



93” AJ Laser 230z

and

92” AJ Raven

Assembly Instructions

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Laser 230z and the Raven as the assembly process is nearly the same. The only differences between the two kits are as follows:

- The Laser has an optional push-pull rudder servo position. The Raven does not.
- The Raven has an optional wing design. The Laser does not.
- The center of gravity (CG) is different and noted at the end of this document.

Up Your Game! Fly AJ Aircraft

AJ Aircraft thanks you for the purchase of this airplane. Top grade materials and precision assembly have been used to make this a top quality aircraft. Following the directions closely will assure you many hours of thrilling flight. Two years of design, development, and testing has gone into this airframe. We hope you're as happy with it as we are!

WARNING!

AJ Aircraft's extensive testing ensures a high quality kit that has gone through many stages to provide you with a safe, reliable, airframe. Poor assembly will lead to an unsafe model, therefore the instructions must be followed closely. Should you have any questions, please do not hesitate to contact us. The safe operation of this model is your responsibility and yours alone. If you are a beginner or have never flown a model of this size and power you should attempt it with the help of an experienced pilot. This product should not be considered a toy, but rather a sophisticated, working model that functions much like a full-scale airplane. Because of its performance capabilities, this product, if not assembled and operated correctly, could cause injury to you or spectators and damage to property.

This aircraft should be flown in accordance to the AMA safety code. It is highly recommended that you join the Academy of Model Aeronautics in order to be properly insured and to operate your model at AMA sanctioned flying fields. If you are not willing to accept all liability for the use of this product please return if to the place of purchase immediately.

AJ Aircraft does not accept responsibility or liability for damages resulting from use of this product.

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Before starting, read through the entire set of instructions to familiarize yourself with the process.
If there's ever a question, contact AJ Aircraft. 734-244-4015

Additional assembly information can be found in assembly videos on the [AJ-Aircraft YouTube Channel]



93 Laser 230z Build Video #1 | 93 Laser 230z Build Video #2 | 93 Laser 230Z Build Video #3 | 93 Laser 230z Build Video #4 | 93 laser 230z Build Video #5

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Description

Whether you're looking to go out and do some 3d huckin' or lay down a smooth-as-butter precision flight, these airplanes are for you! The wings have been thoroughly refined to allow precision flying, while not sacrificing any 3d characteristics. With a generous fuselage height, the model flies as well on its side as it does upright. Generously sized control surfaces give you excellent authority at all speeds. These airplanes feature an awesomely light but strong airframe and a light wing loading that will handle anything you want it to.



Building the airplane is very straight forward. The rudder cables are pre-installed, hinges are pre-glued and sealed. AJ Aircraft goes the extra step to make it easy to get this bird in the air in no time flat. Mounting options designed right into the airframe make it a snap to setup with pull-pull or push-pull (Laser only) rudder configurations. Stand-offs perfect for the DA-70 and extra hardware are included. High quality parts including dual G10 fiberglass control horns, carbon fiber wing tubes and heavy duty ball-links and turnbuckles ensure you won't need to spend more money replacing cheap hardware.

These 30% airframe was designed around the DA-70 or equivalent, with lots of room for this beast of an engine without having to cut holes in the side of your cowl. Mounting templates are included for the DA-60/70 and 3W-50 to make engine installation as easy as can be. A full length pipe tunnel and 3 different pipe mounts gives you the ability to easily add pipes or canisters to tame your DB levels. Trust us when we say once you go full throttle with this baby, you won't want to slow down! As with its siblings, you'll see this is designed with next-gen building techniques to handle the punishment of today's 3D and extreme aerobatics with confidence.

Prefer electrons over ignition? A Hacker Q-80 with 10-12s lipos will have the Laser or Raven screaming across the field. The crazy power and instant throttle response of the Q-80 makes for a 3D/XA pop-toppin', tumblin', knife edge spinnin' insanity machine! Whichever you choose, we're sure it'll put a smile on your face every time you fly it.

Raven

The Raven can be assembled with a double taper wing which provides better tracking precision. Or, you may choose the "Edge" wing for slower stall speeds, low and slow 3D flying.

Edge Wing



Double Taper Wing



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Laser Features

Specs:

- Wing Span - 93"
- Length - 88"
- AUW (dry)- 18-20 lb
- Electric Power – Hacker Q-80
- Gas Power – 60cc-70cc
- Radio - 6 Channel with 5 High Torque Servos (Electric Power)
- Radio - 7 Channel with 5 High Torque Servos (Gas Power)

What's in the box:

- Pre-hinged, glued and sealed ailerons & elevators
- Carbon fiber main landing gear
- Carbon fiber main wing tube
- Removable horizontal stabs & rudder
- G10 fiberglass control horns
- Aluminum reinforced landing gear mount
- Aluminum reinforced firewall
- Aluminum standoffs for gas engines
- Full-length canister tunnel
- Canister muffler mounts
- Heavy duty 4” foam wheels with aluminum hubs
- Heavy duty steel axles
- Thick heavy duty pre-drilled wheel pants
- Pre-drilled & rubber lined landing gear cuffs
- Firewall drilling templates for common engines
- Pre-run rudder pull-pull wires (turnbuckle also included for push-pull option)
- High quality ball links & turnbuckles for all connections
- Extra hardware bag for spares
- Velcro for fuel tank or battery restraint
- All airframe components covered in genuine Ultracote.

