25% L-4 Grasshopper

Designed by Bill Hempel

ASSEMBLY MANUAL

Cover Photos by Keith Davis

Thank you for purchasing a Bill Hempel Team Edge Aircraft. We strive to build high quality and great flying aircraft. We have used our years of experience in the hobby to design and build aircraft that will last for many flying seasons. This is quite possibly the easiest war-bird to ever fly as an RC model! The 105" wing span creates a very light wing loading and the airplane performs like a glider on rails! The fully functional scale landing gear, even with the hardest of bounces, will make you look like a seasoned pro on landing. The scale scheme looks great in the air. This is a GREAT flying airplane that takes off and lands like a trainer. What a great flying machine! We suggest that you read through the manual before starting assembly. If you have questions of concerns please don't hesitate to E-Mail us at teamedge@billhempel,com.

Thank you

Bill Hempel

Billhempel.com assumes no liability for any damage resulting from the used assembled product. By the act of using the assembled product the user accepts all resulting liability. The purchaser or designated person flying this aircraft accepts all liability associated with the use of this product. The product is sold as is and the purchaser accepts any and all responsibility for structural or mechanical failures. Because of the stresses that are associated with aerobatic flight there is no warranty provided and billhempel.com cannot be held liable.

WARNING

Radio Control Model aircraft are not toys. If improperly used, they can cause serious injury or death. Fly only in open areas, and at AMA (*Academy of Model Aeronautics*) approved flying sites. The AMA Safety Code must be followed. Follow all instructions included with your plane, radio, and engine. The purchaser accepts all liabilities.

SPECIFICATIONS:

Wingspan:	105”	
Length:	72”	
Weight:	14 pounds	
Engine:	30cc to 55cc single cylinder gas	
	40cc twin cylinder gas engine	
	OS 1.6 2-stroke glow (Scale power at sea level)	
Servos:	Ailerons:	2 - 120 oz-in with 24” extension
	Elevators:	2 - 120 oz-in with 36” extension
	Rudder:	1 - 120 oz-in
	Throttle:	1

RADIO SUGGESTION

It is highly recommended that a seven-channel radio be used in this model. This allows a separate servo for each aileron and each elevator half and a channel for an electronic ignition cut off for the gas engine with electronic ignition.

UNPACKING

Carefully remove the aircraft from the boxes and inspect for any damage. If you have damage it must be reported to the freight company immediately. Billhempel.com is not responsible for any shipping damage. You must contact the carrier. We will work with the purchaser and the freight company to resolve any issues. However, a claim must be filed before we can begin the process.

RE-SHRINK THE COVERING

Before doing any assembly or installation it is very important to re-shrink or retighten the already applied covering. Due to the shipping process, heat and humidity changes from different climates, the covering may become lose and wrinkle in the sun. If you take the time to re-tighten the covering, you will be rewarded with a long lasting, beautifully covered model. Using your covering iron with a soft sock, gently apply pressure and rub in the covering. If any bubbles occur your iron may be too hot. Reduce heat and work slowly. You should be able to just see the wood grain under the covering when proper adhesion has occurred.

IMPORTANT

Go over all seams and color overlaps with your iron to assure good adhesion of the covering to the wood. This is especially important at the leading edges of the wings and stabs at all overlapping material. Once all seams have been ironed down, then use a heat gun with extreme caution. Be careful; don't apply too much heat to one area for a long period of time. The trim stripes are especially vulnerable to over shrinking. Tightening and re-shrinking the covering is now complete.

PARTS LIST – Large Pieces

Fuselage

Windshield

Cowl

Right and Left Wing

Rudder with hinges

Horizontal Stabilizer

Elevator – right and left with hinges

Wing Tube

Wing Struts – four pieces

Main landing gear – three pieces

Carbon Fiber Tube for Control Rods

Wheels (2)

Tail Wheel

BAGS OF PARTS

(The list below is of the labels in each bag. The full contents will be described when the parts are used.)

Main Wheel

Wing Strut

Main Wing

Tail Wheel

Horizontal Stabilizer

Cowl

Push Rod

Rudder Control Horn with Connectors

Elevator and Aileron Control Horn with Connectors

> The ones with the longer bolts are for the Ailerons and the ones with the shorter bolts are for the Elevators.

WING ASSEMBLY

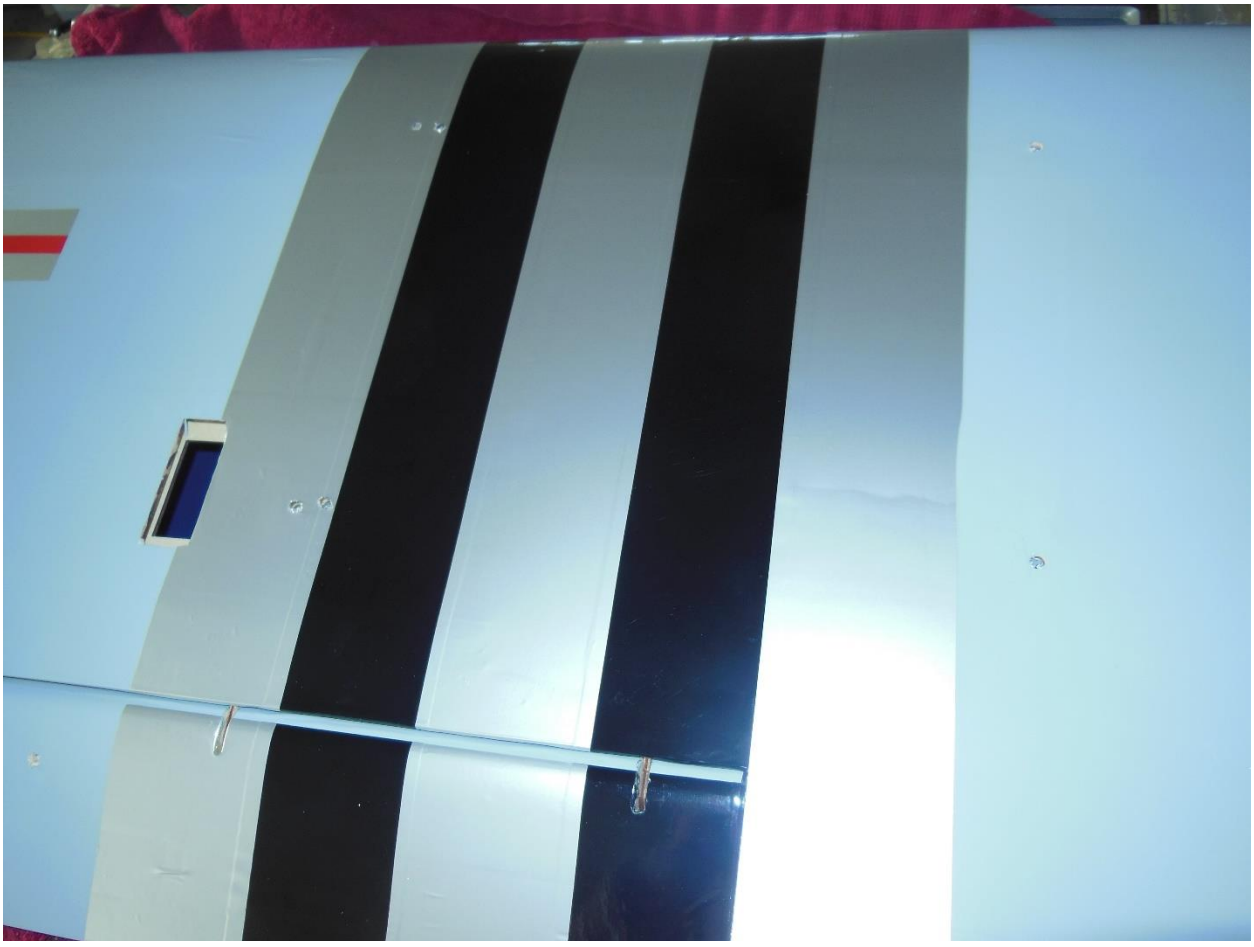
Wing assembly consists of the following tasks:

1. Removing the covering from the servo mount hole and from the various holes for mounting the strut parts. Removing the covering from the hole for the aileron control horn.
2. Mounting the aileron control horn.
3. Mounting the servo.

4. Assembling the aileron pushrod and mounting the aileron pushrod and centering the aileron servo position.
5. Mounting the strut attachment hardware and struts.
6. Assembling the strut.
7. Attaching the strut components to the wing.

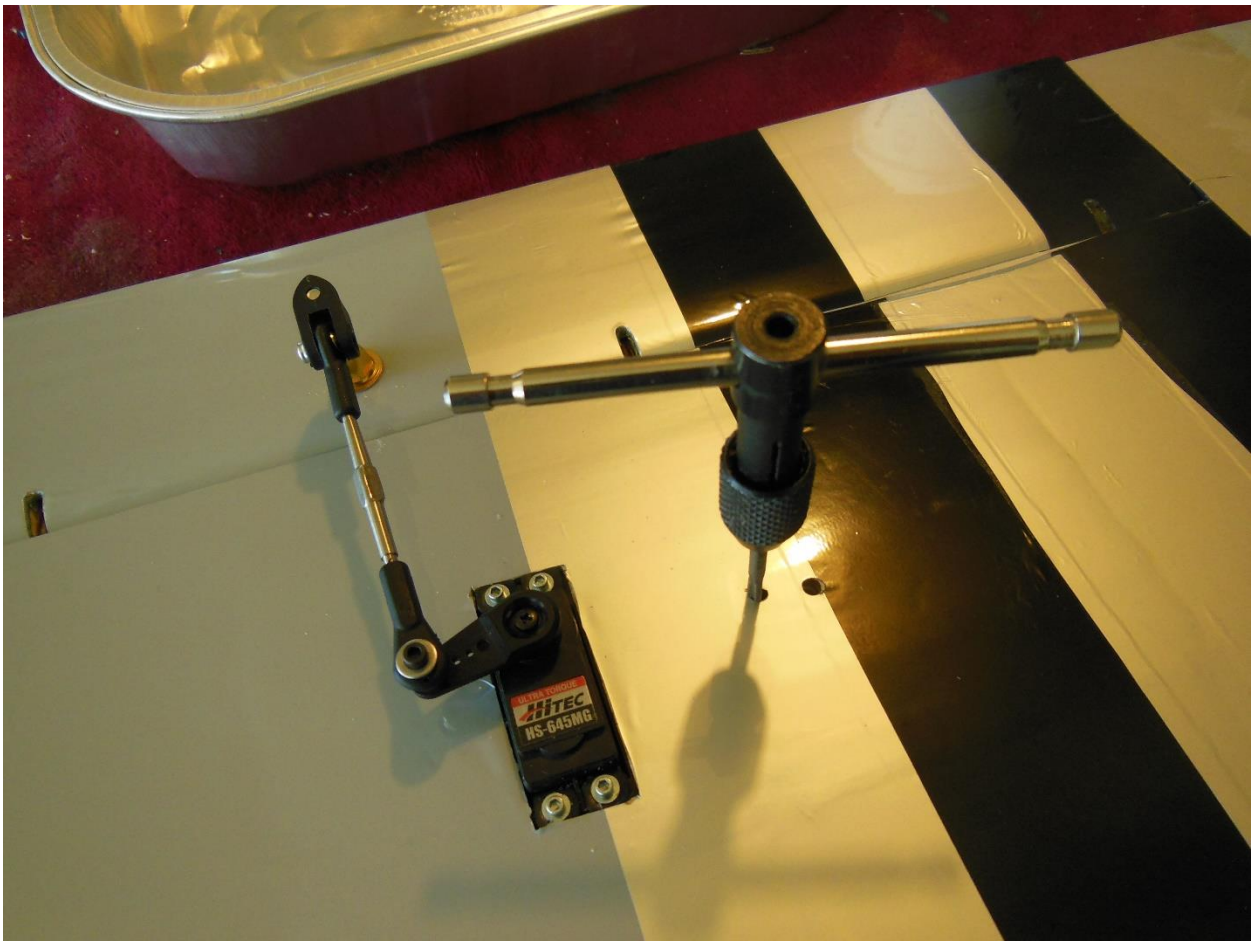
REMOVING COVERING

There are six blind nuts in the bottom of the wing that must be uncovered to mount the strut hardware. The covering must also be removed from the servo mounting position and from the hole in the aileron to mount the control horn. These are all seen in the picture below.



Use a sharp X-Acto knife and carefully remove the covering from the holes as shown in the picture above. It is helpful to use a 6-32 tap and clean out the threads in the blind nuts. This is illustrated in the picture on the next page.

The hole for the aileron control horn needs to be enlarged with a 5/32 drill.



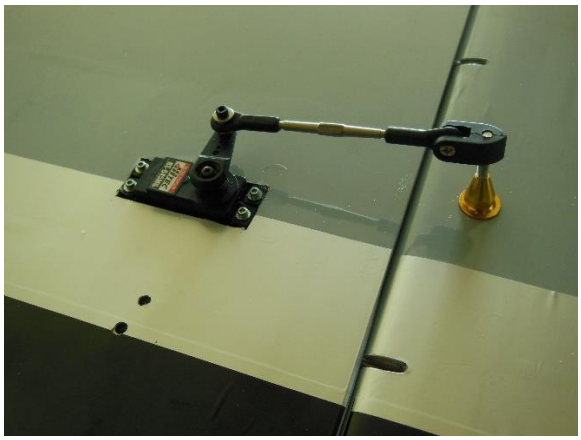
EXTRA PARTS TO FACILITATE ASSEMBLY

1. Socket Head Servo Mounting Screws – 2 x 12 mm - 1 package of 24. (Du-Bro Cat. No. 893, Tower Hobbies Stock Number LXFRM2). Socket Head screws are much easier to insert than are the Phillips Head screws usually provided with the Servos. Much less downward pressure is required to insert them. They are shown in the picture above.
2. Du-Bro Swivel Link 4-40 w/Hardware Black (12). (Du-Bro Cat. No. 861, Tower Hobbies Stock Number LXAPC5). The part used from this package are the brass shims/spacers. Their use will be explained in the instructions for mounting the control rod to the servo arm. The shims/spacers are available from Du-Bro but are not a catalogue item; they must be ordered by phone. Six are required.

MOUNTING THE AILERON CONTROL HORN

The aileron control horn and associated hardware are shown in the pictures below.

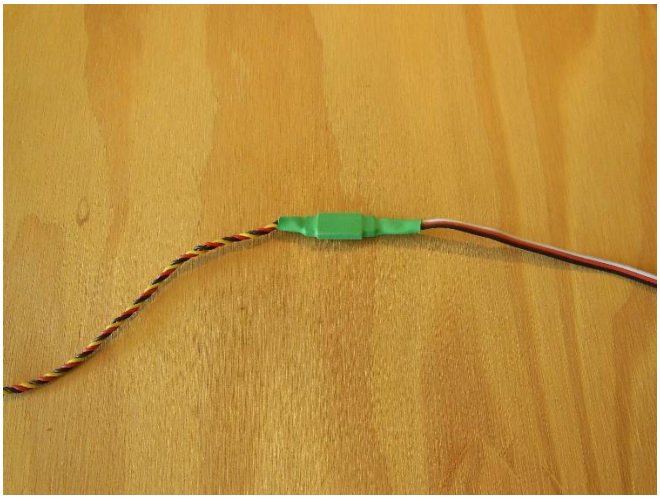
The control horns are mounted as shown in the following two pictures.



As is seen in the picture, the spacer goes on the bolt before the washer and then that is inserted through the hole in the aileron. On the other side of the aileron the washer goes on first and then the nut screws on to hold the control horn in place. Use blue thread locker on these threads to keep this in place and use a 10-mm wrench to tighten down the nut on the control horn being careful not to crush the aileron.

MOUNTING THE SERVO

Attach a 24-inch servo extension to one of the aileron servos. Put a 2-inch piece of 3/8 inch shrink tubing over the servo connection and shrink as shown in the picture below to prevent the servo from coming unhooked during flying.

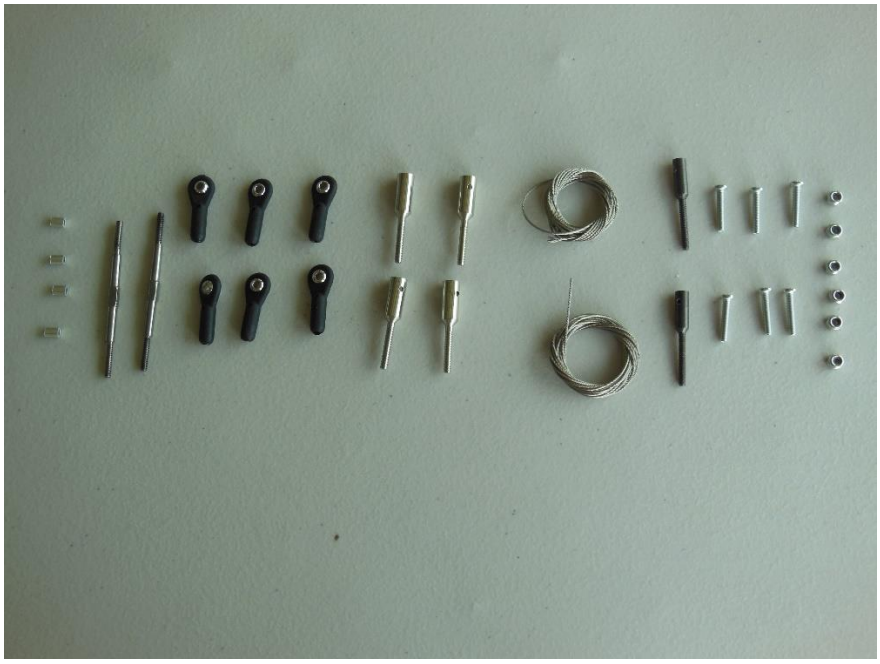


Attach a weight to the end of about 4 feet of string. Put the weight into the servo mounting opening and let it fall down to the center of the wing going through the

ribs until it comes out and you can grab hold of it. Attach the other end of the string to the servo connector and gently pull the servo wire from the opening to the inside of the wing. Insert the servo into the wing opening with the end with the control arm facing the trailing edge of the wing. Drill 1/16-inch holes for each of the four mounting screws for the servo. Remove the servo and harden these holes with thin CA. Remount the servo and attached it in place with the servo mounting screws. (Socket head 2 x 12 mm screws work very well for mounting servos.)

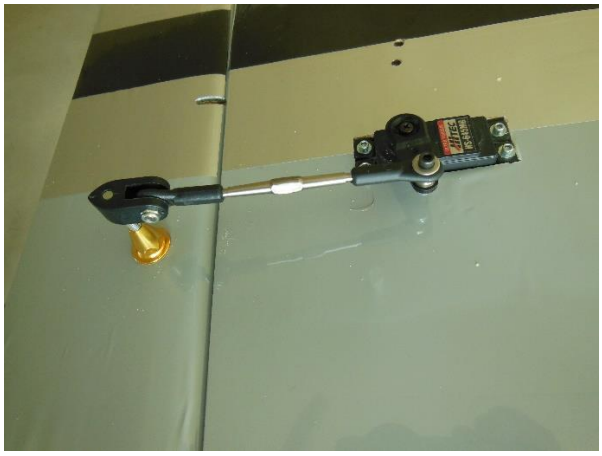
ASSEMBLING THE AILERON PUSHROD

The contents of the Bag of Parts labelled “Push Rods” are shown in the picture below.



