charging.

Congratulations, you have completed construction of your Fei Bao Dolphin

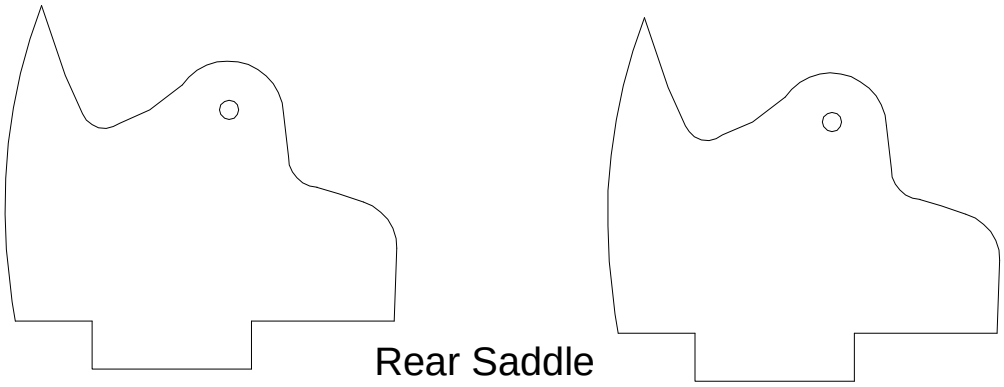
Annex A



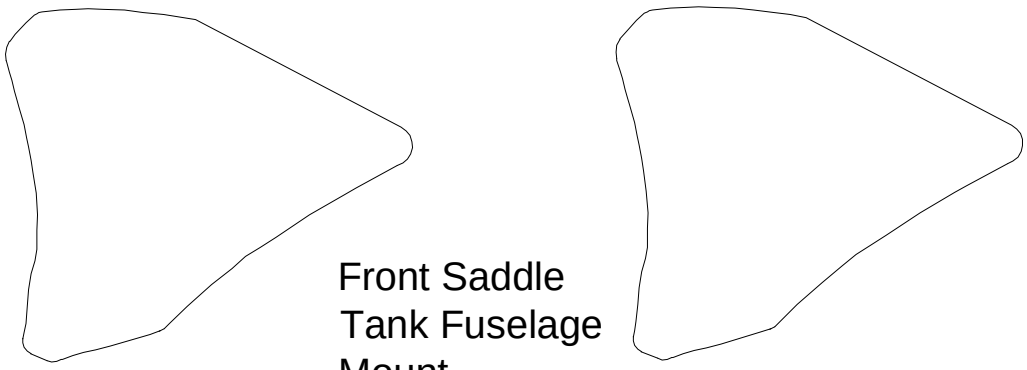
Fuel Tank Mounting Floor