Raven Features

Specs:

- Wing Span - 92"
- Length - 86"
- AUW (dry)- 18-19 lbs.
- Electric Power - Hacker Q-80
- Gas Power - 60cc -70cc
- Radio - 6 Channel with 5 High Torque Servos (Electric Power)
- Radio - 7 Channel with 5 High Torque Servos (Gas Power)

What's in the box:

- Pre-hinged, glued and sealed ailerons & elevators
- Carbon fiber main landing gear
- Carbon fiber main wing tube
- Carbon fiber laminated wing and stab roots
- Removable horizontal stabs & rudder
- G10 fiberglass control horns
- Aluminum reinforced landing gear mount
- Aluminum reinforced firewall
- Aluminum standoffs for gas engines
- Full-length canister tunnel
- Canister muffler mounts
- Heavy duty 4" foam wheels with aluminum hubs
- Heavy duty steel axles
- Thick heavy duty pre-drilled wheel pants
- Pre-drilled & rubber lined landing gear cuffs
- Firewall drilling templates for common engines
- Pre-run rudder pull-pull wires
- High quality ball links & turnbuckles for all connections
- Extra hardware bag for spares
- Velcro for fuel tank or battery restraint
- All airframe components covered in genuine Ultracote.

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Laser Recommended Items for Completion

- (2) x 6" extensions for the ailerons
- (2) x 6" extensions from the receiver to the aileron servos
- (2) x 48" extensions for the elevators
- (1) x 48" extension for the rudder (push/pull setup)
- (1) x 12" extension for the ESC to Receiver (if electric)
- (2) x 12" extensions for the throttle servo and ignition (if gas)
- (4) x 1 3/4" servo arms for elevators & ailerons
- (1) x 3 1/2" double servo arm for pull/pull rudder
- (1) x 1 3/4" servo arm for push/pull rudder
- 4" spinner

Electric Motor Power

- Hacker Q-80, Eflite 360
- Falcon 24x10 prop
- Castle 160 ESC
- Castle Pro BEC
- (2) x 6S Thunder Power LiPo batteries
- Futaba S-9177 servos

Gas Engine Power

- 60cc or 70cc gas engine
- Falcon 24x8, 24x9, 25x8, 26x8 prop
- 24 oz. Fuel Tank
- Receive/Servo Battery
- Ignition shut off
- Futaba S-9177 servos
- Thunder Power 2s 3800mah G8 Pro-lite + 25C
-

Raven Recommended Items for Completion

- (2) x 6" extensions for the ailerons
- (2) x 6" extensions from the receiver to the aileron servos
- (2) x 48" extensions for the elevators
- (1) x 12" extension for the ESC to Receiver (if electric)
- (2) x 12" extensions will be needed for the throttle servo and ignition (if gas)
- (4) x 1 3/4" servo arms for elevators & ailerons
- (1) x 3 1/2" servo arm for rudder
- 4" spinner

Electric Motor Power

- Hacker Q-80, Eflite 360
- Falcon 24x10 prop
- Castle 160 ESC
- Castle Pro BEC
- (2) x 6S Thunder Power LiPo batteries
- Futaba S-9177 servos

Gas Engine Power

- 60cc or 70cc gas engine
- Falcon 24x8, 24x9, 25x8, 26x8 prop
- 24 oz. Fuel Tank
- Receive/Servo Battery
- Ignition shut off
- Futaba S-9177 servos
- Thunder Power 2s 3800mah G8 Pro-lite + 25C
-

AJ's Preference

- Desert Aircraft 70cc Twin
- Falcon 24x10 prop
- Castle Pro BEC
- Thunder Power 2s 3800mah G8 Pro-lite + 25C
- Futaba S-9177 servos
- SpotOnRC V2 1.75" Servo Arms x (4)
- SpotOnRC V2 3.5" Double Servo Arm

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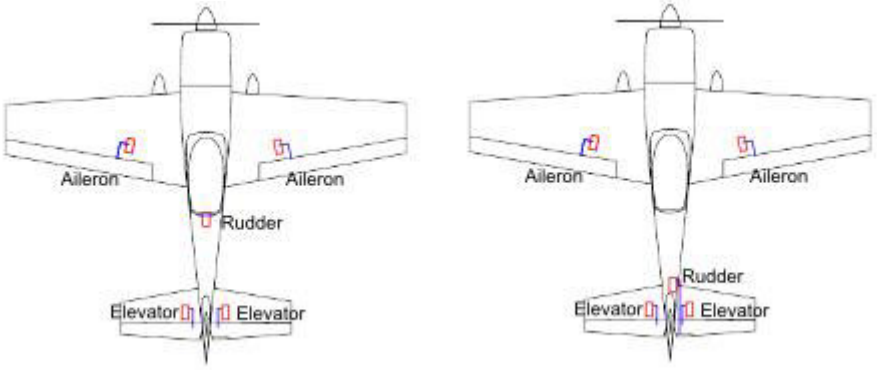
Optional Servo Configurations

The Laser provides for an option of using a pull-pull rudder servo or a push-pull rudder servo setup. Fasteners, control horns and servo connecting rods are provided for optional rudder setup.