To assemble each aileron push rod we will use the parts shown in the following picture.

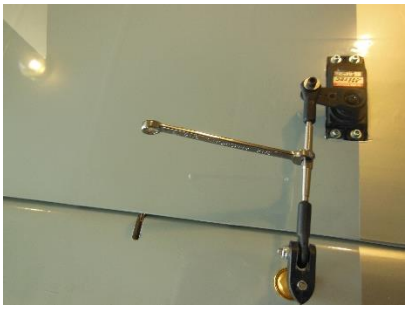
Attach a Swivel Link to each end of the pushrod. Note that one end is a right-handed thread and the other end of the control rod is a left-handed thread. One end of the control rod is attached to the servo arm and the other end is attached to the control rod on the aileron. This is illustrated in the picture below.



The Du-Bro Swivel Link 4-40 w/Hardware Black packages contains 4-40 socket head cap screws. Note that the brass shim goes on the servo arm and then the swivel link is placed on top of the shim. A number four washer is placed on the 4-40 socket head cap screw before it is inserted through the swivel link, the shim and then the servo arm. An elastic stop nut is used to hold the whole assembly together.

Plug the servo lead into the proper slot in your receiver, turn on your transmitter, and set the aileron trim and sub trim to the neutral positions. Attach the servo arm perpendicular to the servo, again using blue thread locker if it is a metal to metal connection. Attach the U-shaped connector to the control horn. Holding the aileron adjust the control rod so that it is the proper length to hold the aileron in the neutral position. Attach the U-shaped connector to the swivel link using the screw

and elastic stop nut that is provided. With the transmitter on use a 3/16 inch open end wrench and adjust the length of the control rod so that the aileron is in the perfectly neutral position as shown in the picture below.

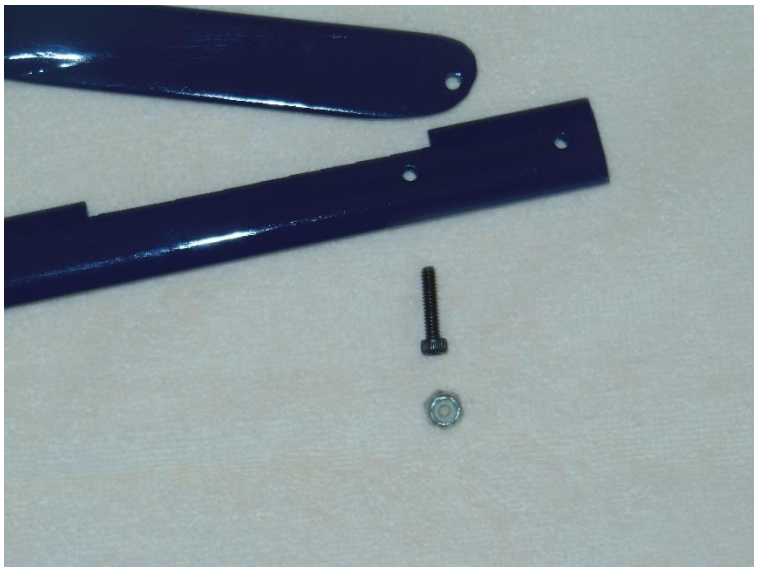


MOUNTING THE STRUT ATTACHMENT HARDWARE AND STRUTS

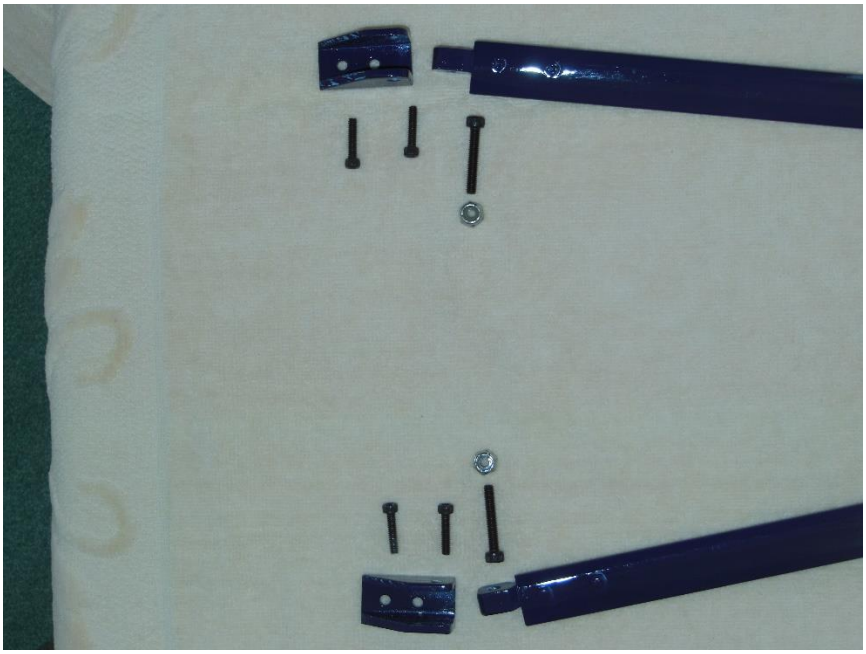
The strut and strut attachment hardware are shown in the picture below.

These include the parts from the wing struts Bag of Parts. Note that the longer screws are 8-32; these are used to attach the wing strut to the wing strut mount on the wing. All of the other screws are 6-32.

Bolt the two sections of the strut together using the 6-32 socket head cap screw and the elastic stop nut. Be careful to make sure that the orientation of each strut component is the same as you fasten them together. See picture on the following page.

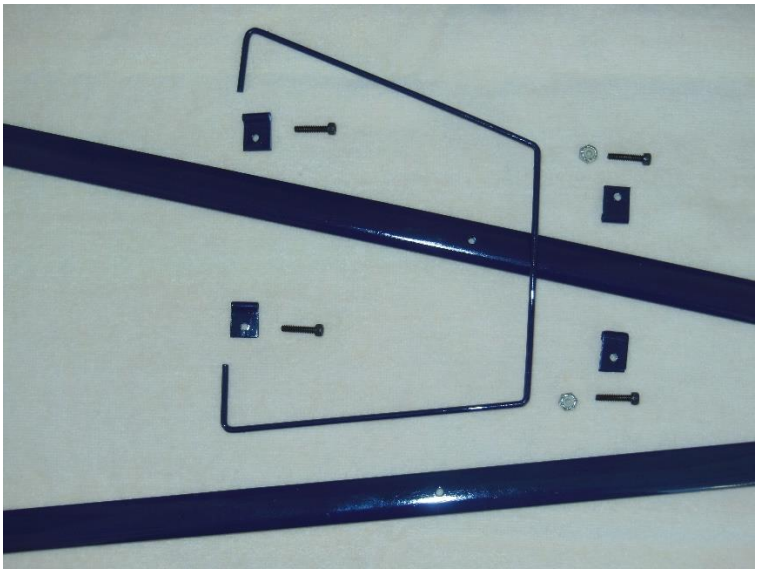


The hardware used to attach the strut to the wing is shown in the picture below.

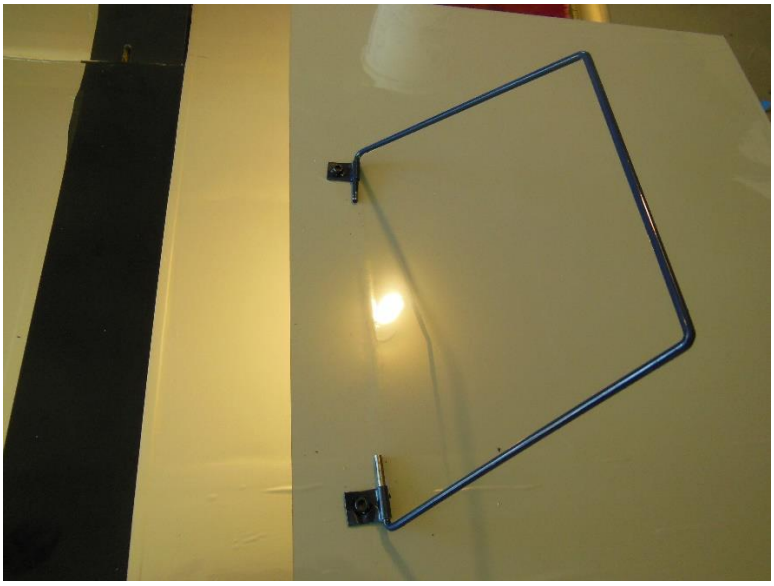


Attach the strut mount to the wing using the 6-32 socket head cap screws. Be sure to use blue thread locker on the screws to make sure they don't back out during flight. Orient the strut mount so that the sloping end is toward the wing tip. Attach the strut to the strut mount using the 8-32 socket head cap screws and elastic stop nuts.

The strut brace and attaching hardware is shown in the picture below.



Attach the strut brace mount to the wing using 6-32 socket head cap screws. Orient the brace mount as shown in the picture below.



Note that the strut brace is not symmetrical and that the sharpest bend faces the leading edge of the wing. Attach the strut brace to the strut using 6-32 socket head

cap screws and elastic stop nuts. Note the orientation of the strut brace attachment in the picture below.

This completes the wing assembly. Installation of the strut mounting hardware to the fuselage will be covered later in this assembly process.

FUSELAGE AND TAIL ASSEMBLY

The first step in assembling the fuselage and tail assembly is to remove the doors and remove the door hinges. At this time, it is also convenient to remove the elevator hinges and the rudder hinges and collect all the hinges together into a safe place for installation later. An extra step that is beneficial in preserving the life of the model is to go over all the joints inside the fuselage with thin CA. This will reinforce the joints.

There are openings in the fuselage covering that must have the covering removed.

These are.

Four holes for wing mounting as shown in the following picture.

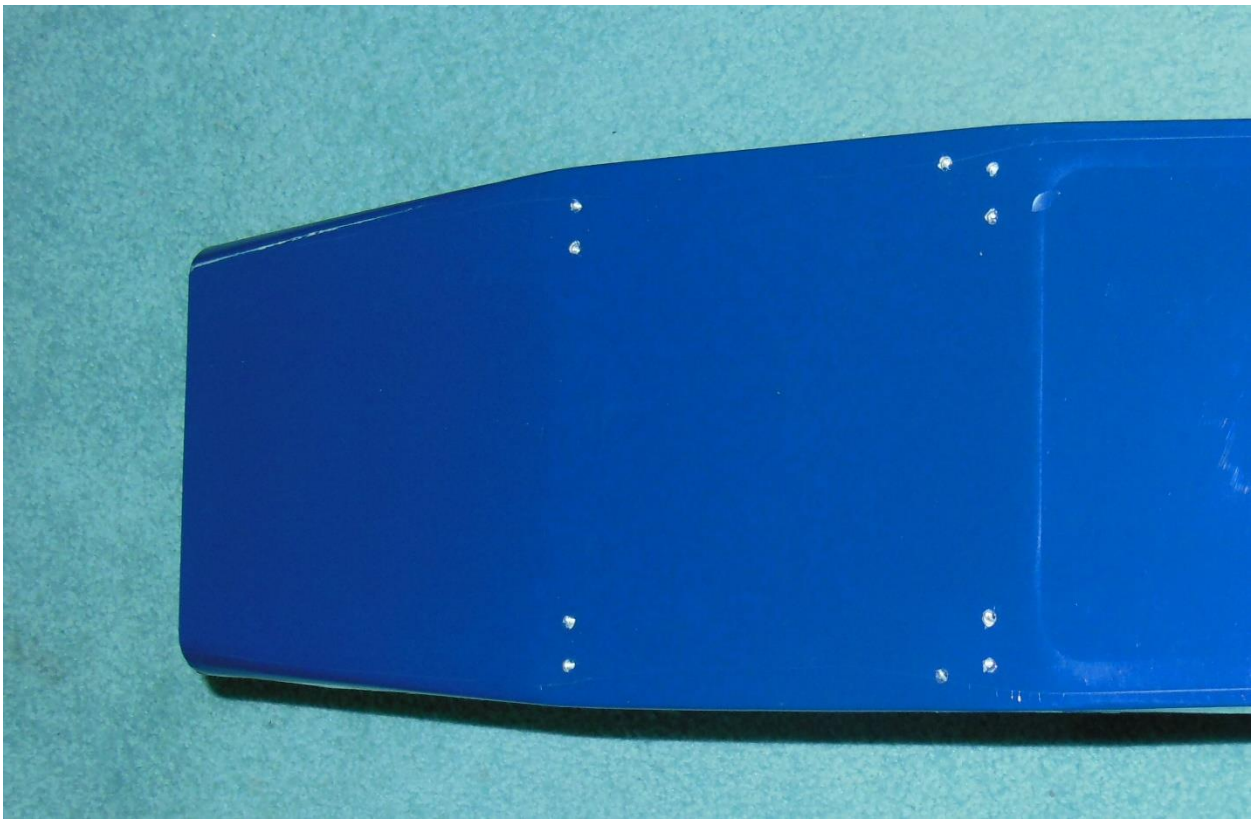
Two openings for the elevator servos.

Two slots for the rudder control cables.

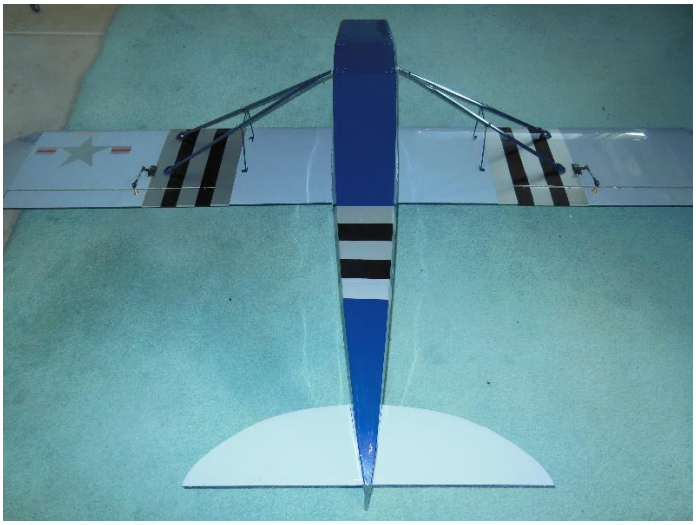
The opening for the horizontal stabilizer.

These openings are shown in the picture on the next page.

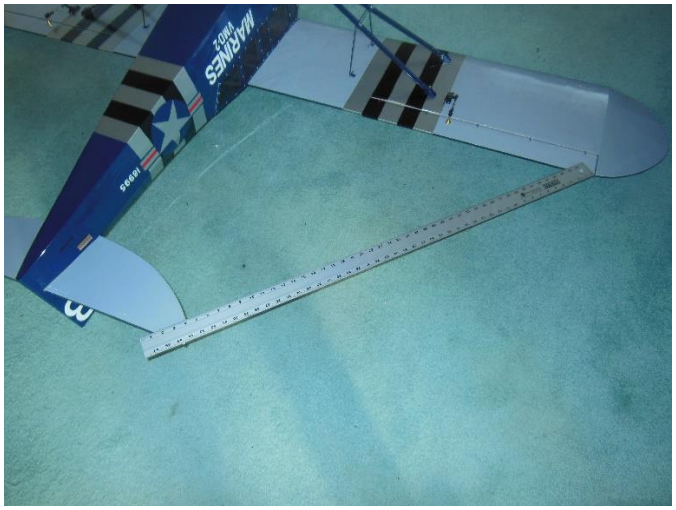
The covering over the holes for the landing gear and wing strut mounts must also be removed. Again, clean these threads with a 6-32 tap. The hole locations are shown in the picture below.



To position the horizontal stabilizer properly to the fuselage the wings must be attached to the airplane. Insert the carbon fiber wing tube into the hole in the fuselage and slide each wing onto it so that they are flush with the edge of the fuselage. From the small package marked “Main wing” remove the two wing mounting screws and attach the wings firmly to the fuselage. Put the airplane upside out on your bench as shown in the picture below.



The covering must be removed from the center of the horizontal stabilizer, so it can be epoxied into the fuselage. Insert the horizontal stabilizer into the slot in the back of the fuselage. Make sure it is centered in the fuselage by measuring from the edge of the side of the back of the fuselage to the tip of the horizontal stabilizer. These two distances must be the same. Also measure from the tip of the horizontal stabilizer to the tip of the aileron as shown in the picture below.



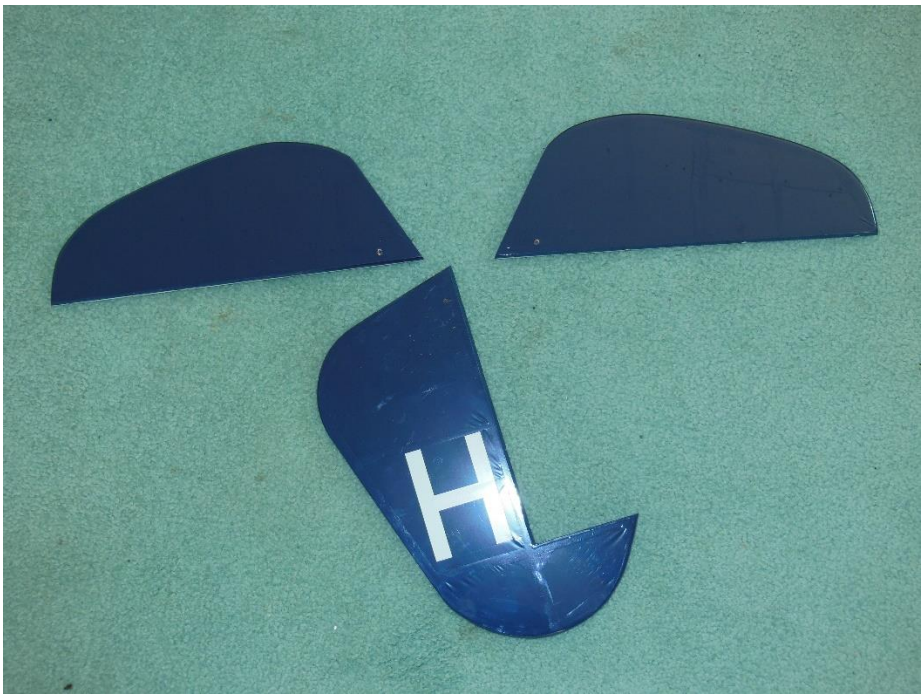
These two distances must be equal on each side of the airplane. When the horizontal stabilizer is centered, using a felt tip pen, mark where the horizontal stabilizer goes into the fuselage both on the top and the bottom. Remove the horizontal stabilizer from the fuselage and carefully remove the covering in between the lines you have just marked. Note that the sizes of the cutouts are different on the top and bottom of the horizontal stabilizer. The horizontal stabilizer with covering removed is illustrated in the picture below.

Mix up enough 30-minute epoxy to cover both of the cutouts on the top and the bottom of the horizontal stabilizer. Evenly coat with epoxy both sides of the horizontal stabilizer where the covering has been removed. Carefully slide the horizontal stabilizer into the fuselage and make sure it is positioned exactly as was determined earlier. Make the same measurements that were made before to get the initial positioning of the horizontal stabilizer. Now set this whole assembly aside for 24 hours to let this epoxy cure thoroughly. When the epoxy is thoroughly cured remove the wings and set them aside.