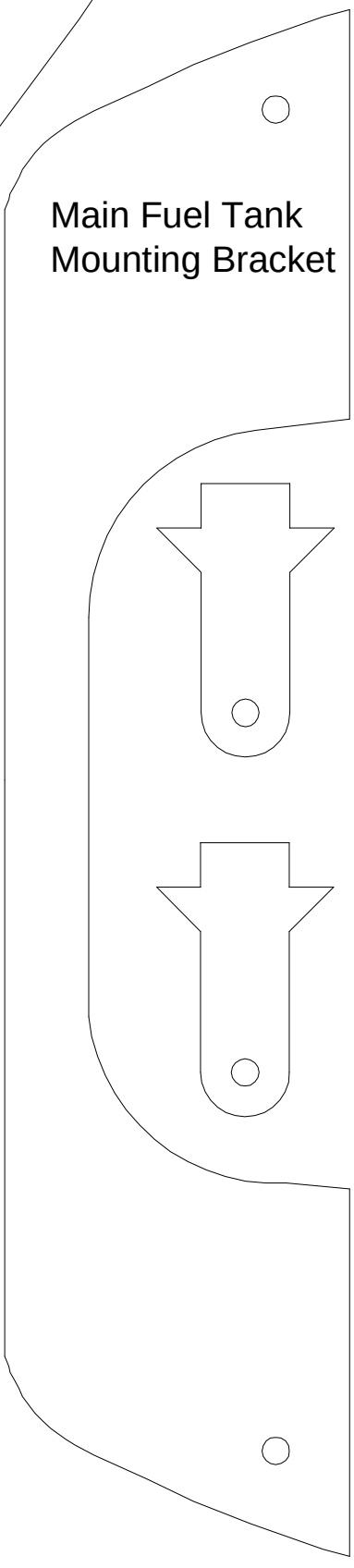
Front Saddle
Tank Mount



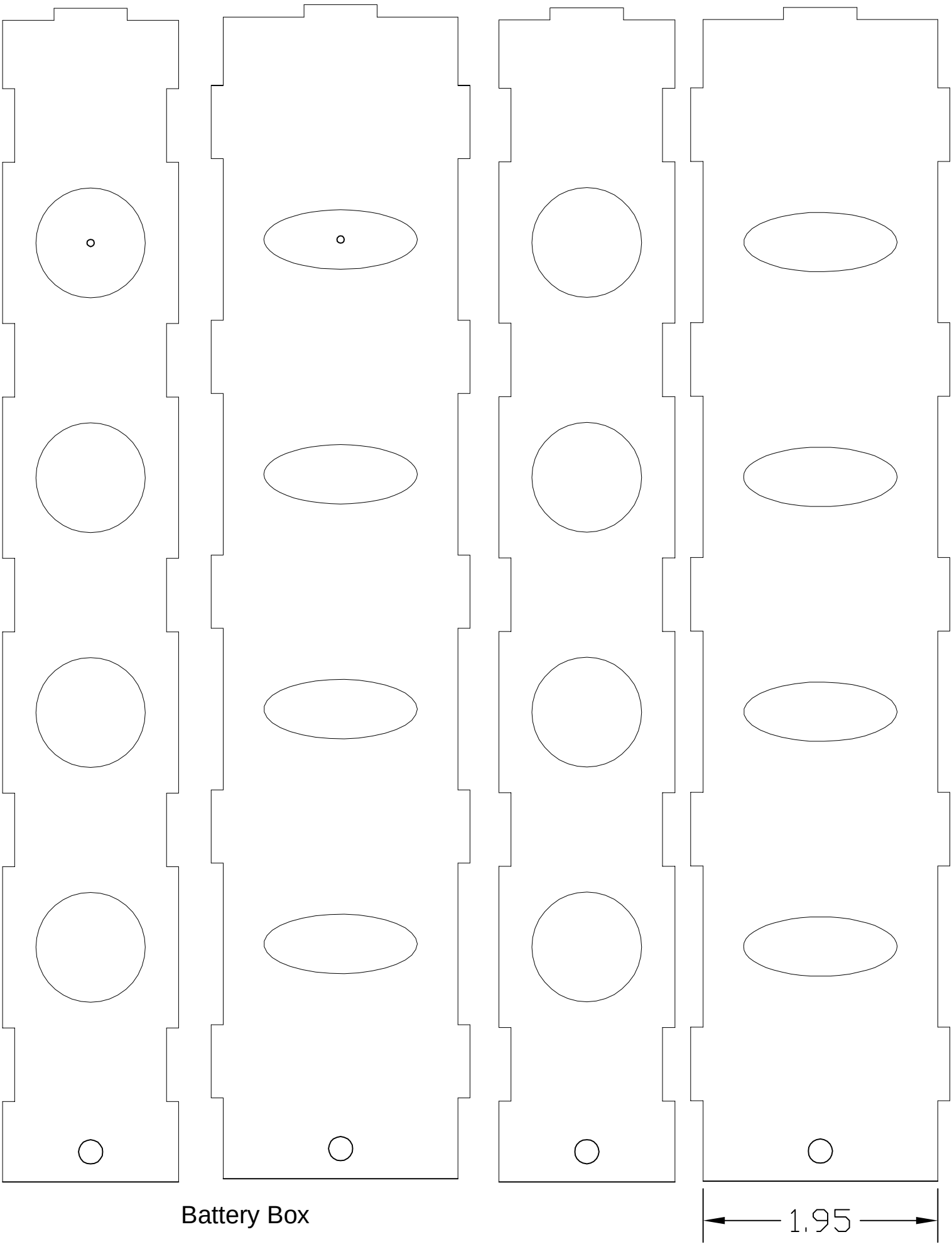
Rear Saddle
Tank Mount



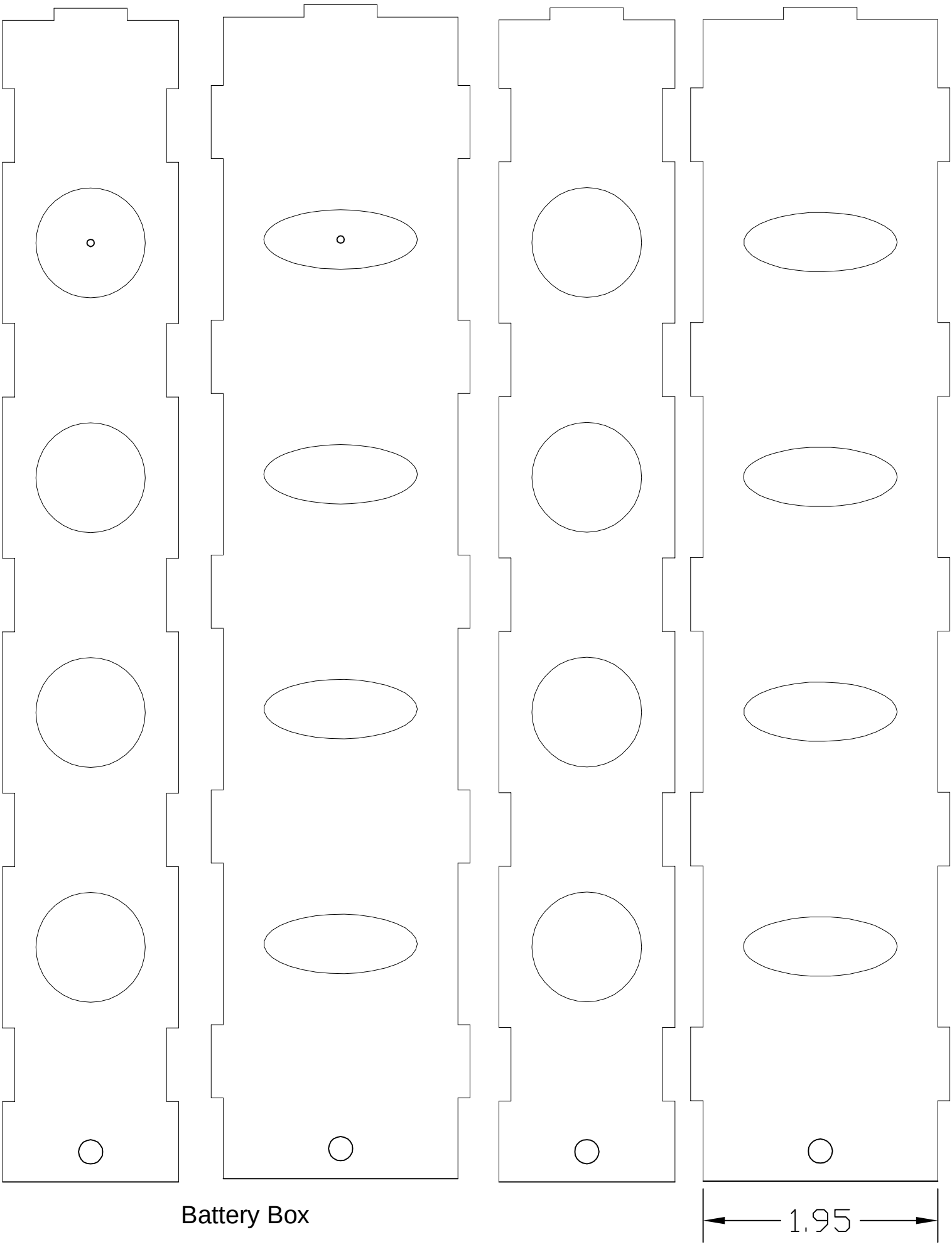
Front Saddle
Tank Fuselage
Mount



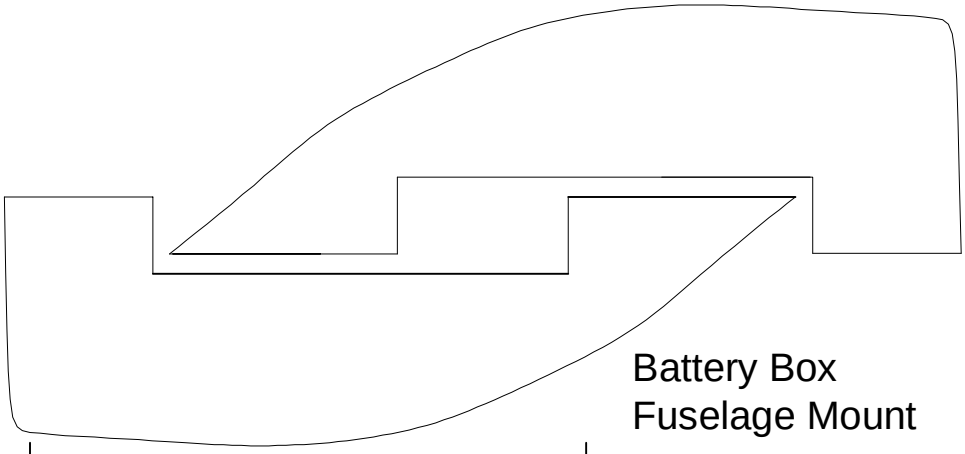
Main Fuel Tank
Mounting Bracket



Battery Box

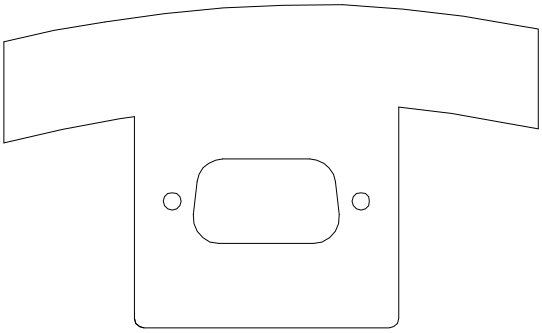


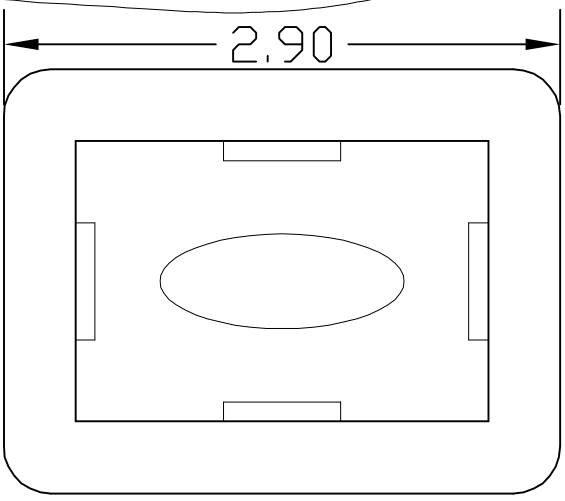
Battery Box