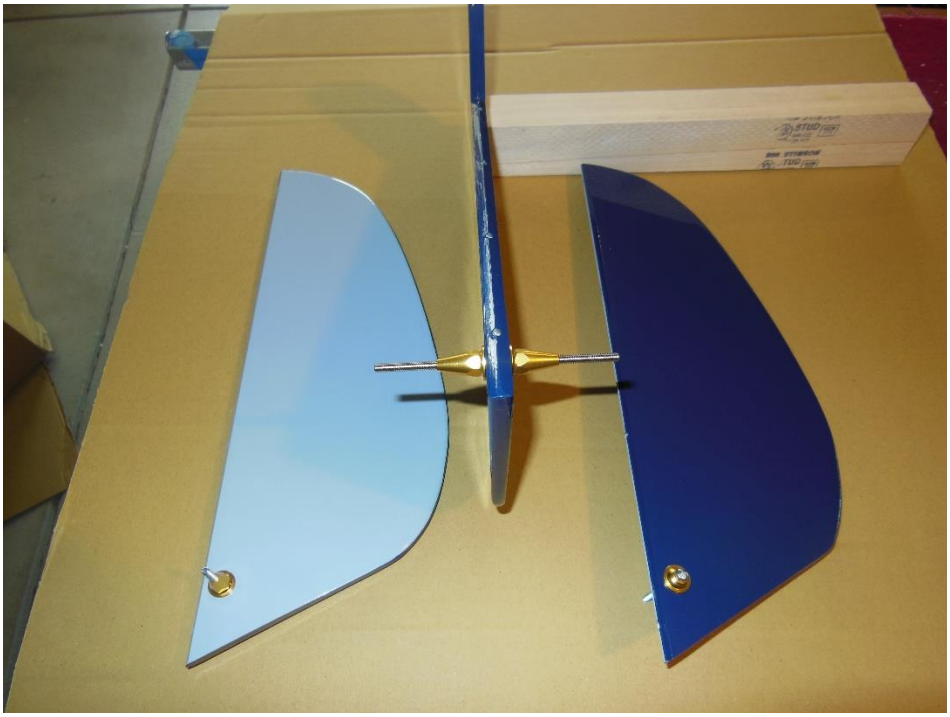
Locate the holes in both the horizontal stabilizer and the vertical stabilizer where the tail bracing wires will be attached. See pictures below for location.

Carefully remove the covering from both sides of these holes.

Before installing the rudder and elevator hinges, remove the covering from the holes for the control horns. Again, enlarge these holes with a 5/32 drill. The hole locations are shown in the picture below.



Attach the control horns to the elevators and rudder as shown in the following photo. Again, use blue thread locker on the threads and be sure that the rudder control horn is exactly centered.



INSTALLING THE RUDDER AND ELEVATOR HINGES

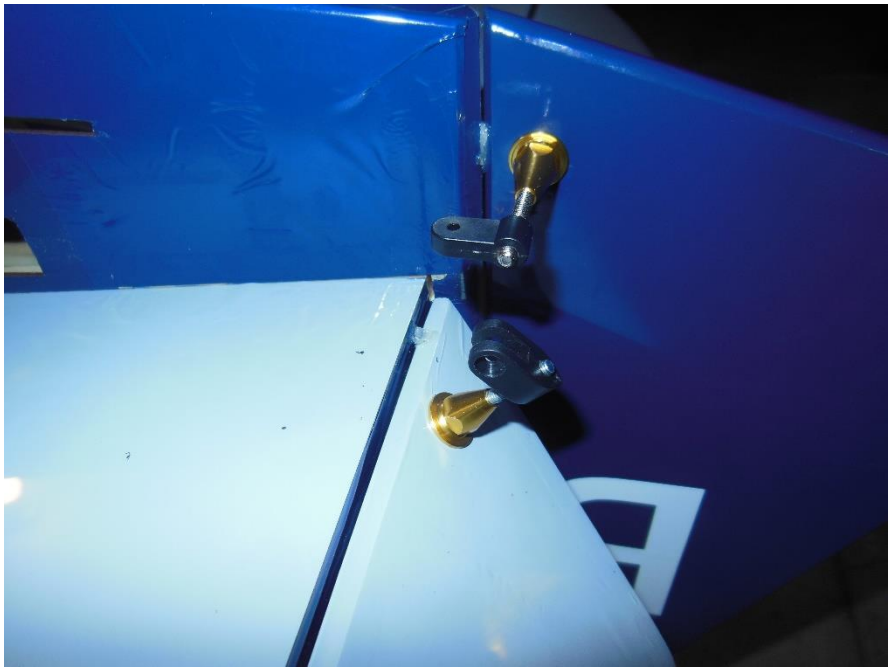
The challenge in installing pin hinges is to keep the glue or epoxy out of the hinge. A good way to do this is to put petroleum jelly over the hinge. One way to do this is illustrated in the picture below.

Place your sealing iron upside down in the stand as shown. Turn on to a medium heat. Place petroleum jelly inside of a metal jar lid and allow it to melt. Then use a fine artist brush and carefully cover the joint area with petroleum jelly. Now we are ready to glue or epoxy the hinges in place.

Carefully put glue or epoxy on the end of the hinges and insert them into the holes in either the elevator or the rudder. Wipe off any excess glue or epoxy before going on to the next step. Carefully put glue on the ends of the hinges and insert the hinges into the holes in either the stabilizer or the rudder. Make sure that the hinges are inserted fully and that the elevator or rudder is as close to the stabilizer or fuselage as possible. Clean off any excess glue or epoxy. Epoxy is easily removed by placing isopropyl alcohol on a paper towel and just wiping it off.

INSTALLING ELEVAOR AND RUDDER CONTROL ARMS

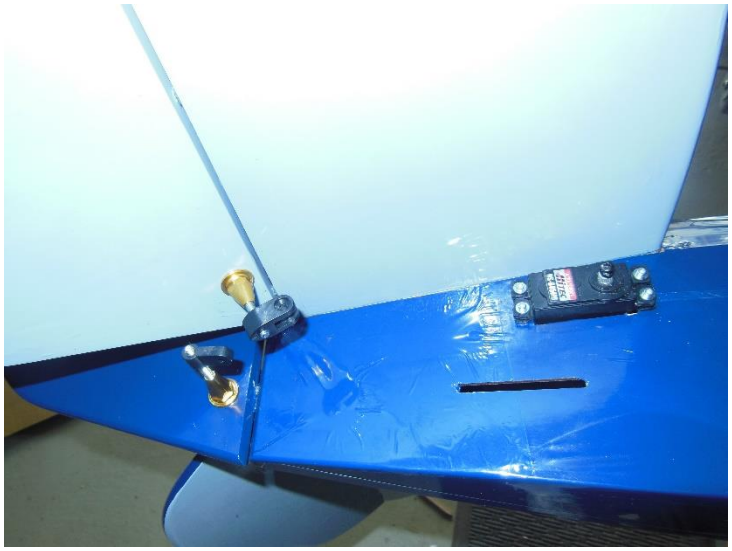
The picture below shows the elevator and rudder control arms attached to the control horns.



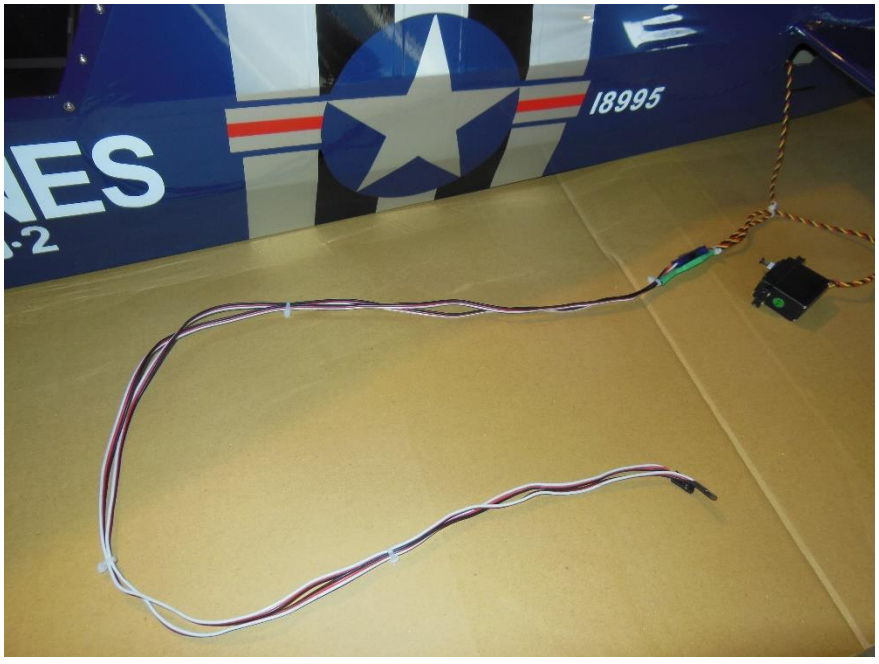
Note that the rudder control arms are flat, and the elevator control arms are U-shaped. These are easier to install if the hole is first tapped with a 4 mm – 0.70 tap. Do not extend the tap all the way through the hole. Leave a little bit untapped at the end to provide resistance to hold the control arm in place. Adjust these so they do not interfere with the elevator and rudder movement.

INSTALLIING ELEVATOR SERVOS AND CONTROL RODS

Attach a 36 inch extension to each of the elevator servos. Install a servo as shown in the picture below.

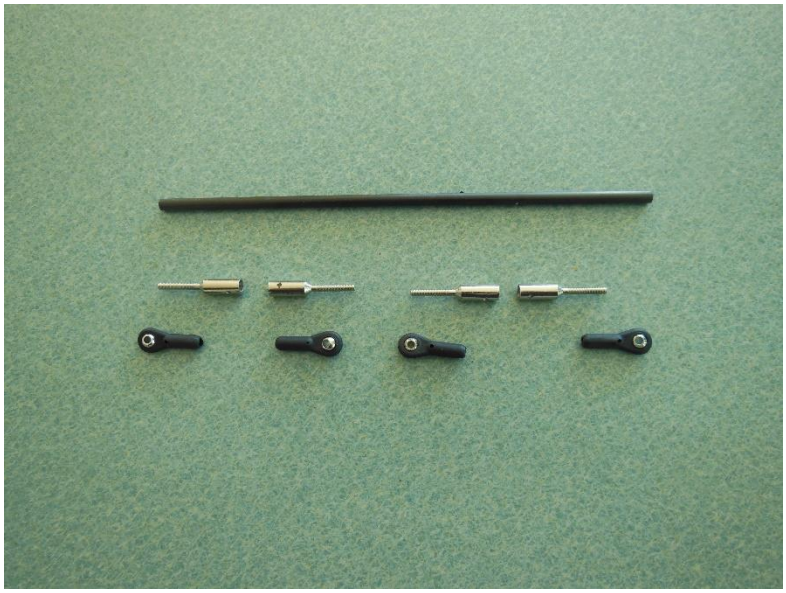


Extend the servo lead through the mounting hole for the servo on the other side of the fuselage. Taking the other elevator servo use zip ties to hold the two servo extensions together as shown in the picture below.



Place the servo extensions back inside the fuselage and mount the servo in the servo mounting hole. Orient the servos the same way on each side of the fuselage. Reach down inside the fuselage, grab the servo extensions, and pull them forward to where the radio will be installed.

The elevator control rods are assembled from the components shown in the picture below.



Cut two pieces each 3 ¼ inches long from the carbon fiber tube. Be careful not to inhale any of the dust from the cutting. Assemble two control rods as shown in the picture below.

Mix up some JB Weld and coat the ends of the rods with JB Weld and then insert them into the end pieces. Wipe off any excess with a paper towel with isopropyl alcohol on it. Set aside and allow to dry for 24 hours before proceeding with any further assembly.

Attach a swivel link to the control horn as shown in the picture below.

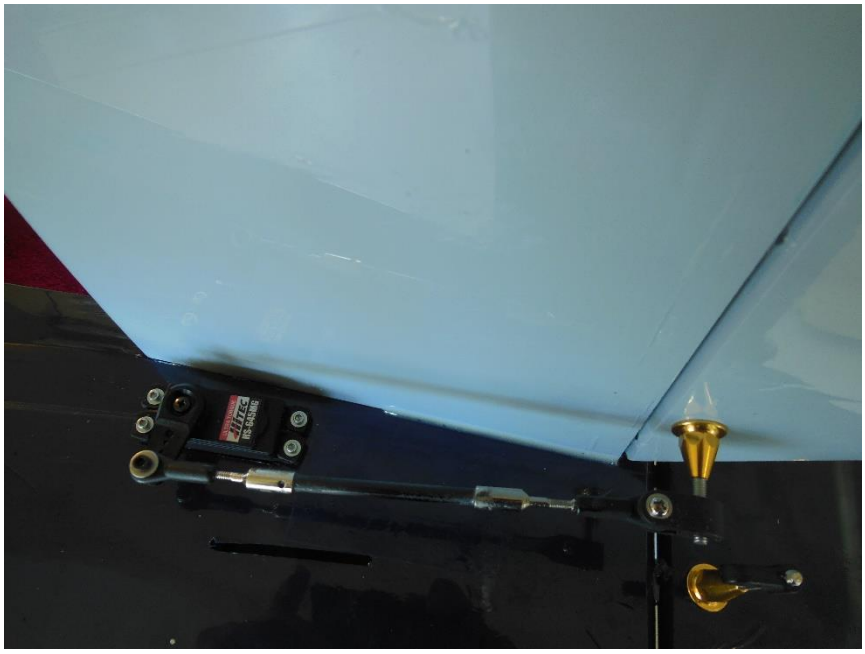
The parts placement on the 4-40 bolt holding the swivel links to the servo arm is as follows:

No.4 Washer –swivel link– Brass Bushing – Servo arm – 4-40 elastic stop nut

To aid in assembly run a 4-40 tap about a quarter inch into each of the swivel links. Then attach a swivel link to each end of the assembled control rods.

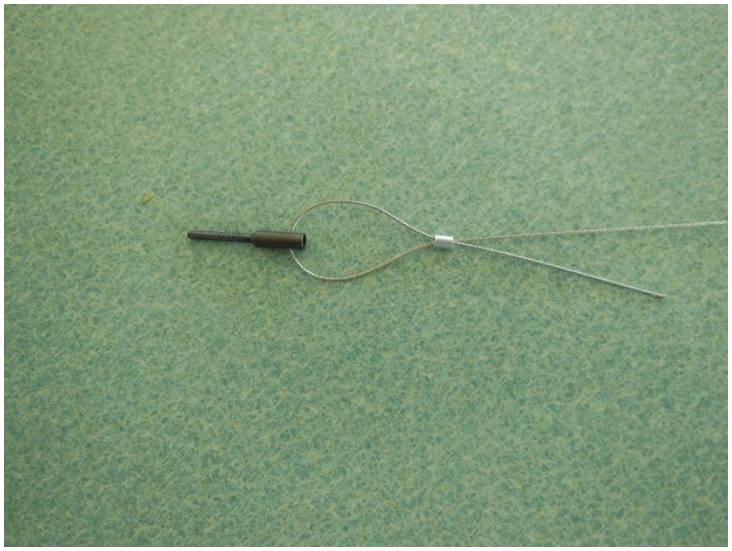
Hook up the elevator servos to the receiver. Turn on your transmitter and set both the trim and sub trim on the elevators to neutral. Using a piece of wood on the top and bottom of the horizontal stabilizer, clamp the elevators into the neutral position. Adjust the control rod length so it just fits into the control horn on the elevator. See following picture. Do this for both elevator servos. Minor adjustments can be made using the sub trim function in your radio.

The completed assembly is shown in the following picture.



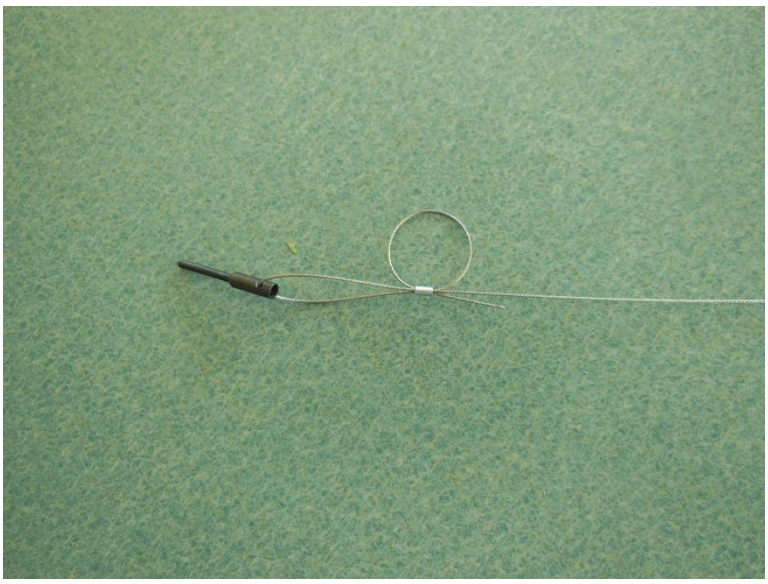
INSTALLING RUDDER SERVO AND PULL-PULL CABLES

The rudder cables will have to be installed on the ends of connectors that screw into the swivel links. One technique for doing this is illustrated in the set of following photos.



Insert the cable through the metal sleeve then through the hole in the connector and then back through the metal sleeve as shown in the picture above.

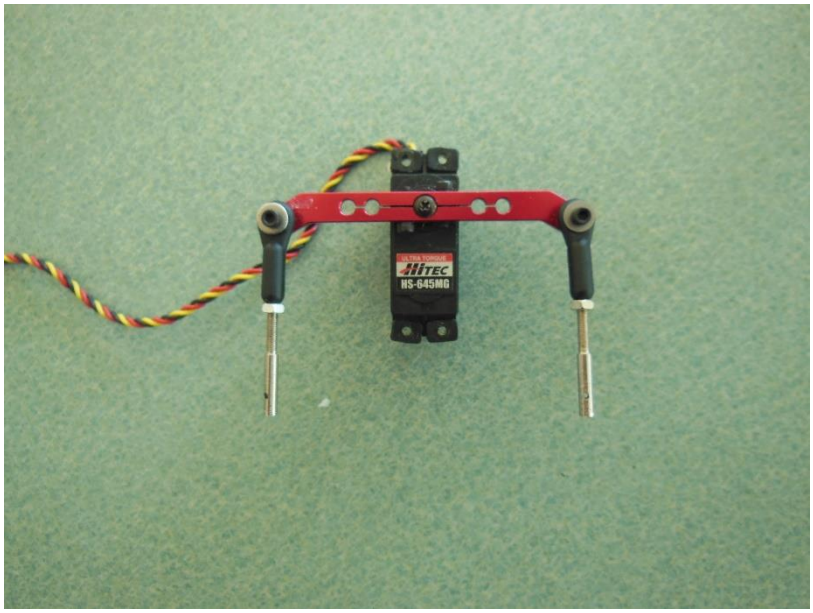
Take the short end and bring it around and insert it through the metal sleeve as shown in the picture below.