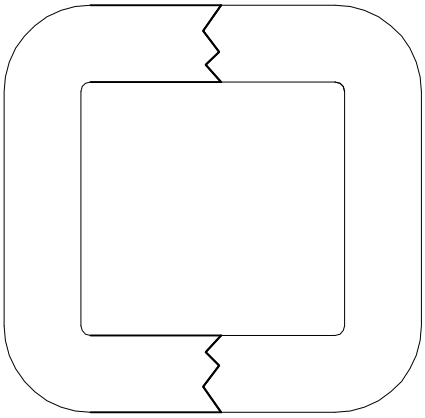
Battery Box
Fuselage Mount

Fuselage Connector Mount

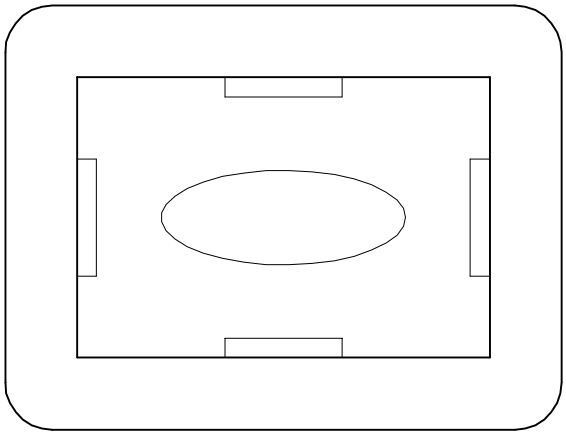




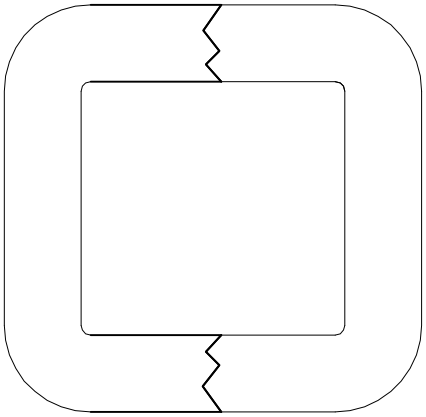
Battery Box
End & Frame

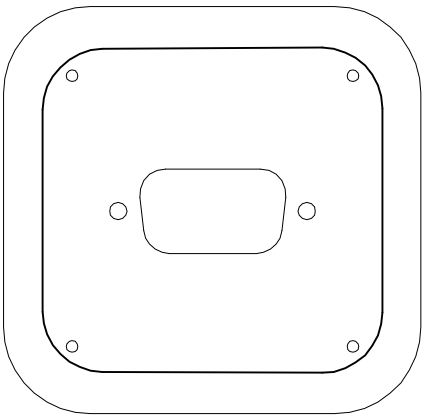


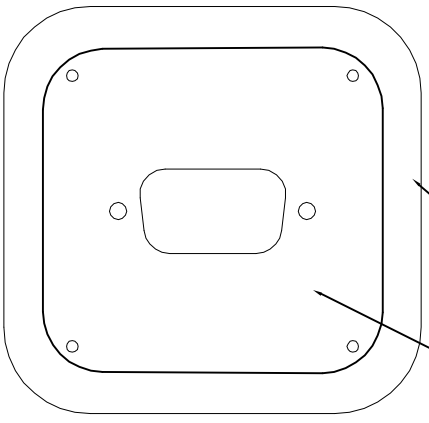
Wing Connector Backer



Battery Box
End & Frame

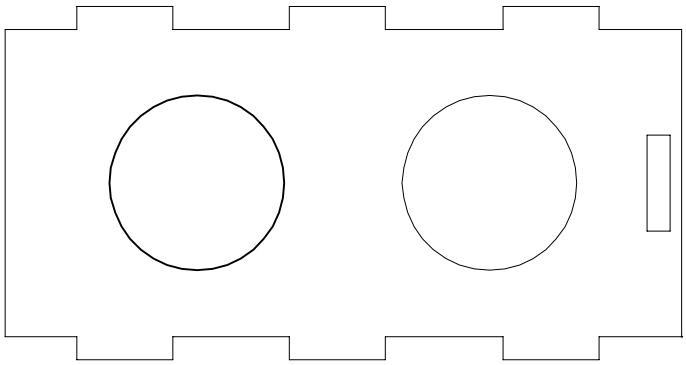


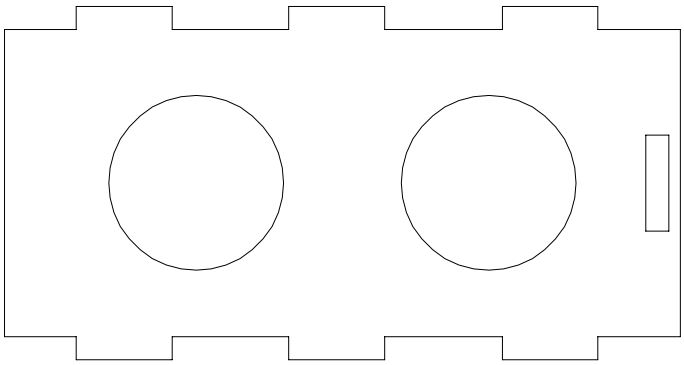