Adjust the cable tension and pull the loop tight as shown below.

Use a crimping tool and crush the metal sleeve onto the wires to hold them in place. A drop of thin CA will ensure that the cables don't come loose. We will use this technique for installing the rudder pull-pull cables and the tail wire supports. We are now ready to install the rudder servo and pull-pull cables for the rudder.

Attach a 3-inch servo arm to the rudder servo as next shown.



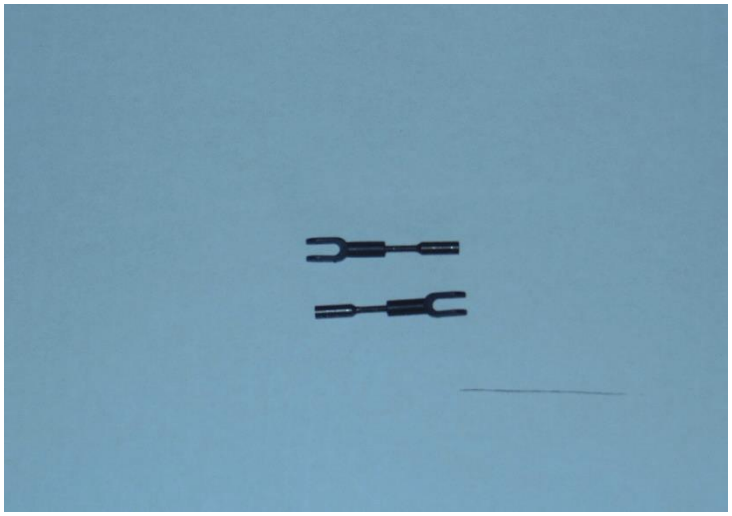
On each end of the servo arm attach a swivel link with a cable connector screwed into it as shown above.

Attach a cable to each of the cable connectors as described above. Mount the rudder servo in the fuselage as shown in the picture below.

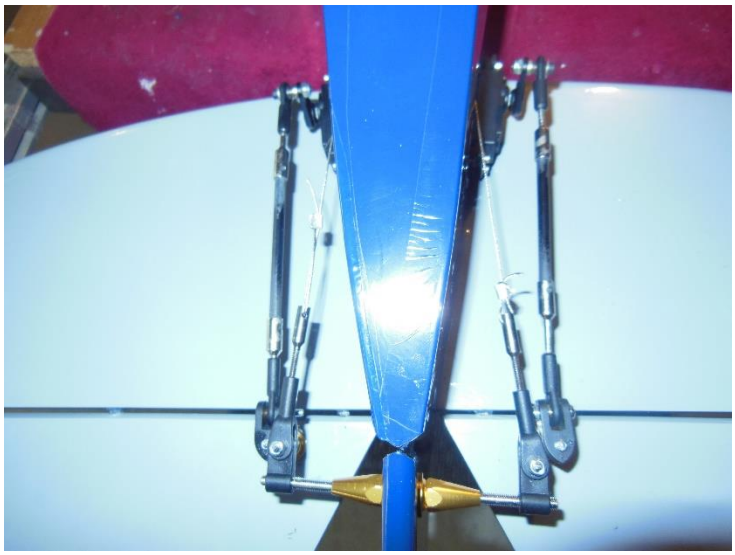
Note that the rudder control cables will cross inside the fuselage. Insert a 36-inch control rod through the slot near the tail for the cable and attach the end of the cable with masking tape. Then pull the control rod back out through the slot in the side of the fuselage, remove the tape from the control rod and tape the cable to the

fuselage so it won't slip back inside. Do the same with the other rudder control cable. Remember the rudder control cables cross inside the fuselage.

The cable connectors that attach on to the rudder are shown in the picture below.



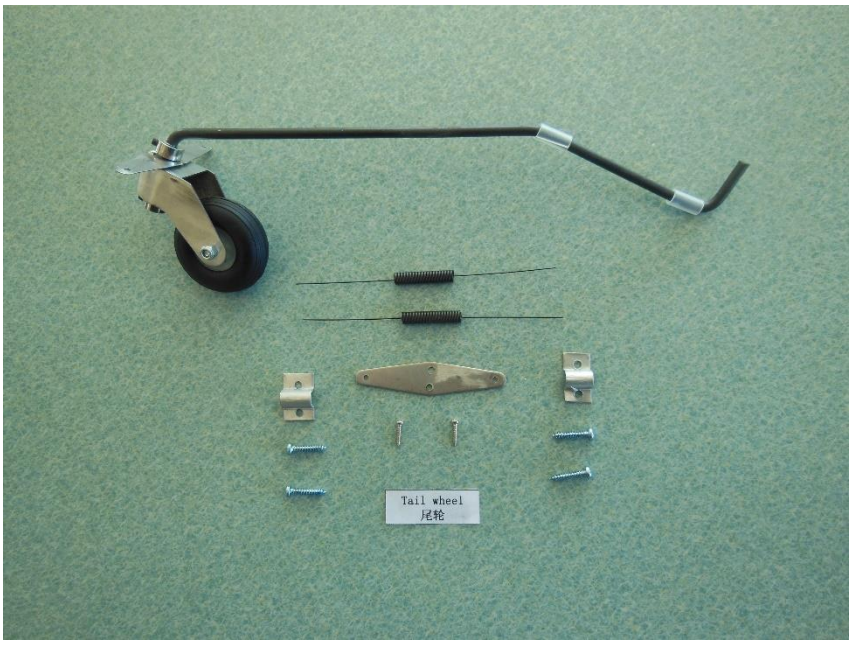
Attach these to the rudder control arm as shown below.



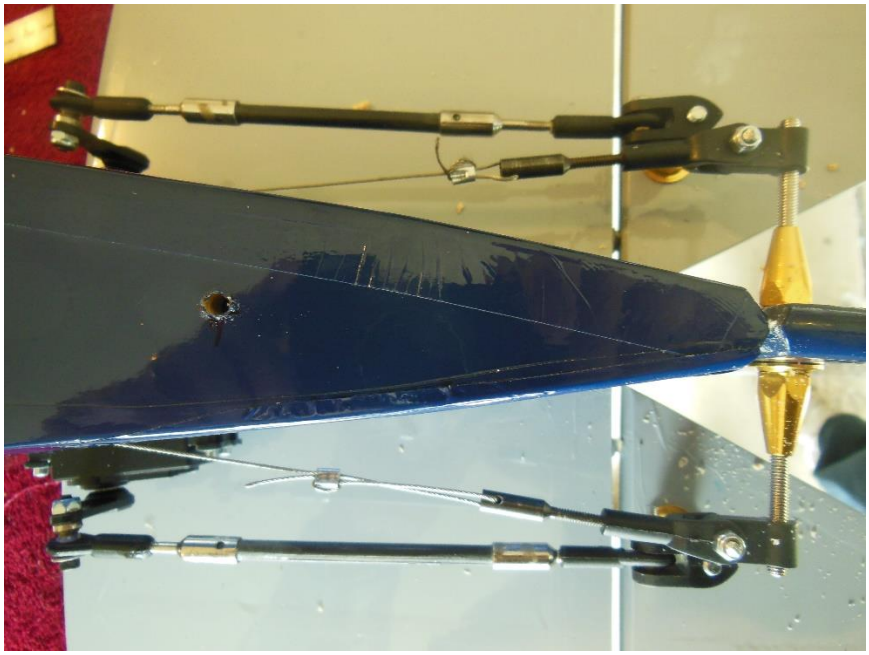
Using pieces of wood on either side of the rudder clamp the rudder in the neutral position. Plug the servo into your receiver, turn on your transmitter and set the rudder trim and sub trim at neutral. Now connect the rudder cables to each of the control arms trying to get them tensioned equally. This completes the set up of the tail assembly.

TAIL WHEEL INSTALLATION

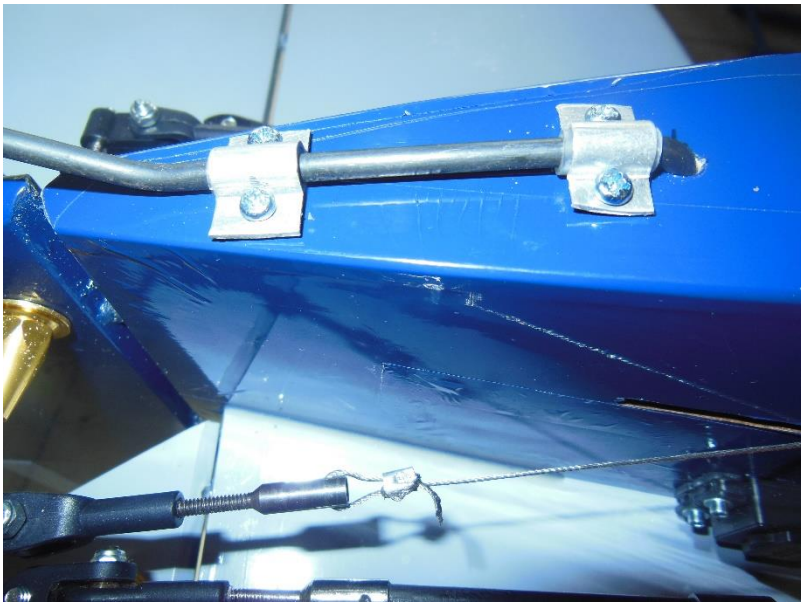
The tail wheel and mounting components are shown in the picture below.



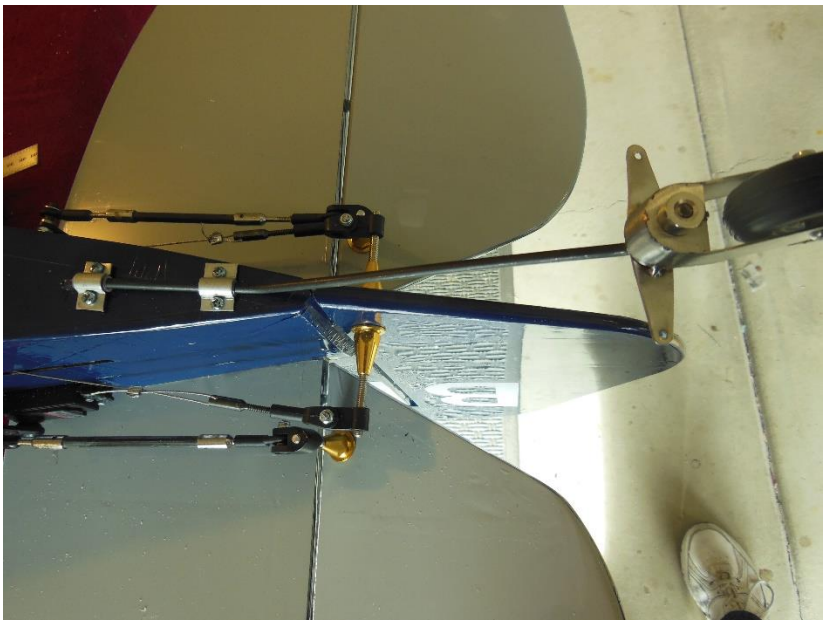
Drill in 11/64 hole 3 ¾ inches from the end of the fuselage as shown in the picture below. The hole should be centered. Insert the tail wheel assembly into the hole and center on the bottom of the fuselage.



Position the U clamps over the nylon sleeves on the landing gear, drill 3/32 pilot holes for the screws, and insert the screws to securely hold the tail wheel assembly to the fuselage. A drop of thick CA on the end of the screws helps hold them in place. The completed assembly is shown in the picture below.



The attached tail wheel is shown in the picture below.



Attach the steering arm for the tail wheel springs to the rudder as shown in the following picture. Put a little thick CA on the end of each screw as you put it in to ensure that it stays in place.

TAIL WHEEL STEERING

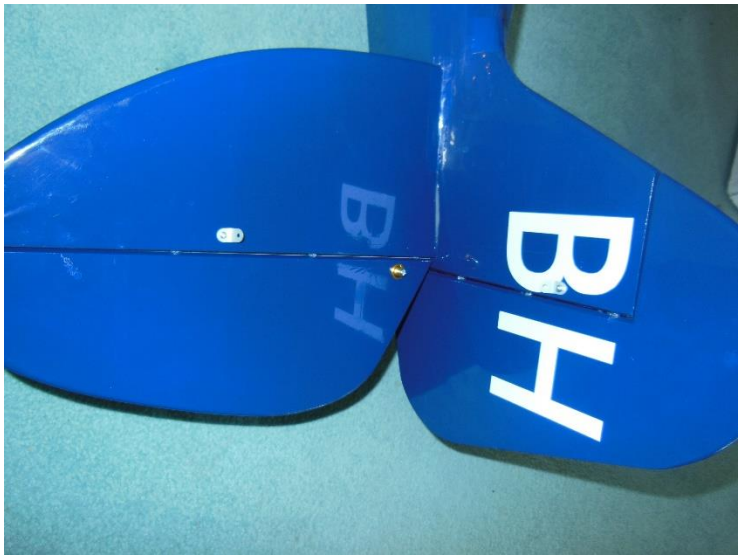
Springs are provided to connect the tail wheel to the rudder. A solid connection makes the airplane easier to handle in strong winds on the ground. One way to do this is shown in the picture below.

With your transmitter on and the rudder centered, make a solid connection as shown above. A piece of fuel tubing is used to keep the clevis tight on the tail wheel and a Z-bend is used in the control horn on the fuselage. A number two control rod is used to make this connection. Attach a spring to the other side.

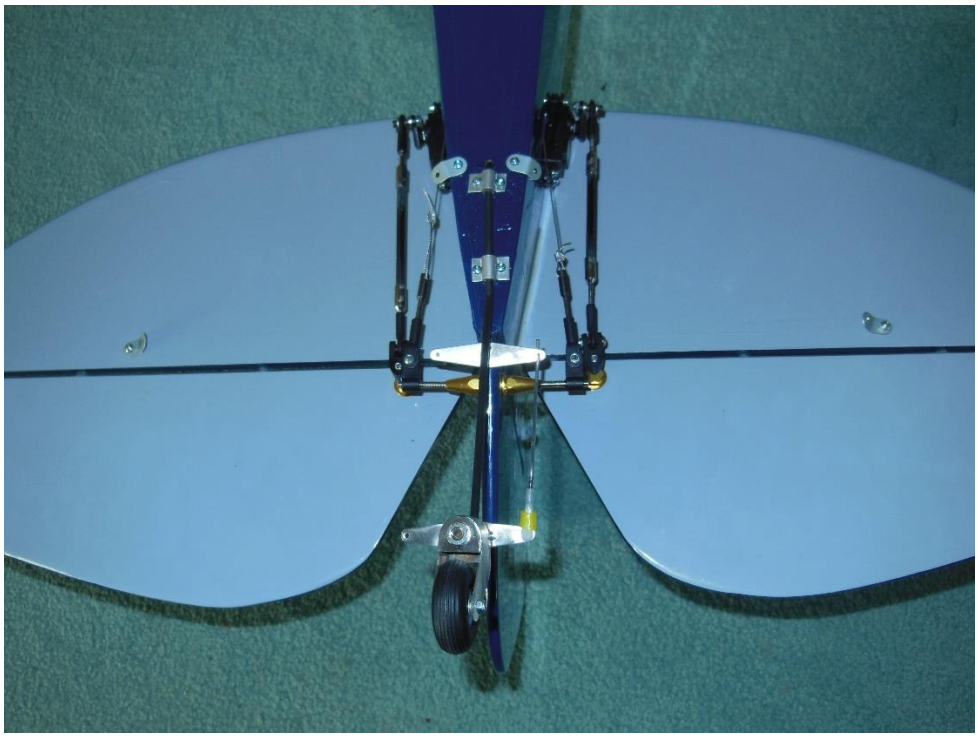
INSTALLING TAIL WIRE BRACES

The parts for the tail wires are in the package labeled Stab. The contents are shown in the picture below.

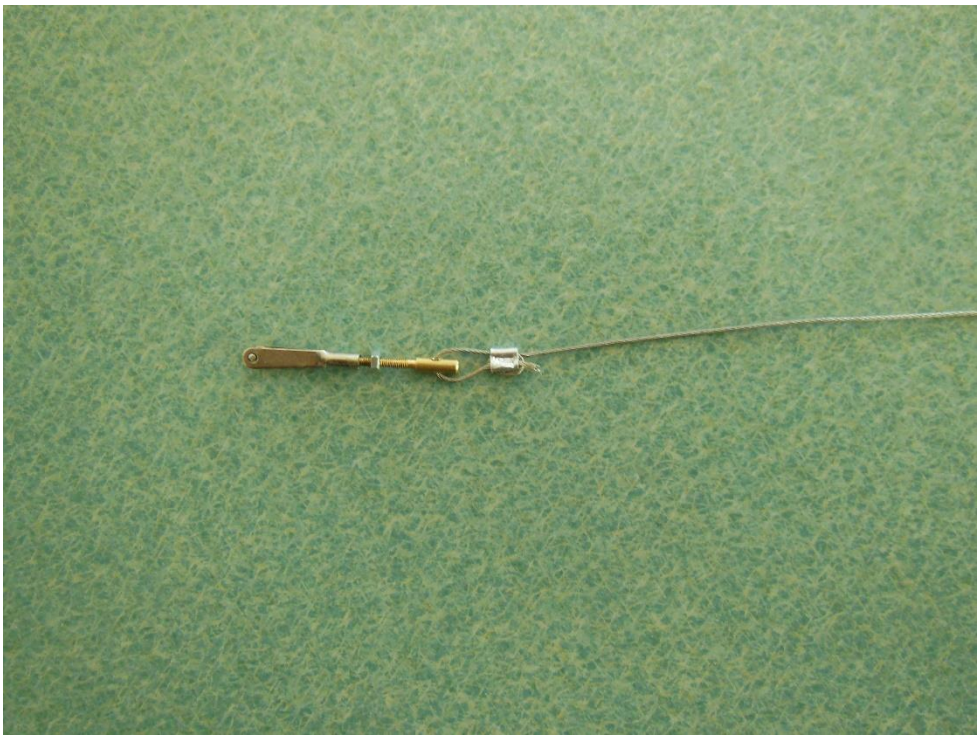
Bend each bracket to a 45° angle and then bolt the brackets in place on the horizontal and vertical stabilizers as shown. The bolt goes through the bracket and then through the hole in the stabilizer. Then the second bracket is held in place with a lock nut. These installations are shown in the pictures below.



The location of the attachment to the bottom of the fuselage is shown in the following picture.

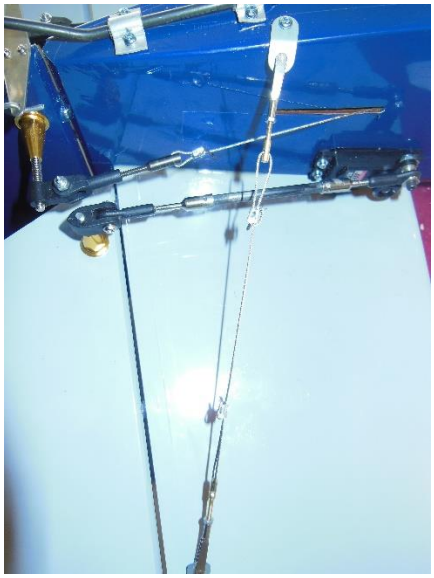


Prepare one end of the tail brace cable as shown in the picture below.