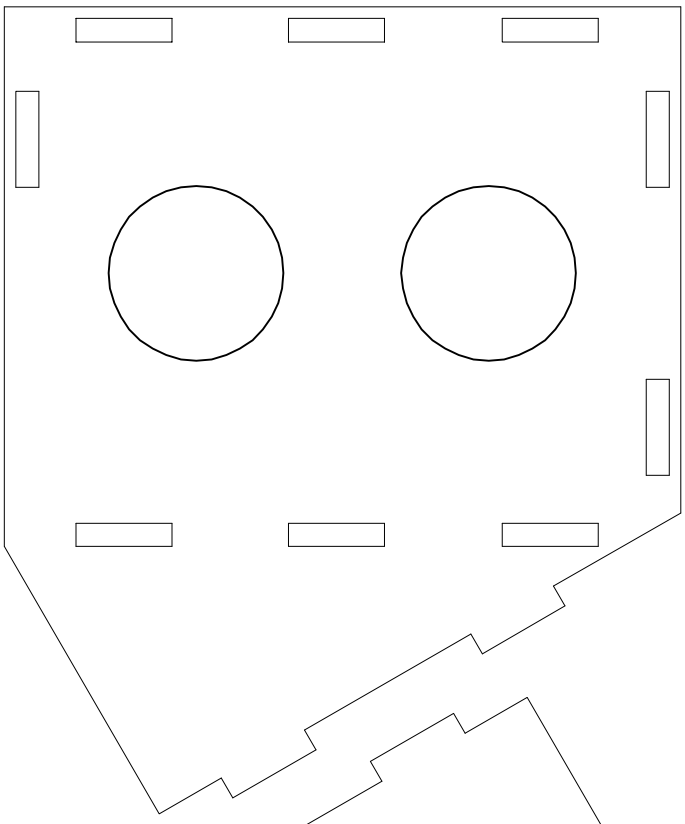


Wing Connector
Spacer Plate

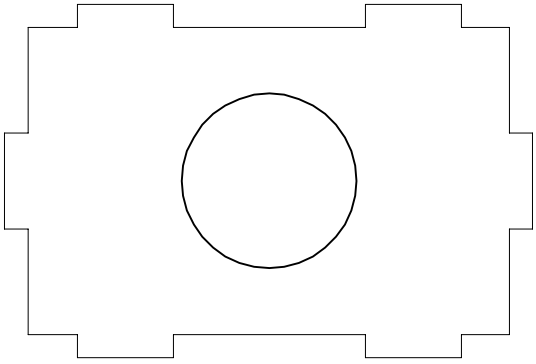
Wing Connector Plate

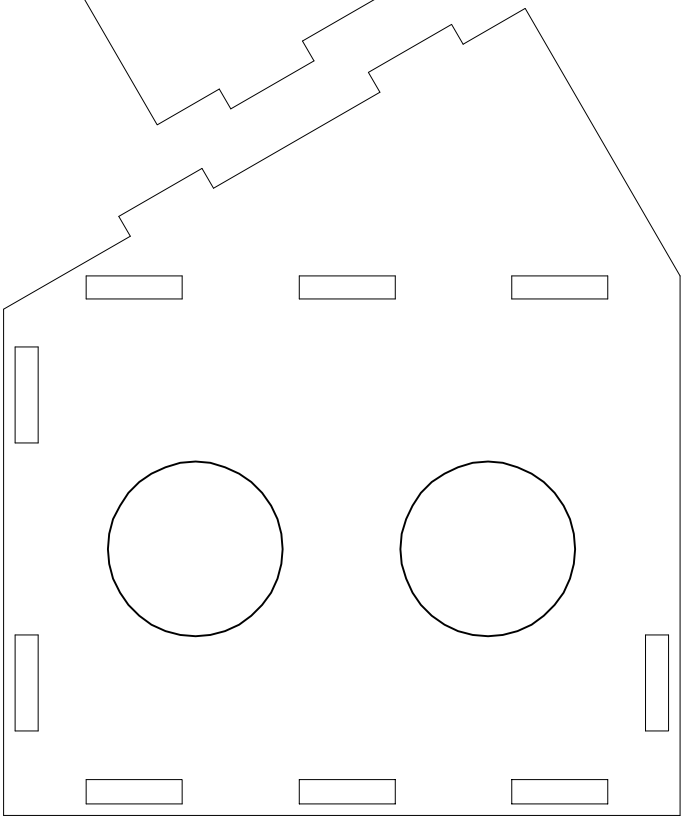


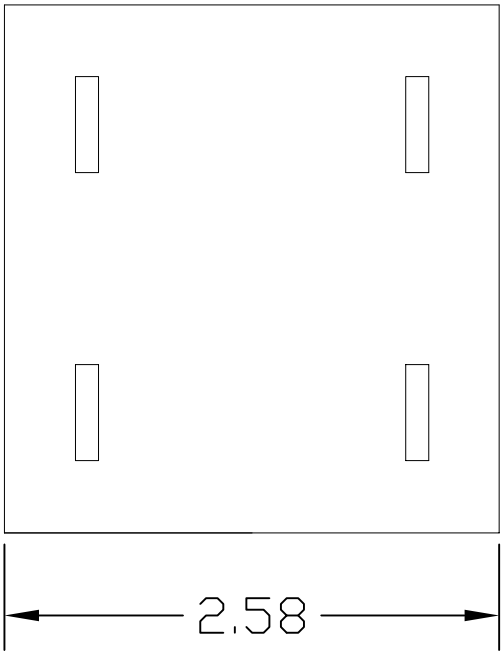