Assemble this the same way that was used to do the rudder control cables. A completed tail wire brace on the top of the elevator and rudder is shown in the following picture.

A completed tail wire brace on the bottom of the elevator and the fuselage is shown in the picture below.

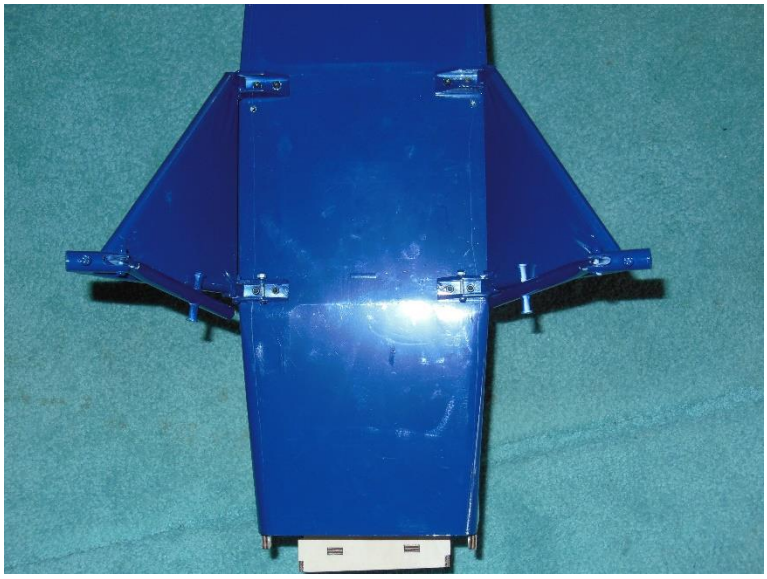


This completes the tail assembly. The tail wires should be snug, but still have a slight amount of play in them.

MAIN LANDING GEAR INSTALLATION

The components for the main landing gear are shown in the picture below.

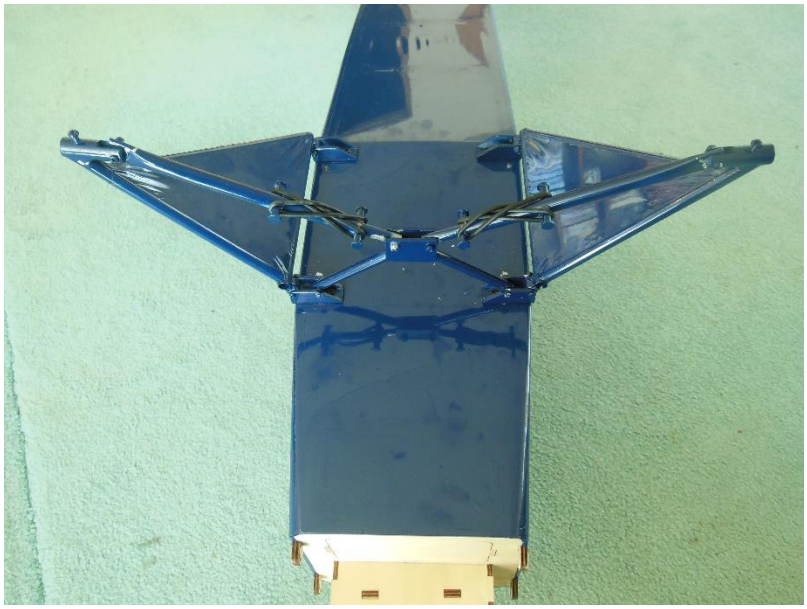
Attach each side of the main landing gear as shown in the picture below. Use 6-32 socket head cap screws with blue thread locker to prevent them from coming loose. The screws are in the bag labelled Main Wheel. This is shown below.



The completed assembly is shown in the following picture.

The cross brace needs to be assembled before attaching it to the main landing gear connectors. Use rubber bands to keep the gear from spreading while you are attaching it to the connectors.

Rubber O-rings make good main landing gear springs as shown below.



FUSELAGE WING STRUT MOUNT

Attach the two fuselage wing strut mounts just in front of the rear landing gear mount as shown below using 6-32 socket head cap screws. Be sure to use blue thread locker on the screws.

A close-up side view is shown below.

Note that some material had to be removed from the strut mount for it to fit into the end of the strut.

To determine the hole position in the strut mount, attach the wings and put the struts over the strut mounts. Mark the position of the hole in the strut on the strut mount with a felt tip pen. Remove the wings and drill holes in the strut mounts at the locations noted previously. It may be necessary to remove the strut mounts to drill the holes.

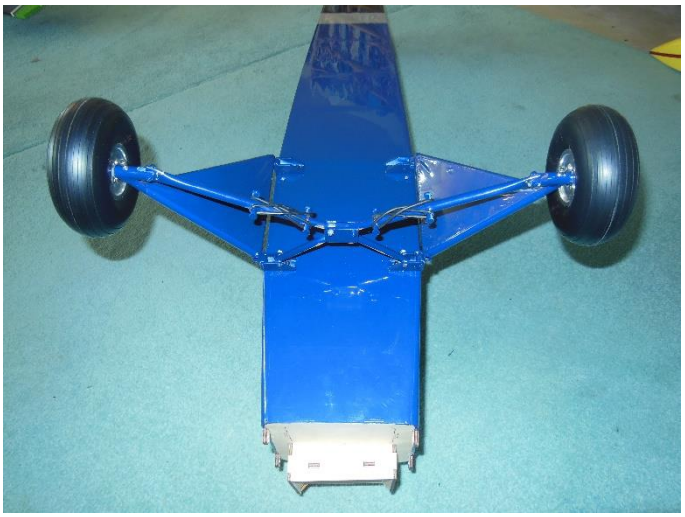
MAIN WHEEL INSTALLATION

The Main Wheels, axles, and axle collars are shown in the picture below.

Remove the outside wheel cover from each wheel and ensure that all of the screws holding the wheel together are tight. The screw collars shown in the photo are not needed to install the wheels. Remove both of the Phillips head screws intended to be used to hold the axles in place on the main gear. Replace these with M4 x10 socket head cap screws. Insert the shaft through the wheel and insert it into the receptacle on the main gear. Using a felt tip pen, mark where the screw hole is on the axle. Remove the axle and grind a flat spot around this mark as shown in the photo below.

Place the axle through the wheel and insert it into the main gear making sure that the flat spot is toward the screw hole. Insert the M4 x 10 socket head cap screws

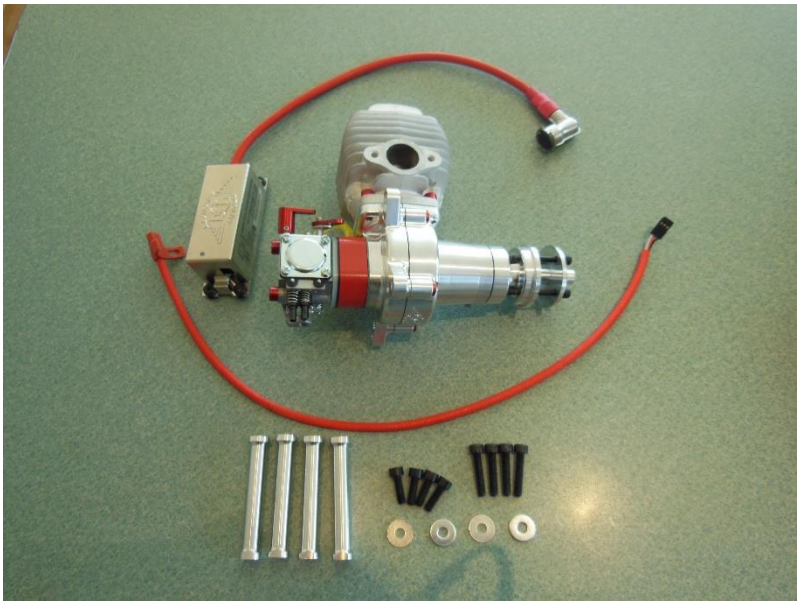
making sure to use blue thread locker on them. Finished assembly is shown in the pictures below.



Replace the wheel covers using the three screws provided.

GAS ENGINE INSTALLATION

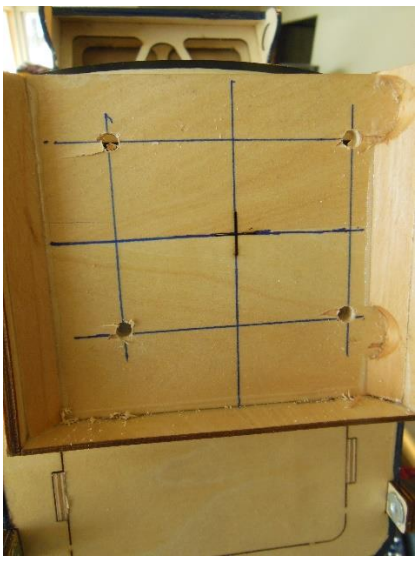
Here we will describe in detail the installation of the DA-35 gas engine. The engine and all parts supplied by the factory are shown in the picture below.



Shown are the motor, the electronic ignition unit and spark plug wire, the ignition pick up wire, the four standoffs for mounting, the socket head cap screws for attaching the standoffs to the firewall and the motor to the standoffs, and washers.

Find the bolt mounting spacing in the instruction manual for your gas engine and lay it out on the firewall as shown in the picture below.

Drill a 3/32 pilot hole at each of the four locations. Then enlarge these to fit the mounting bolts that are required for your engine. This is shown in the picture below.

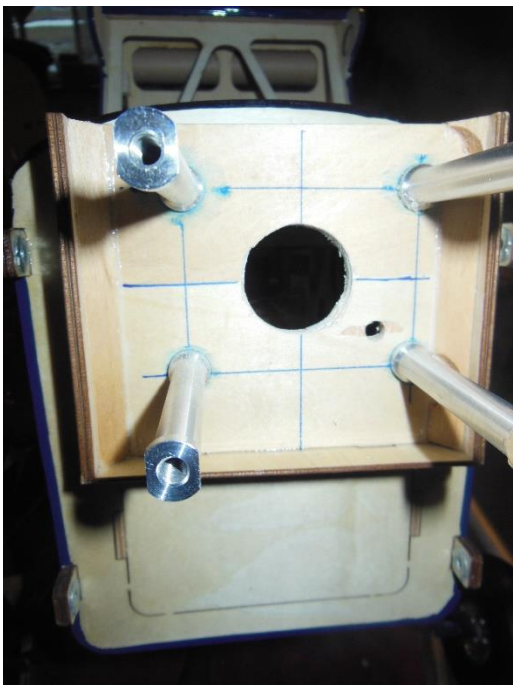


Following the instructions in your gas engine manual install the four standoffs as shown in the picture below. The standoffs are mounted to the firewall with M 5 x 25 metric screws and washers. The round ends of the standoffs are placed next to the firewall. The ends of the spacers with “flats” are attached to the motor mount tabs with the M 5 x 16 metric screws. Use blue Loctite on all engine mounting screws.

Temporarily install the motor so that the hole for the throttle rod can be determined. Do not use the thread locker now. A DA- 35 is shown installed below.

The distance from the firewall to the back of the propeller should be 6 ¼ inches.

Mark on the firewall where to drill a hole for the throttle control rod. Remove the motor, drill the hole for the control rod and make a hole behind where the carburetor will be to provide airflow to the carburetor as shown below.

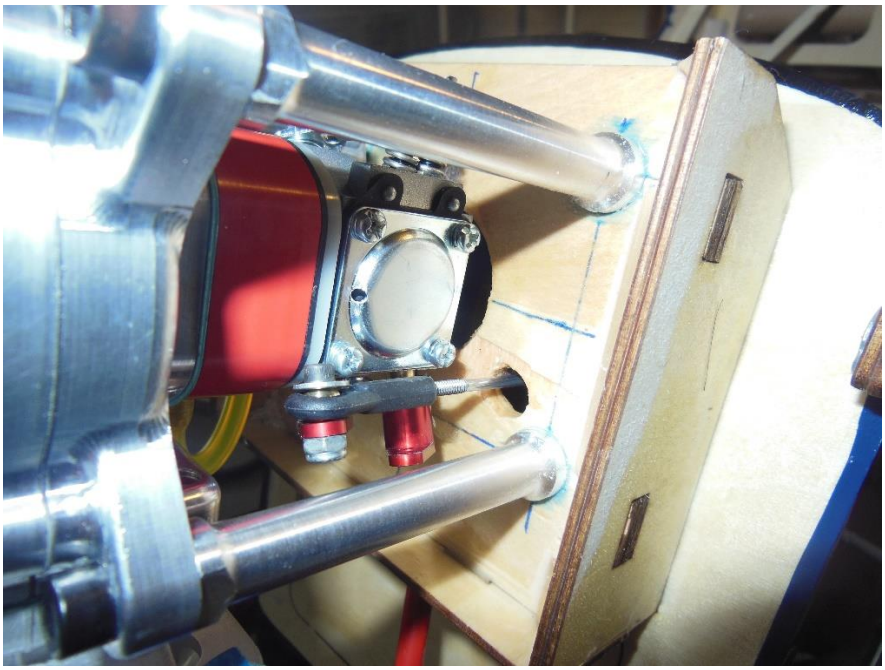


THROTTLE SERVO AND CONTROL ROD

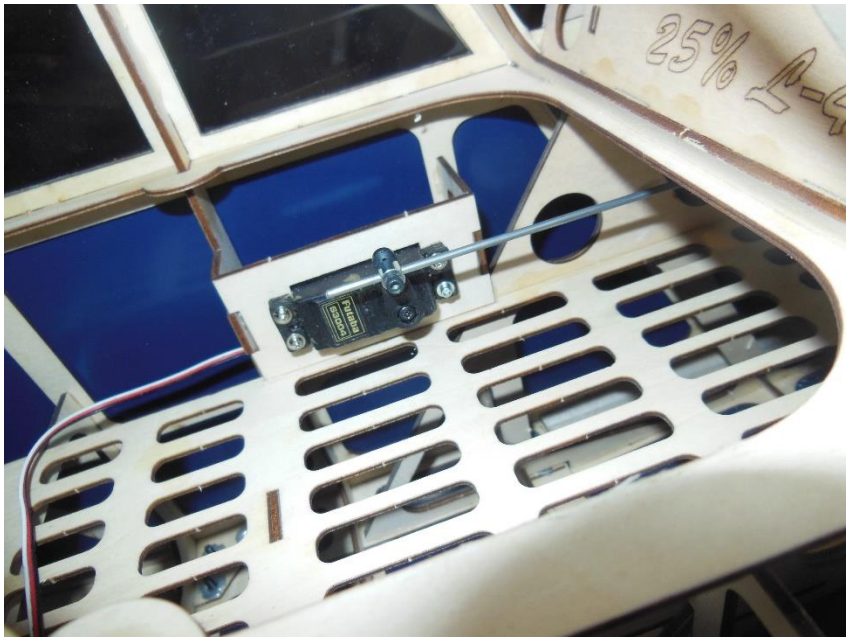
For the DA 35 the throttle servo is mounted on the left side of the fuselage as shown below.

Use a Heavy Duty 4-40 E/Z connector on the servo arm. (Du-Bro Cat. No. 490)

One configuration for the servo control rod is shown in the picture below. The control rod is a 0.093” diameter rod with 4-40 threads on one end. Screw a 4-40 swivel link to the threaded end and attach it to the motor throttle linkage as shown in the picture below (4-40 SCHS, No. 4 washer, swivel link, Throttle arm, 4-40 elastic stop nut).

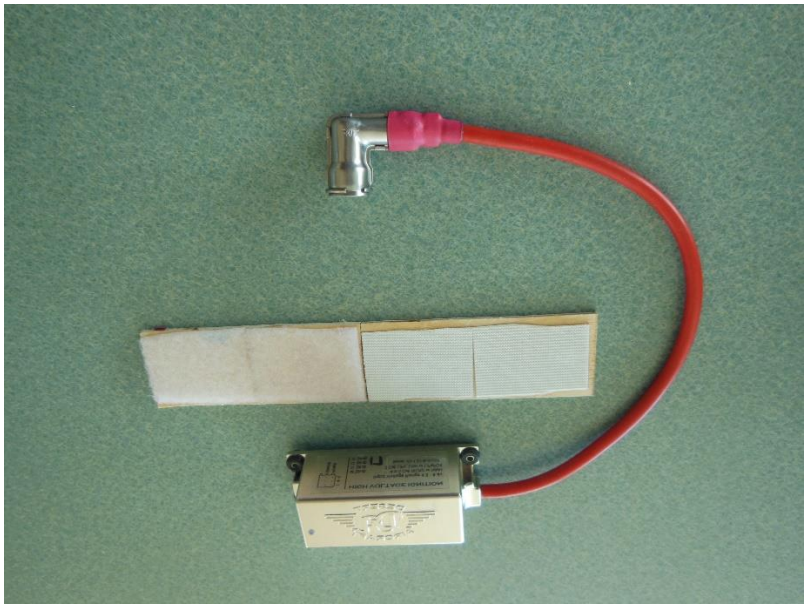


The connection at the servo is shown in the following picture.

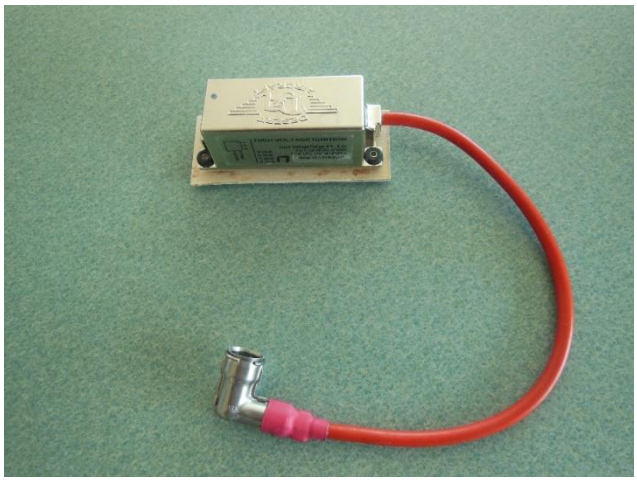


To help in placing the fuel tank and the ignition unit leave the servo control rod in place temporarily.