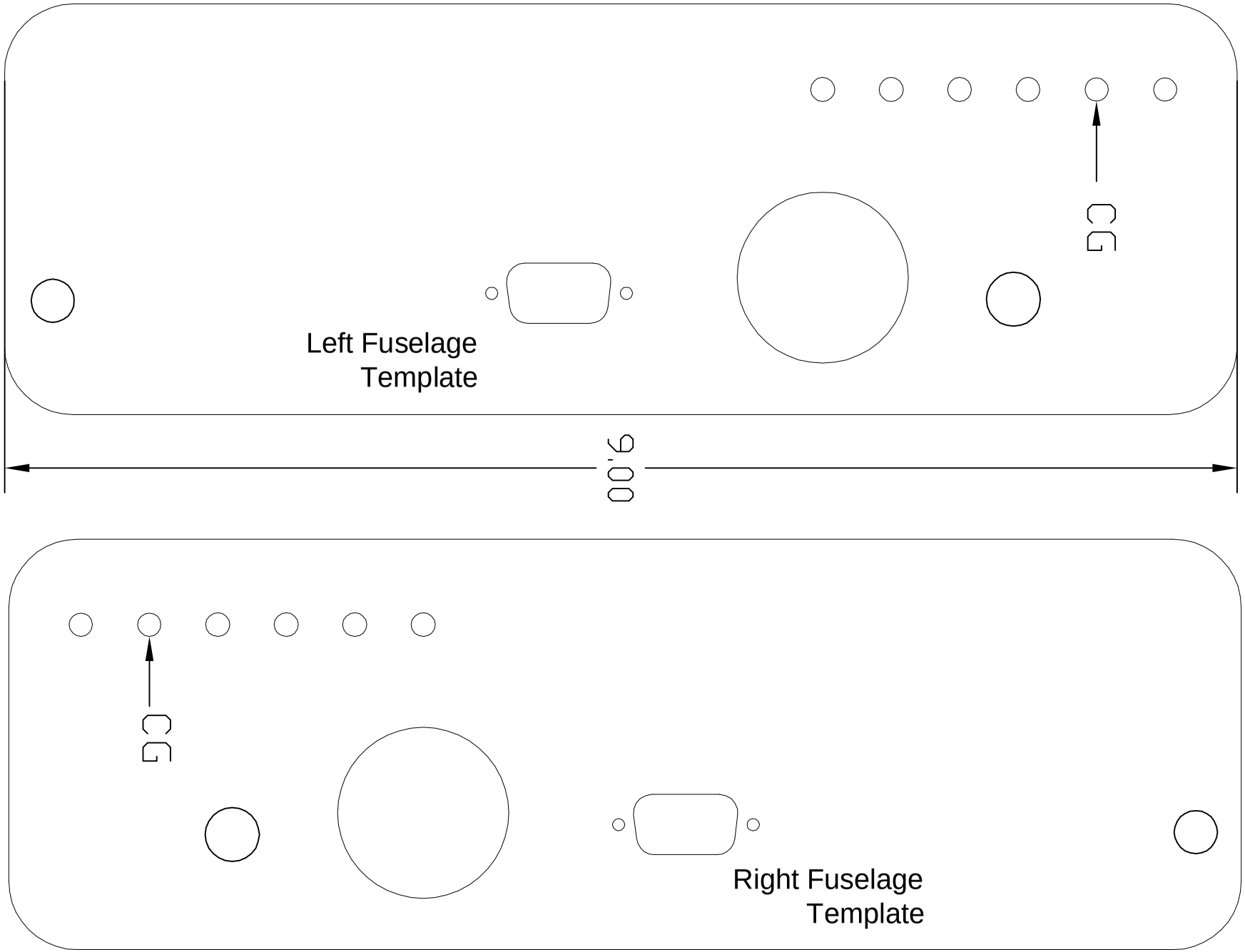


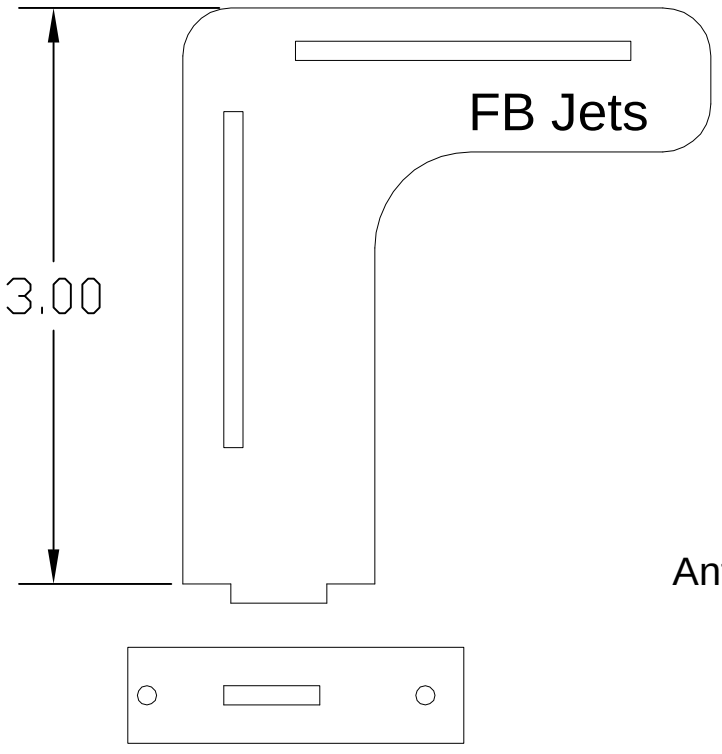
UAT Holder



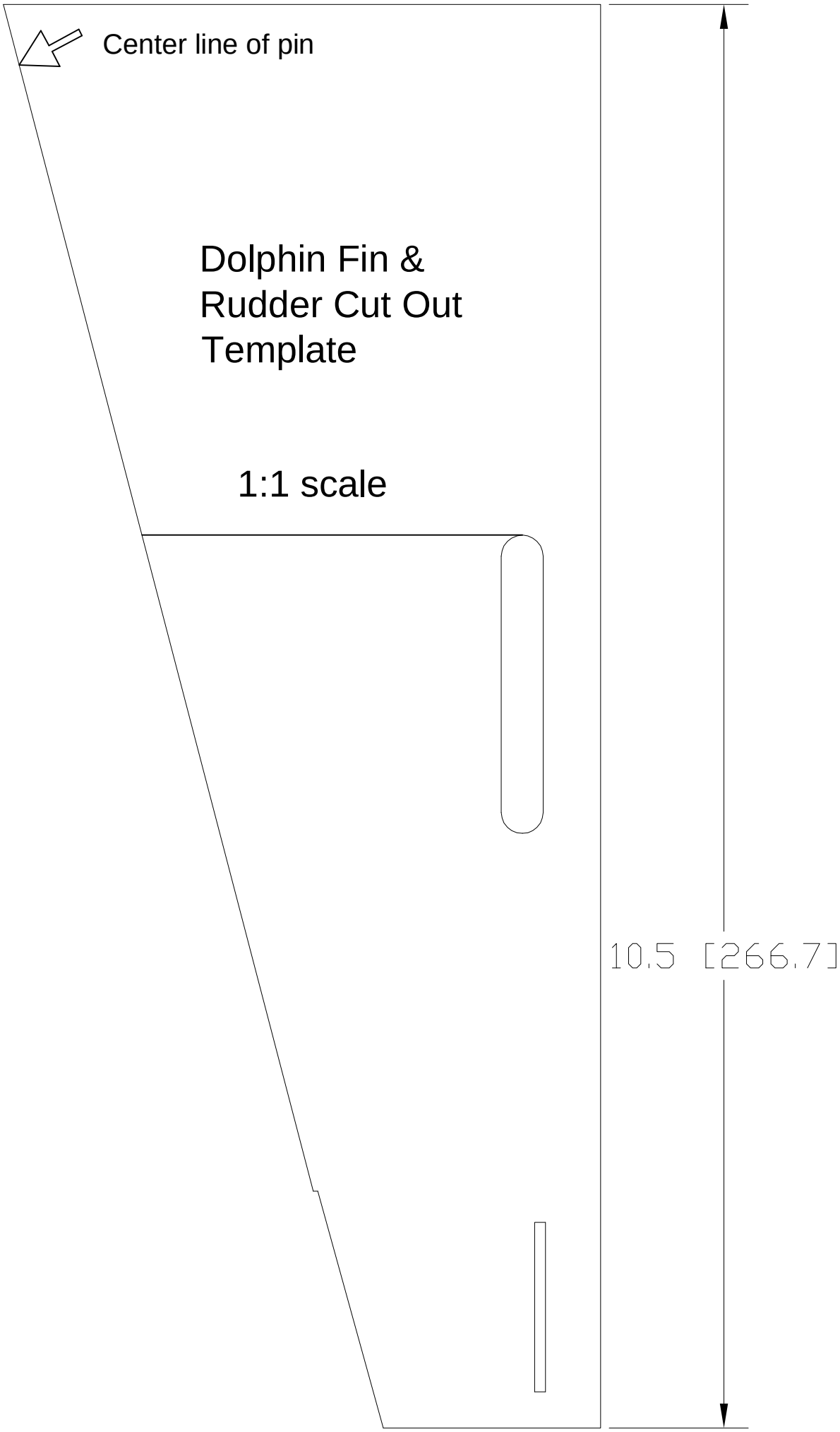


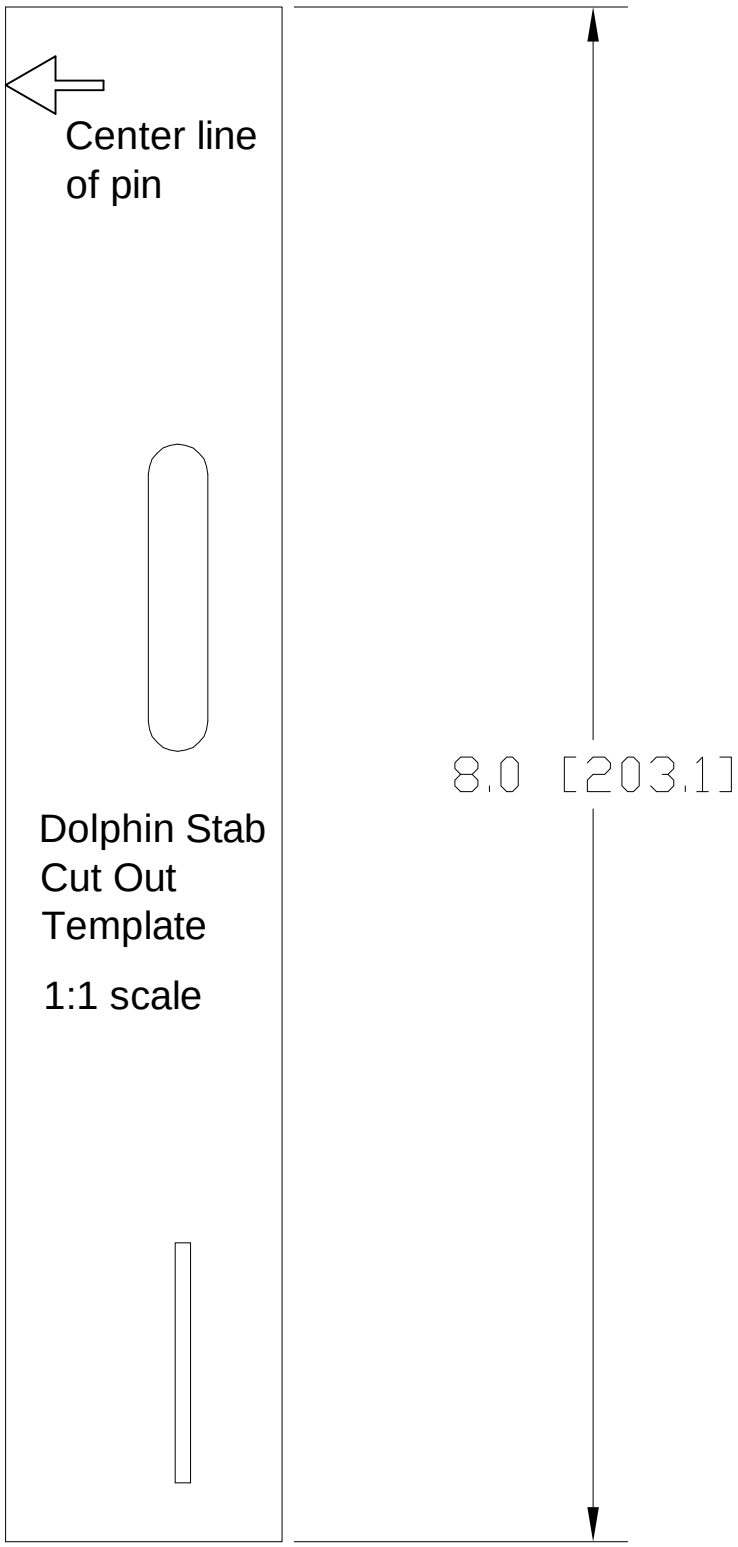



CG
Left Fuselage
Template
9.00
CG
Right Fuselage
Template



Antenna Holder


Center line of pin
Dolphin Fin &
Rudder Cut Out
Template
1:1 scale
10.5 [266.7]


Center line
of pin
8.0 [203.1]
Dolphin Stab
Cut Out
Template
1:1 scale