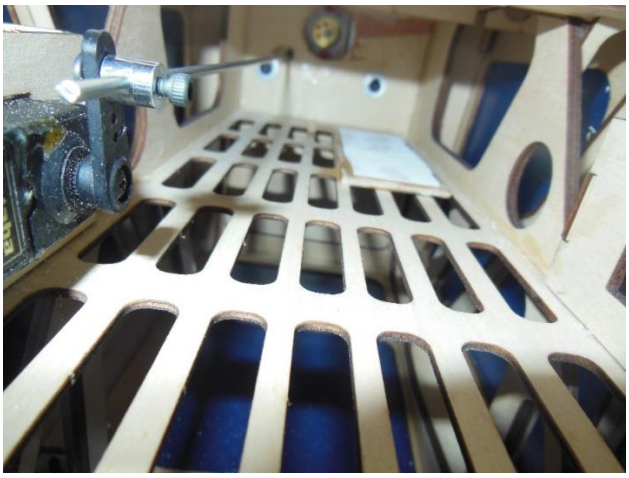
The electronic ignition unit should be inside the fuselage. One method for installing is illustrated below. However, use your imagination if you want to change this installation proceedure. Cut two pieces of 1/8 inch plywood just large enough to hold the electronic ignition unit as shown in the picture below



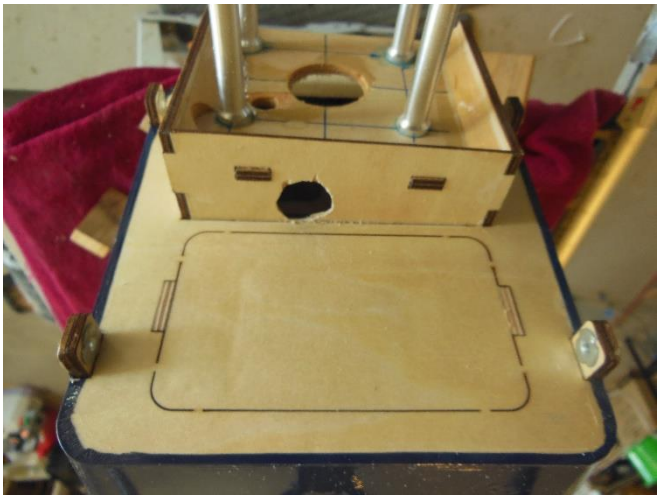
Glue hook and loop material to one side of each piece of plywood. Attach the ignition unit to one of the pieces as shown following.



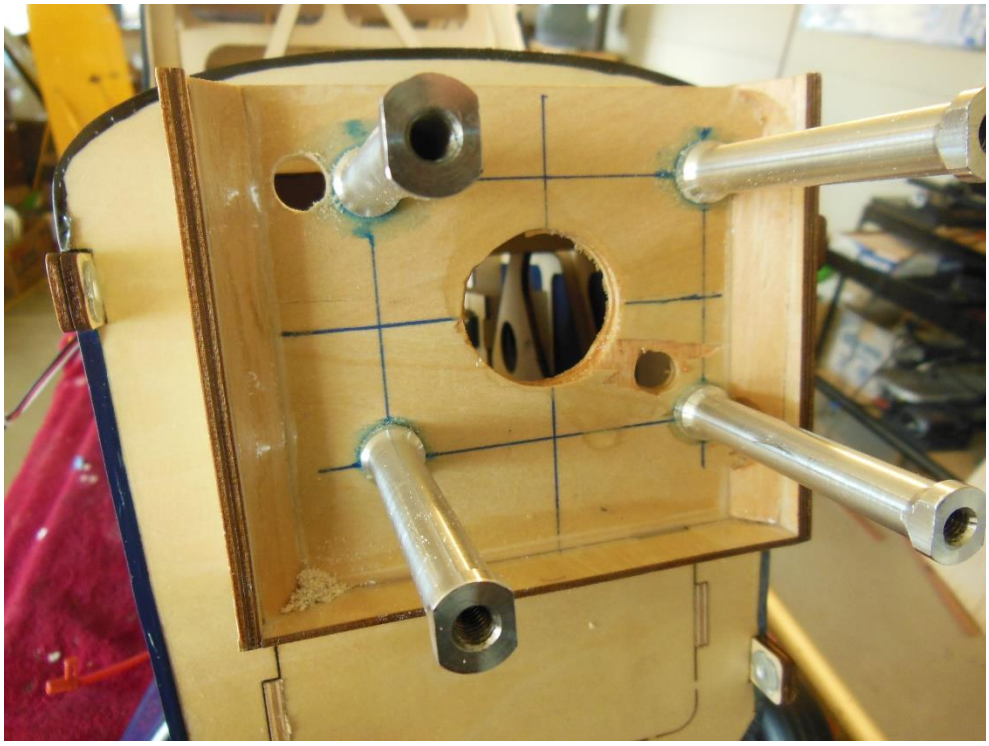
Glue the other piece inside the fuselage as shown below.



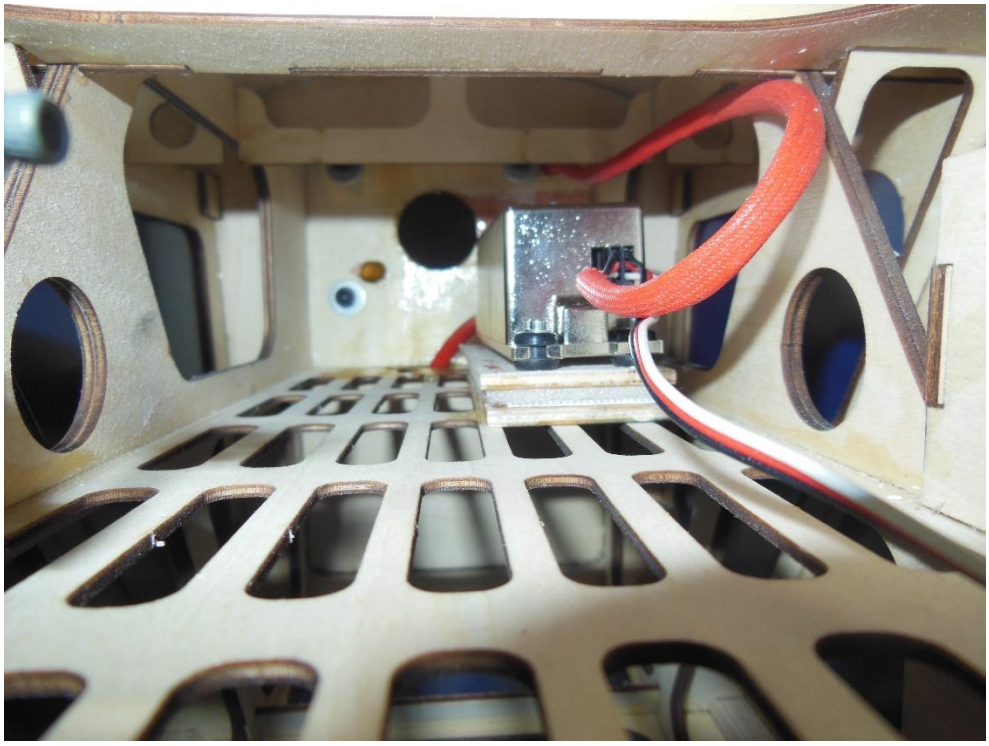
Drill a hole for the spark plug wire as shown below.

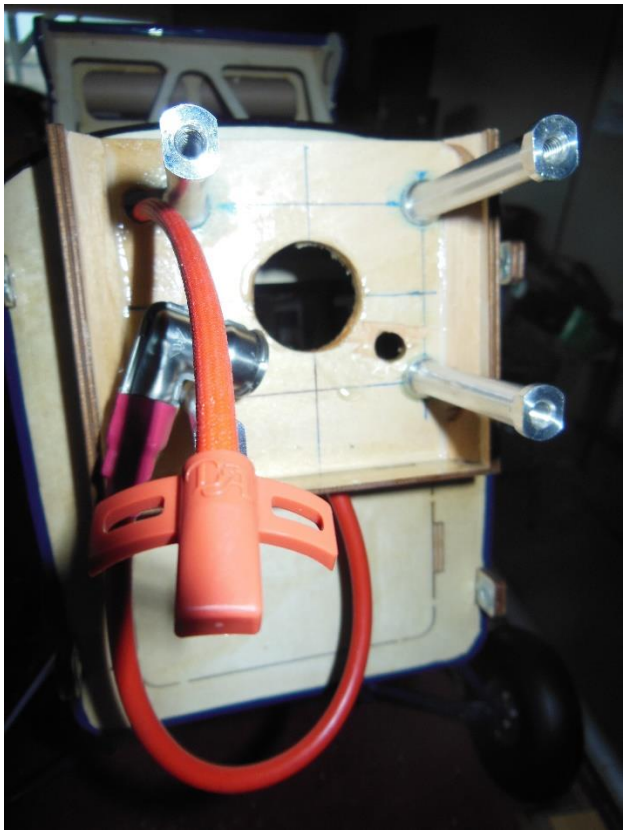


Drill a hole for the ignition sensor cable as shown below.

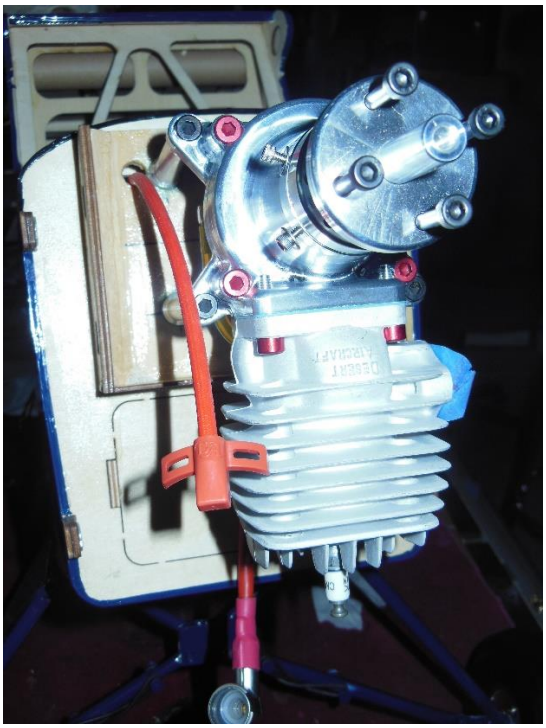


Plug a servo extension into the power input plug and plug the ignition sensor cable into the specified places on the electronic ignition module. Install the electronic ignition module as shown below.





Now reinstall the motor using blue thread locker on the socket head cap screws,

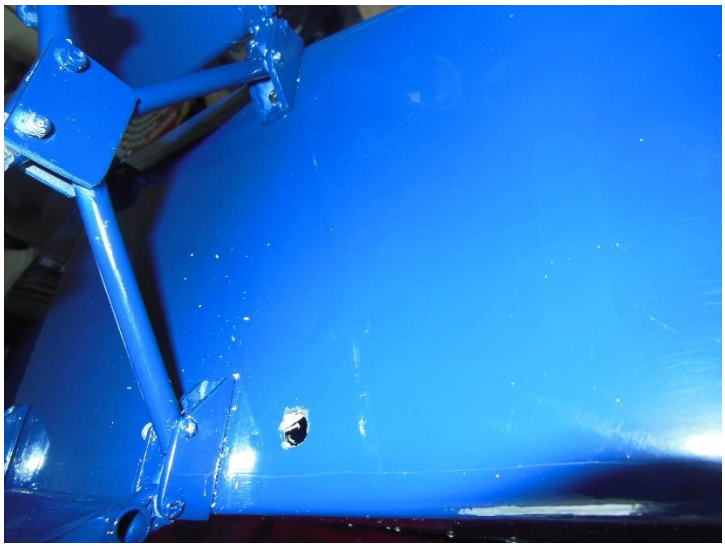


FUEL SYSTEM

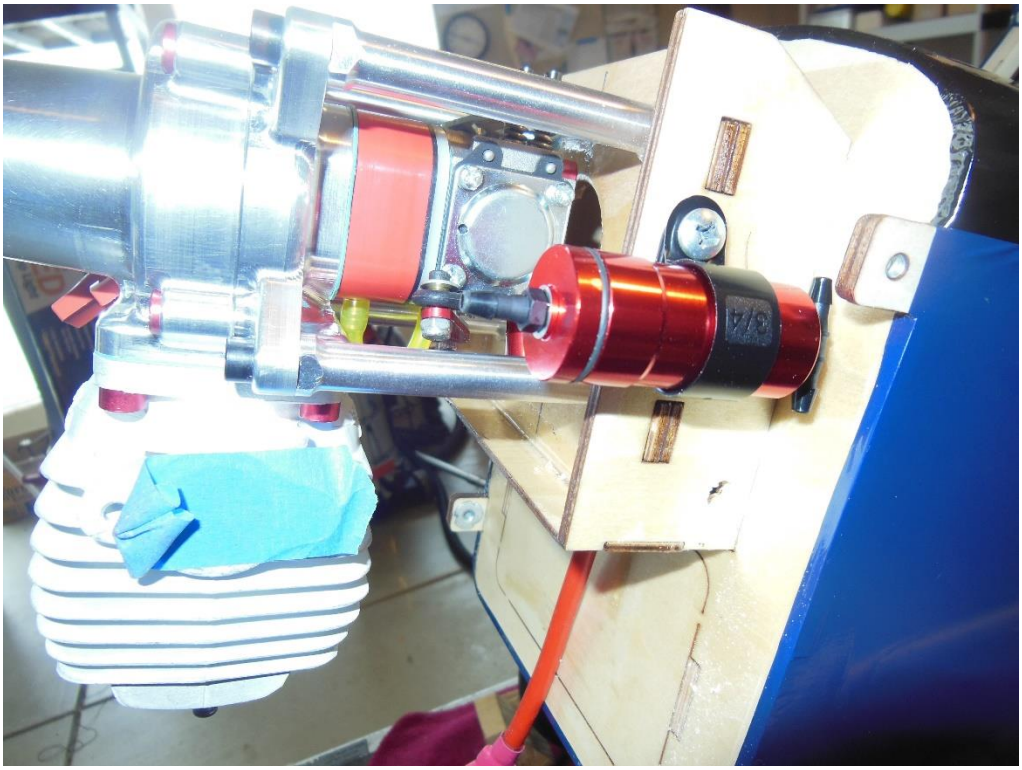
This manual will describe the installation of a fuel system that the author has found practical, efficient, and very functional. The major components are shown in the picture below. Other tanks and installation methods will function just as well so use your own judgment as to what you want to do.

The products shown are a 20 oz Roto Flow fuel tank and a Quik Fire fuel balancer and filter. (J & L Power Products, Inc. www.jlproducts.net) Using the balancer and filter eliminates two fuel line connections.

Drill a hole in the bottom of the fuselage for the fuel tank vent line as shown below. Make the hole size appropriate for your method of venting the fuel tank.



Mount the fuel balancer and filter on the side of the motor mount so that the outlet is just a little above the entrance to the carburetor on the motor. This is shown in the picture below.



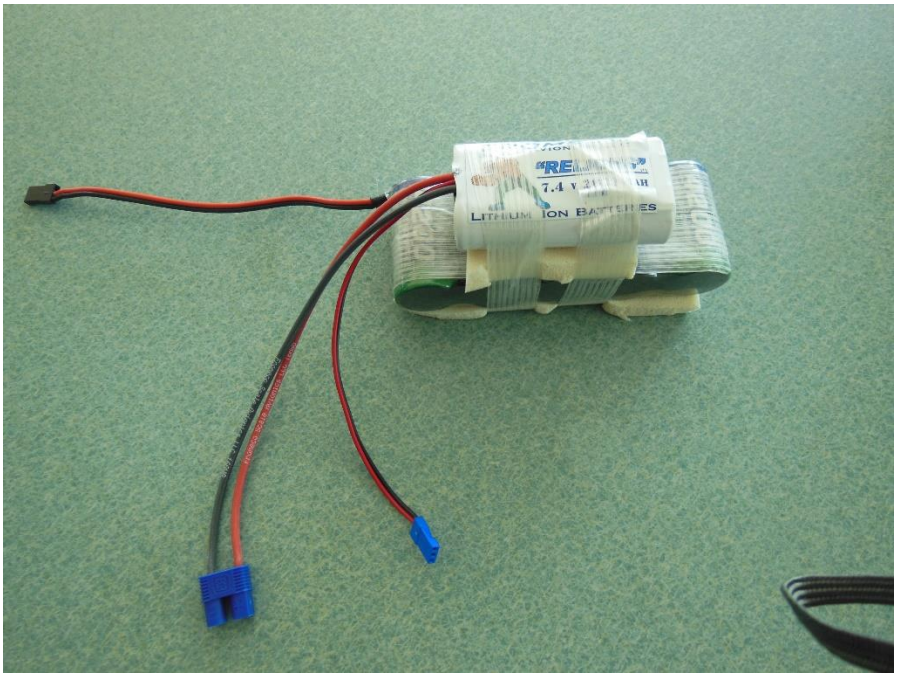
Drill a hole as shown to route the fuel line from the balancer to the tank.

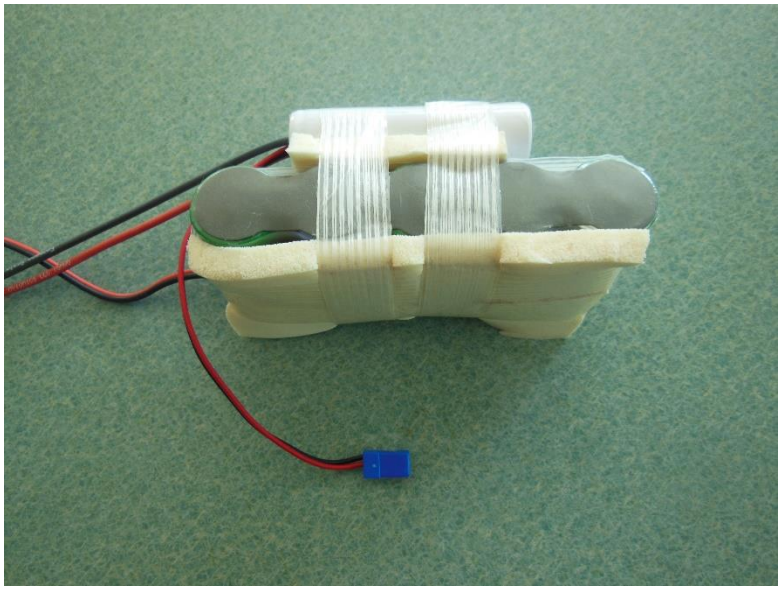
Insert a piece of fuel tubing into the hole by the balancer and into the vent line hole so that they end up inside the fuselage as shown below.

Attach the fuel lines to the fuel tank as shown in the following picture.

Note that a small zip tie is used to secure the lines to the fuel tank.

The batteries will be placed ahead of the fuel tank in the fuselage, so they need to be installed now. One possible battery combination for this airplane is shown in the picture below. To power the radio and the servos a six-volt 4200 mA hour nickel metal hydride battery pack is used. For the ignition system a 7.4 V lithium Ion battery is used. Note that for the DA 35 a voltage regulator is not required. The assembled battery pack is shown in the pictures below.

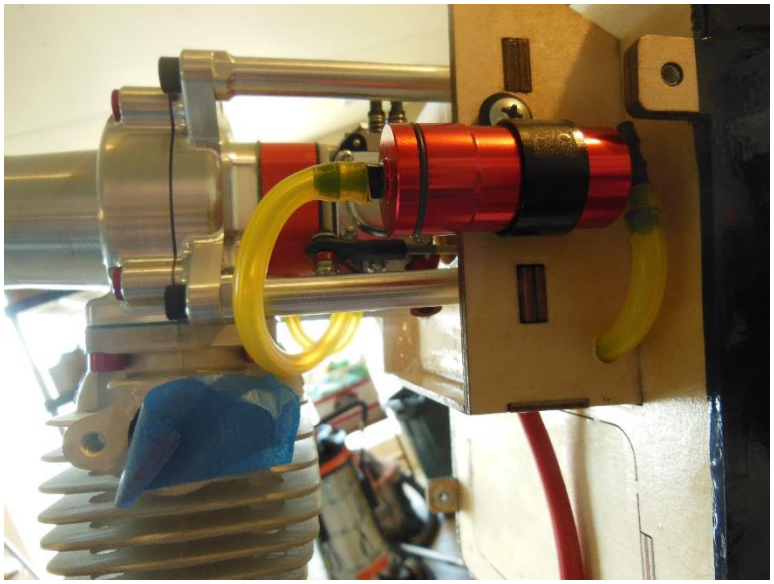




Now install the tank and battery pack as shown below.

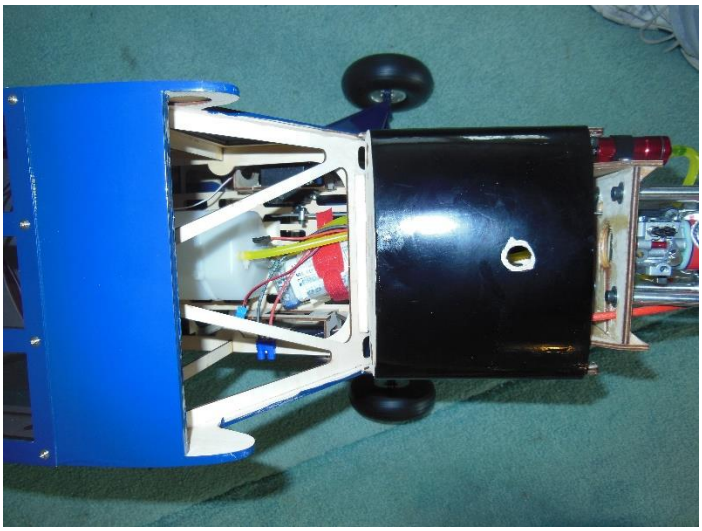
Note that the fuel tank is placed on a piece of foam and is held in place by zip ties. The battery pack is held in place by hook and loop material. Ensure with the tank placement that neither the throttle servo movement nor the rudder servo movements are hindered.

Attach the fuel line from the center of the tank to the bottom of the T on the back of the filter balancer. Run a fuel line from the end of the filter balancer to the carburetor as shown in the following picture.

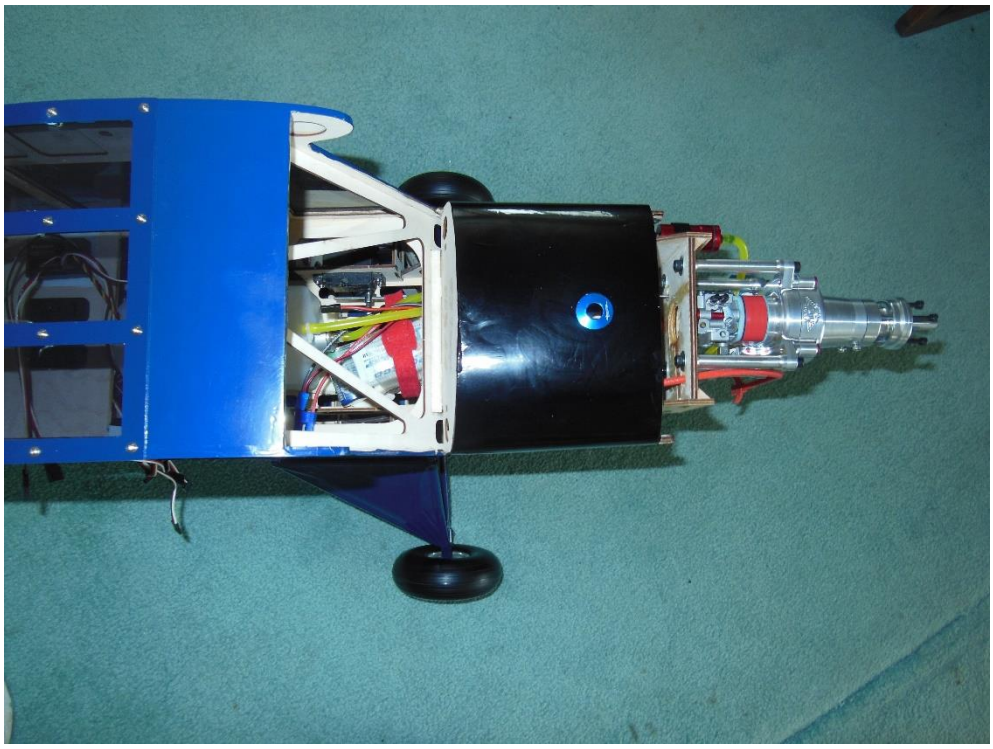


The fuel tank vent line exits the bottom of the fuselage through the hole previously drilled. Put a zip tie around it to keep it from moving back into the fuselage if you just extend the vent line out of the bottom of the airplane.

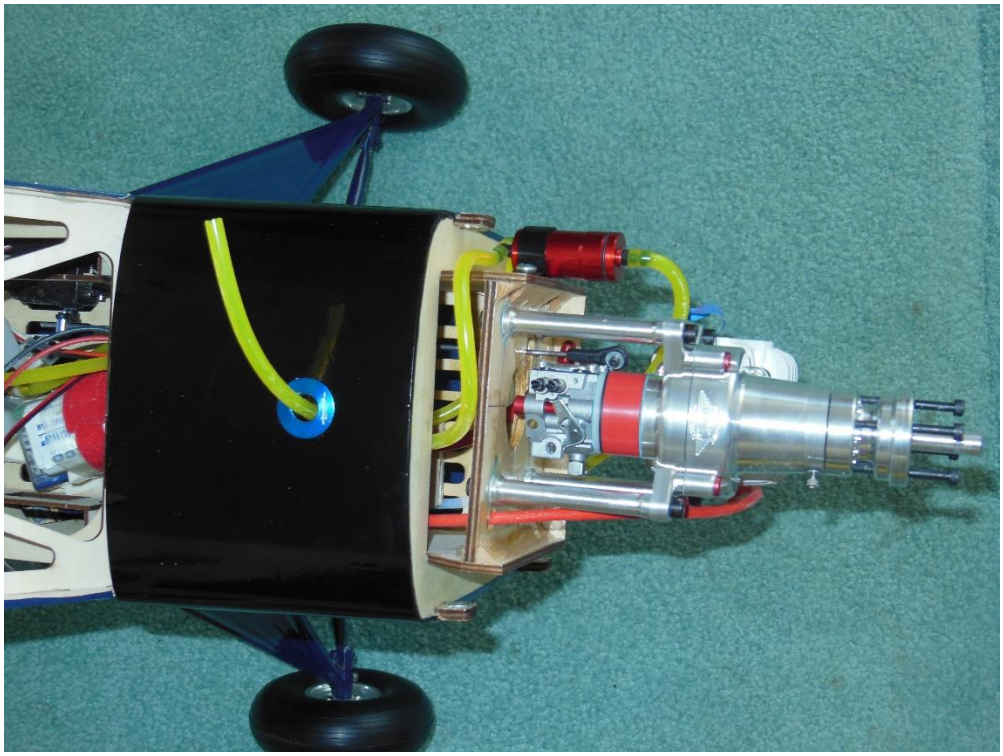
For the fuel filler line use a SEACRAFT Fuel Dot available from billhemphill.com. To install this, make a large enough hole for the fuel dot to fit through in the top of the fuselage as shown in the picture below.



Remove some of the covering so that the epoxy will have some wood to attach to as shown above. Using 30-minute epoxy glue the fuel dot into the hole you have just made. The installed fuel dot is shown in the following picture.

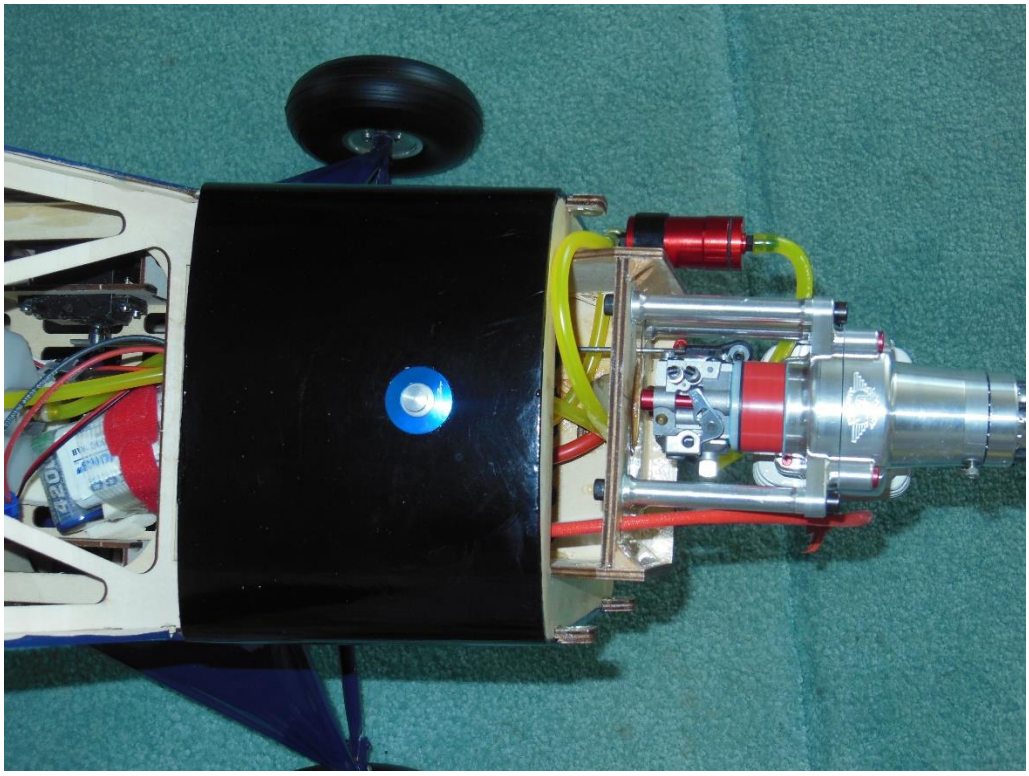


Insert the fuel filler line through the Fuel Dot to the T on the filter balancer and attach as shown in the picture below.



Put the cap on the end of the fuel filler line as shown below.

Then push the tubing back into the fuselage and press the cap into the Fuel Dot. This is shown in the picture below.

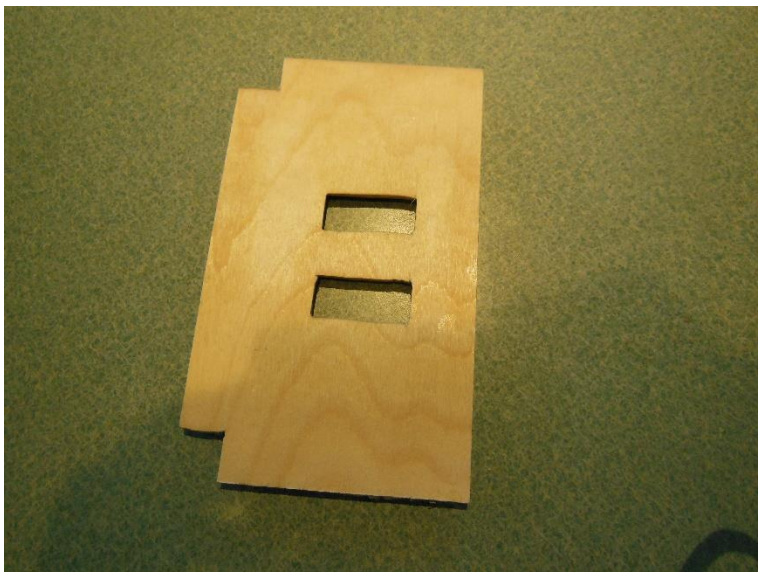


RECEIVER AND SWITCH INTALLATION

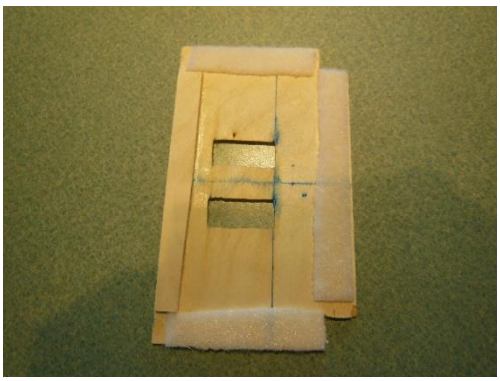
At this point install the receiver and switches of your choice. This is not a complex airplane and only requires a seven-channel receiver. For gas ignition engines, an electronic cut off is very desirable to have (DLEG9205E Gas Engine Kill Switch). A typical receiver switch and ignition cut off are shown in the picture below. Two switches are required. The switch shown has a built-in charging jack.

These will be installed on a removable tray placed behind the fuel tank.

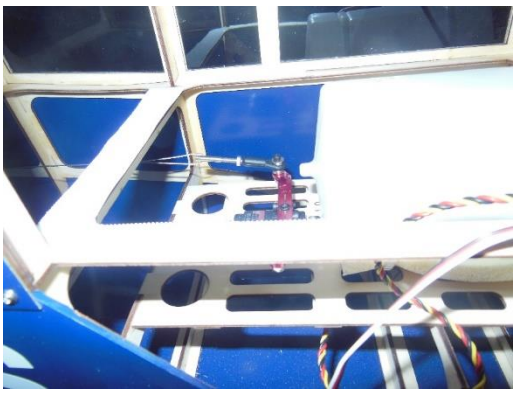
Cut a piece of 1/8 inch plywood to fit behind the fuel tank and make the holes for the two switches as shown in the picture below.



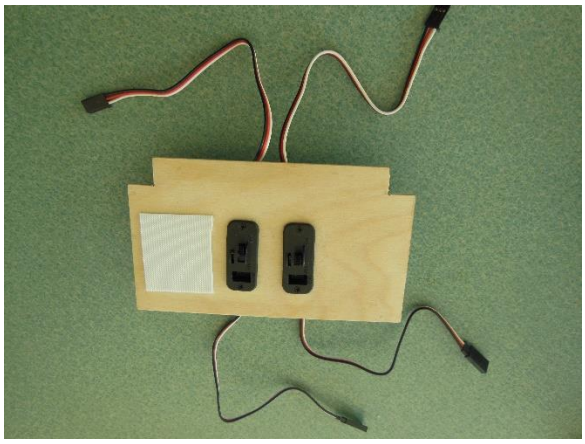
Turn it over and place a strip of reinforcing plywood along one edge and attach one half of the loop and hook material to the edges as shown in the picture below.



Place the other portion of the loop and hook material inside the fuselage as shown below.

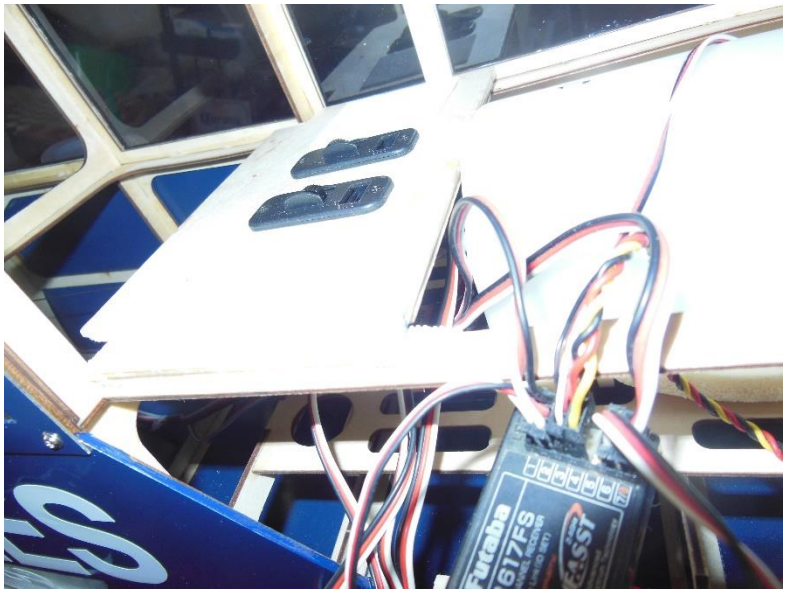


Mount the switches and glue a piece of loop and hook material to the tray as shown below.



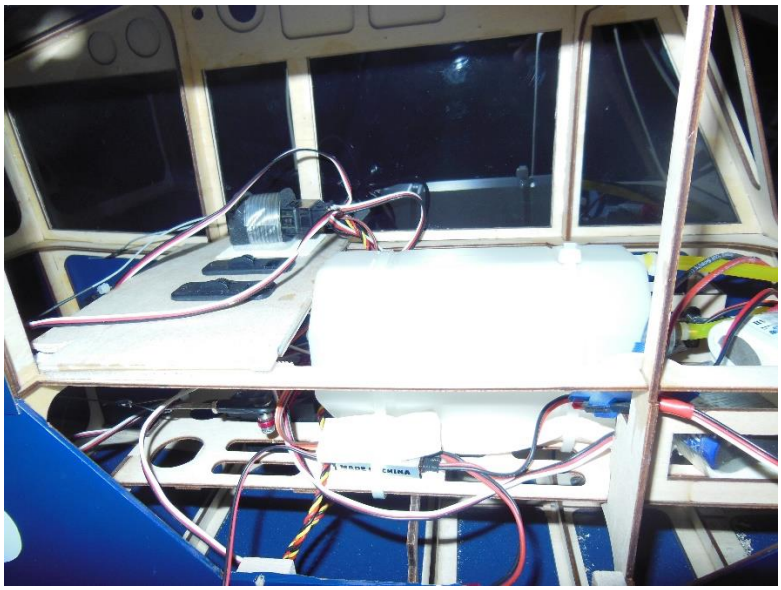
The loop and hook material is to attach the receiver to the tray.

Place the receiver tray in the fuselage as shown below.

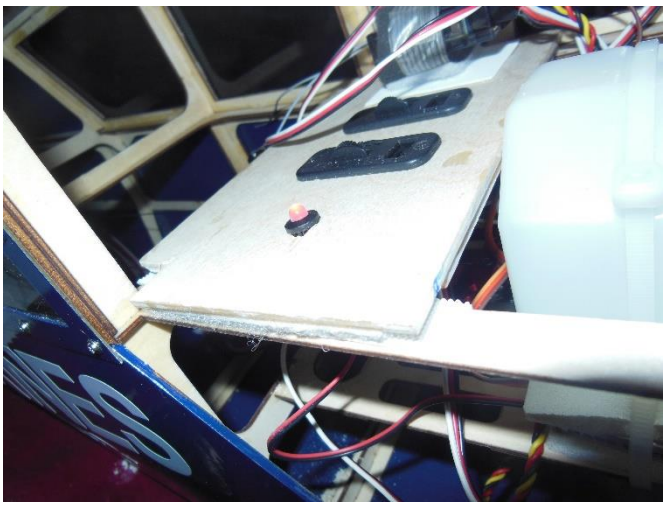


Attach the remaining servos into the receiver, hook up the batteries to the switch and install the ignition cut off as per the instructions included in the package. With a seven-channel receiver a Y harness is required; with an eight-channel receiver a Y harness is not needed. Turn on your transmitter, turn on both switches and ensure that the controls move as you desire and that the electronic ignition cut off is working properly. The control throws will be set later.

The receiver in place and all the connections are shown in the picture below.



The red LED for the ignition cut off is shown mounted below on the plywood with the switches and the receiver.

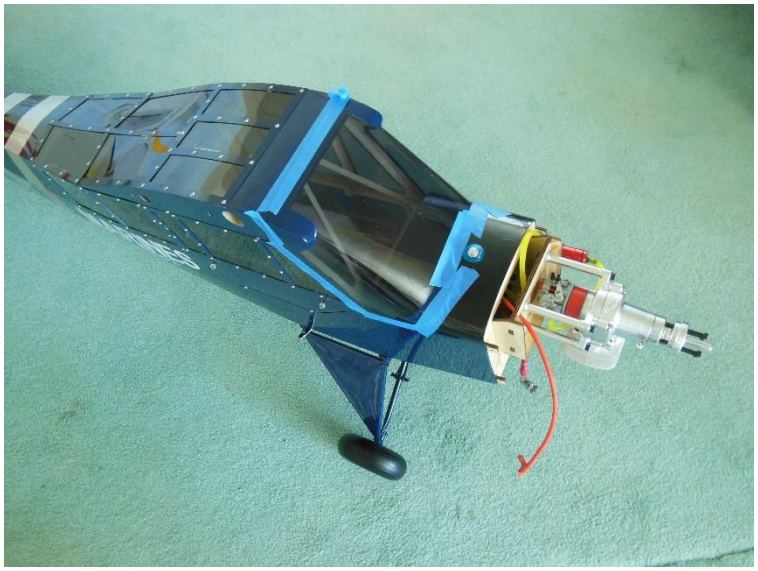


DOOR ATTACHMENT

Using the same technique that was utilized in putting petroleum jelly on the hinges for the rudder and elevator, put petroleum jelly on the hinges for the door. Using 30-minute epoxy, attach the door hinges to the two door components and then to the fuselage. Ensure that the doors open and close smoothly. The finished, attached, closed doors are shown below.

WINDSHIELD ATTACHMENT

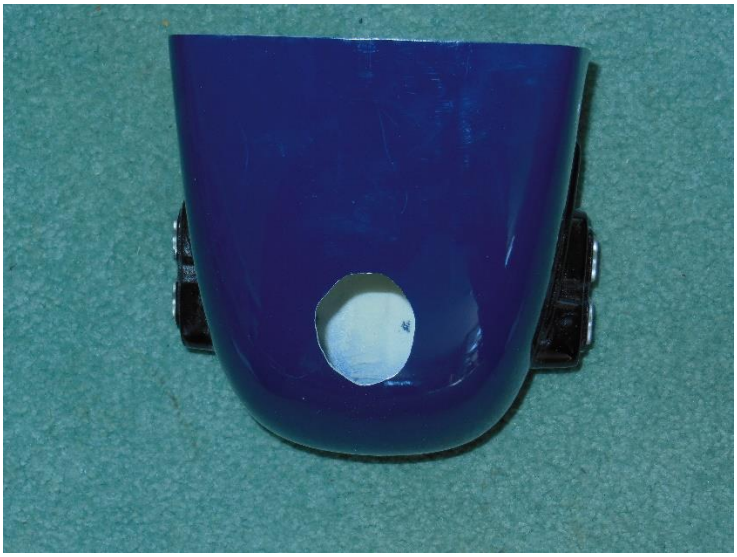
Attach the windshield using canopy glue. Use masking tape to hold in place until the glue dries. See picture below.



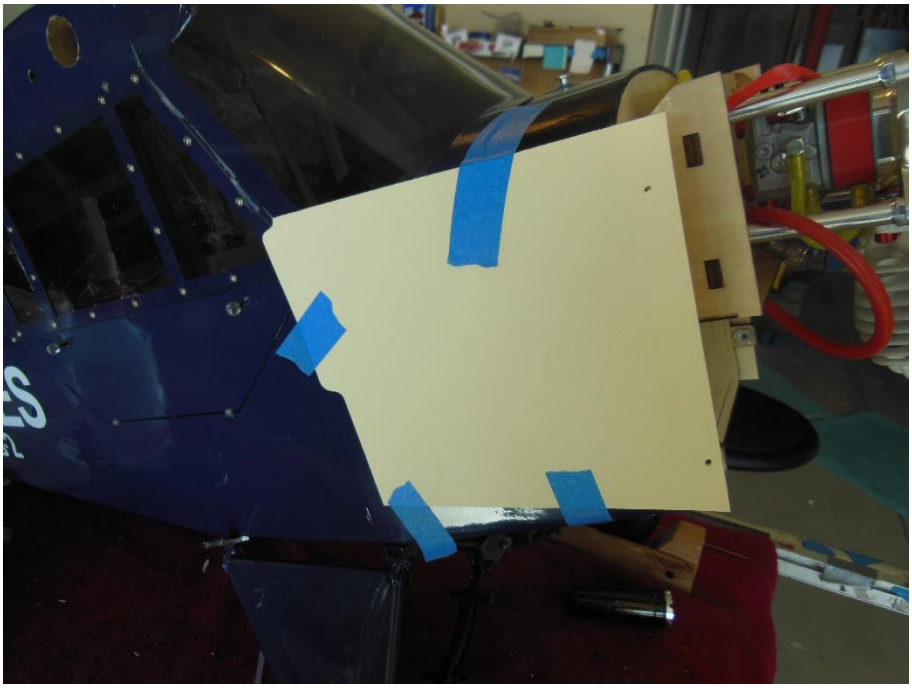
When the canopy glue is dry, about 24 hours, remove the masking tape and the windshield installation is completed.

COWL ATTACHMENT

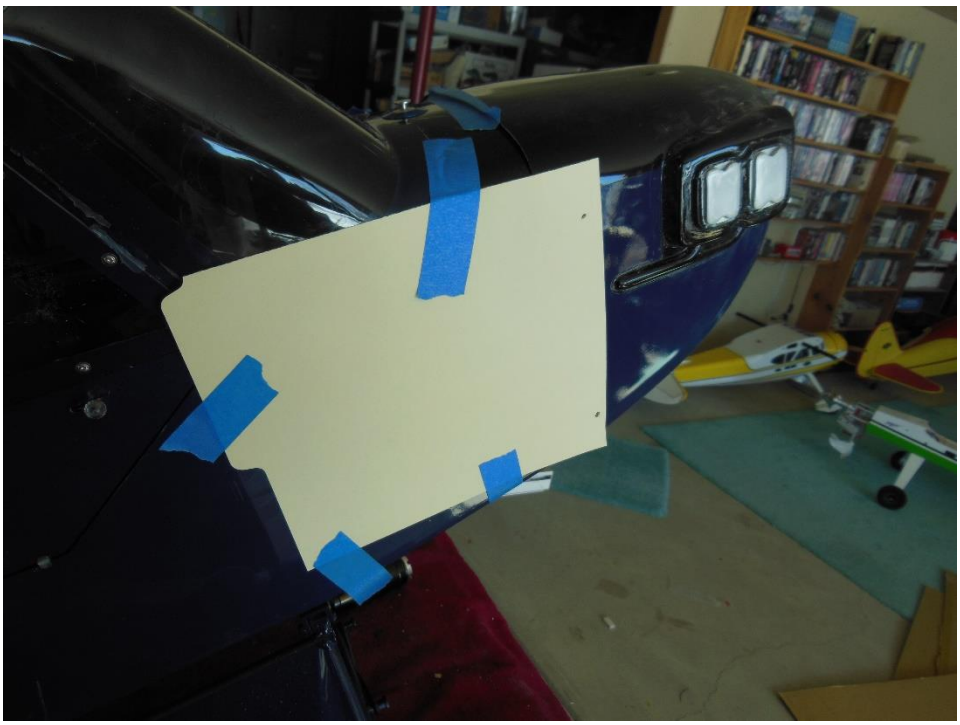
For the DA 35, it is necessary to cut a hole in the bottom of the cowl for the spark plug before the hole location for mounting screws for the cowl can be determined. See picture below for location.



Cut two pieces out of a manila file folder to fit on each side of the fuselage is shown below.

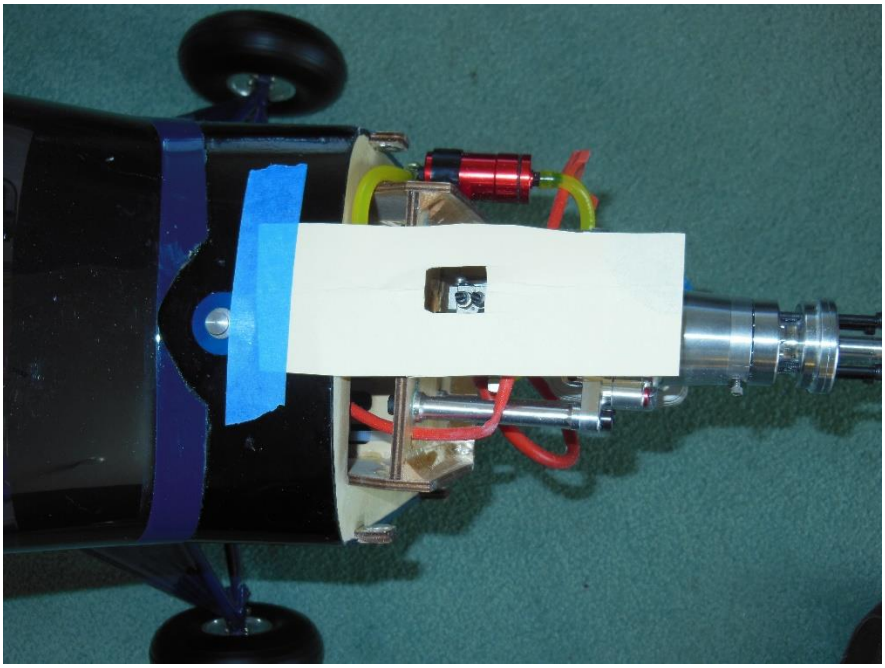


Make a small hole at each blind nut location. Mount the cowl as shown below.

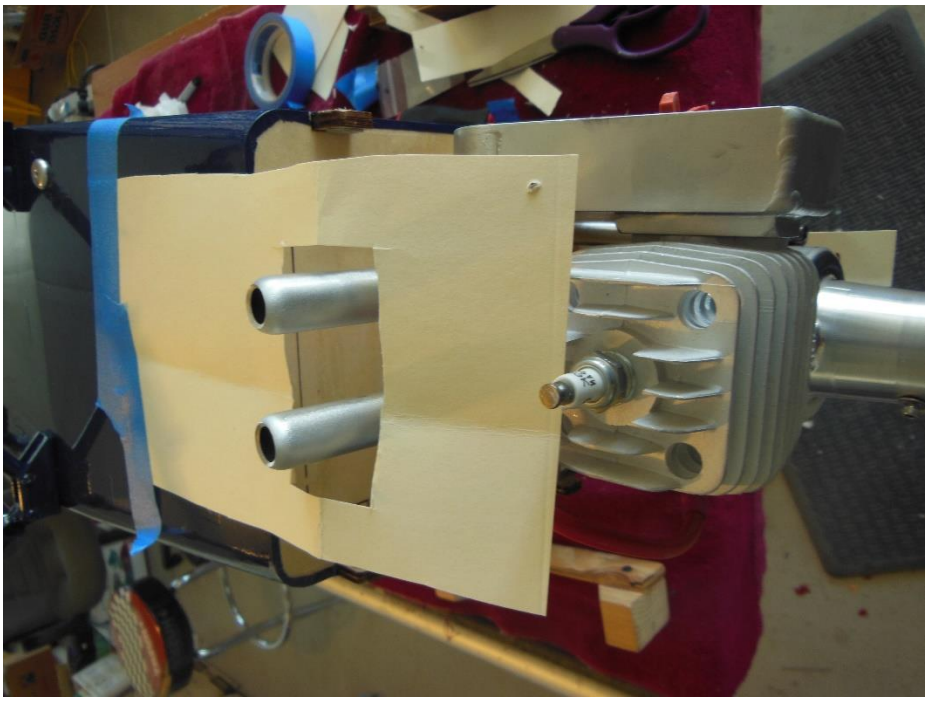


Mark the location of each hole, remove the cowl, and drill holes for the mounting screws.

Using a piece of the manila file folder, locate the spot on the top of the cowl that needs to be removed to provide access for the engine tuning screws. This is shown in the picture below.



Temporarily, mount the muffler, and make another template for the bottom of the fuselage to cut out for the exhaust stacks. This is shown below.

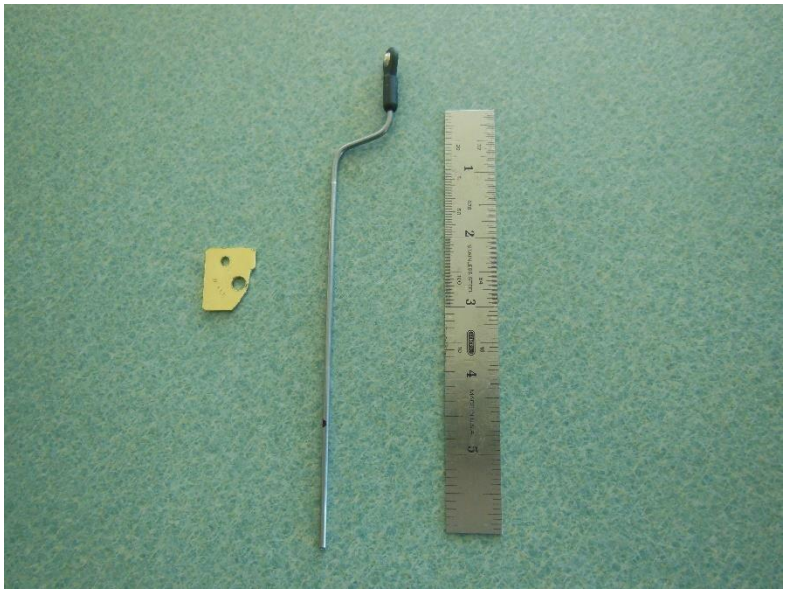


Remove the muffler and reattach the cowl to the fuselage as shown below.

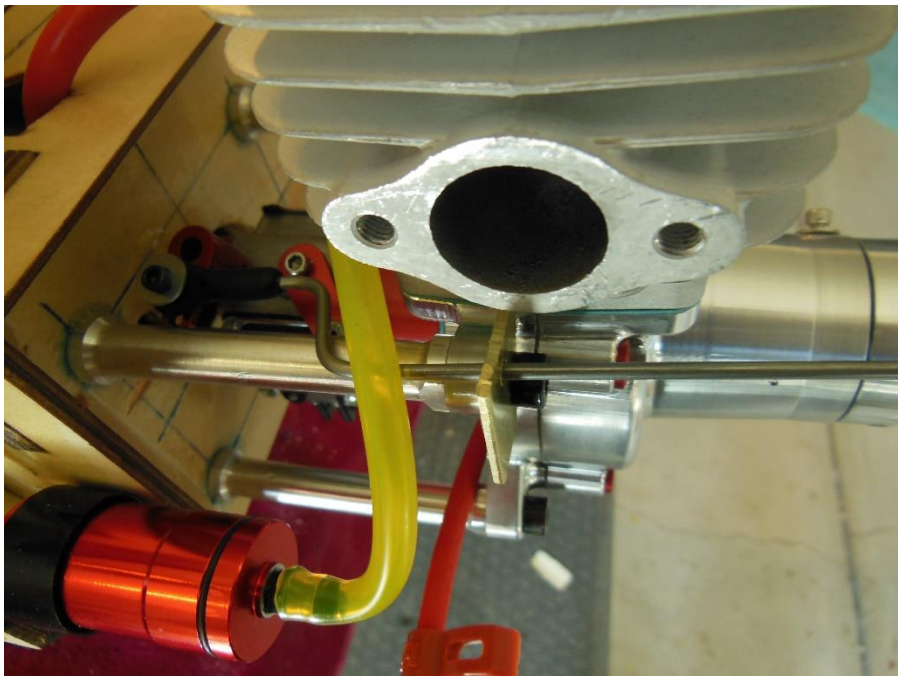
Mark on the cowl where to cut out for the exhaust stacks on the bottom, and the access hole on the top for tuning the carburetor. Remove the cowl and cut out the holes that you just marked. Also cut a hole in the cowl for cooling as shown below. You will also have to cut part of the cowl for the muffler. The muffler cut out is on the left in the picture below. Remember when you are cutting the cowl that it is fiberglass and be sure to wear a dust mask.

CHOKE CONTROL ROD

Using a 4-40 control rod with a threaded end and a Swivel Link make a choke control rod as shown in the picture below.



The little brass plate is used as a guide for the choke control rod. The larger hole is for one of the motor mounting screws and the smaller hole is for the choke control rod. Its installation is shown in the pictures below. Use blue thread locker when attaching the quick link to the choke control on the carburetor.



A picture showing the choke control rod configuration and the installed cowl is shown below.

FINAL ASSEMBLY AND BALANCING

Attach the muffler, but at this time do not put sealant between the muffler and the motor. Attach the cowl and mount the prop and spinner. Mount the wings and attach the wing struts using 6-32 socket head cap screws and elastic stop nuts.

BALANCE YOUR AIRPLANE

The most important step in finishing the airplane is to make sure that the center of gravity is in the proper place. The center of gravity range for this airplane is from 4 inches to 5 ½ inches from the leading edge of the wing. Experience has shown that this airplane flies best with a forward center of gravity.

With the motor, muffler, fuel tank, and batteries located as shown in the pictures above it requires 19.5 ounces of weight to have the center of gravity 4 inches from the leading edge of the wing. One suggestion for adding weights is as follows. Lead weights that hunters use to wait their decoys are inexpensive and easy to attach. These weights are shown in the picture below. These weights are generally available at either sporting goods or hardware stores.

Each piece weighs 6 ½ ounces. To attach these, cut them into two equal lengths, drill holes, and attach to the firewall with sheet metal screws. The attached weights are shown in the following picture.

Mix up some 30-minute epoxy and apply around the edges of the weights to seal them to the firewall.

Replace the muffler making a gasket from Ultra Copper High temperature RTV silicone and use blue thread locker on the muffler screws. Replace the cowl with just a touch of blue thread locker on each screw. Mount the prop and spinner. This completes the assembly of the airplane.

CONTROL THROWS

Set the control throws according to the table below.

	HIGH RATES	LOW RATES
ELEVATOR	28 degrees each direction (2.75")	13 degrees each direction (1.25")
AILERONS	20 degrees each direction (1.125")	12 degrees each direction (5/8")
RUDDER	25 degrees each direction (1.75")	14 degrees each direction (1")

PRE-FLIGHT

The engine should be properly adjusted and running smoothly and should have a good throttle transition. If the engine isn't running properly don't try flying the plane.

Perform a range check with the engine running. Make sure the range check meets or exceeds the radio manufacturers recommendations.

Set the Fail Safe on the radio and the throttle cut for the radio manufacturer's instructions.

Check the batteries to make sure they are fully charged and recheck the batteries after each flight.

Make sure that you have used thread locker on all bolts and nuts.

We recommend using low rates for the initial test flights.

Have fun, enjoy your aircraft, and fly safe.

NOTES ON INSTALLING A DLE-40 TWIN

If the distance from the firewall to the back of the propeller is 6 ¼ inches, the mufflers will just fit as shown in the picture below.

Cut outs must be made in the cowl for the two cylinders, and exhaust extensions will be needed to discharge the exhaust outside of the cowl.