The Raven does not have the optional push-pull servo position.



Tools Needed

Blue Painter's Masking Tape
Thin CA Glue
30 Minute Epoxy
Denatured Alcohol
Paper Towels
Removable Thread Locker (Loctite 242, Blue)
Metric & Imperial Allen Wrenches
Hobby Knife & Fresh Blades
Covering Iron (Trim Iron)
Clamps
Small Flat File
Electric Drill w/ Assorted Small Bits (1/16", 5/64")
Small Flat Blade Screwdrivers
Small Phillips Screwdriver
Sandpaper (150-220 Grit)
Pliers
Measuring Tape & Ruler

Inspection

We believe we offer the highest quality kits available. However you may find some minor blemishes, fractures or joint separations in the construction of our models. Many of these can be easily repaired by backing up the joint with balsa sheet or hard balsa sticks without affecting the performance or appearance of the aircraft.

Take the time to inspect the components of the aircraft. Inspect the fuselage for any interior joints that may have loosened as a result of shipping & handling. Apply thin CA glue around the joints of the fuselage core, firewall, fuselage formers, and rudder servo tray to strengthen. Allow glue to wick down into joints but be careful to not allow CA glue to drip or puddle on covering material. Periodically inspect joints as you fly your airplane. Vibration and repetitive extreme maneuvers my cause a joints to loosen over time.





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Covering

The covering on your airframe may have developed loose areas through temperature and humidity changes between manufacturing and shipping. This may also occur during the summer heat. The covering may require retightening a few times during your first summer of flying.

Take a few minutes to go over all of the seams making sure all edges are secure, then proceed to shrinking any area that may need tightening. (Use an iron on all seam edges. Use a heat gun on open areas and sheeted areas. An iron can be used in open and sheeted areas but hold the iron slightly above the surface. You don't want press the covering into the wood. Using an iron sock will reduce scratches.

- All airframe components are covered in genuine Ultracote covering.
- Laser Retro Scheme (True Red HANU866, White HANU870, Bright Yellow HANU872)
- Laser Patriot Scheme (True Red HANU866, White HANU870, Midnight Blue HANU885, Bright Yellow HANU872)
- Laser Reflex Color Scheme (White HANU870, Bright Yellow HANU872, Midnight Blue HANU885, Silver HANU885)
- Laser Valor Color Scheme (True Red HANU866, White HANU870, Midnight Blue HANU885, Silver HANU885)
- Raven Red (True Red HANU866, White HANU870, Silver HANU881, Pearl Charcoal HANU846)
- Raven Green (White HANU870, Apple Green HANU903, Pearl Charcoal HANU846, Silver HANU881)



At 200-220°F (93-104°C) the adhesive on UltraCote® becomes active allowing the covering to be attached to the model. While 220° will fully bond the covering to the model it is well below the temperature that causes UltraCote® to shrink.

At 300°F (149°C) the initial shrinking of UltraCote® begins.

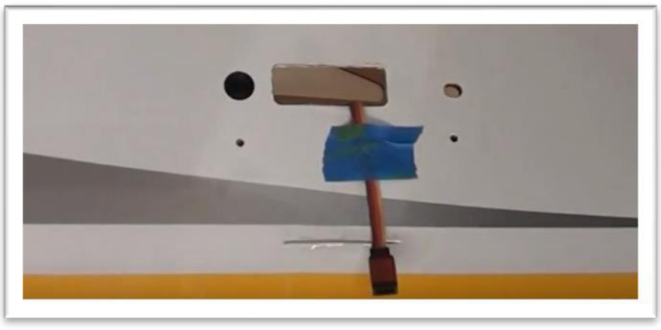
At 350°F (176°C) UltraCote® reaches its maximum shrinking point. Raising the temperature above this point will not cause further shrinkage.

Use as little heat as needed. Using too much heat may cause reshrinking issues later.

Locate the wing positioning holes and cutouts in the side of the fuselage. Using a covering iron, adhere the area around the openings in the fuselage side then trim away the covering.



At the tail of the fuselage locate the horizontal stabilizer mounting holes, alignment pin hole, and 2 screw holes. They are located just above the rudder cable exit. Using a covering iron, adhere the area around the openings in the fuselage side then trim away the covering.



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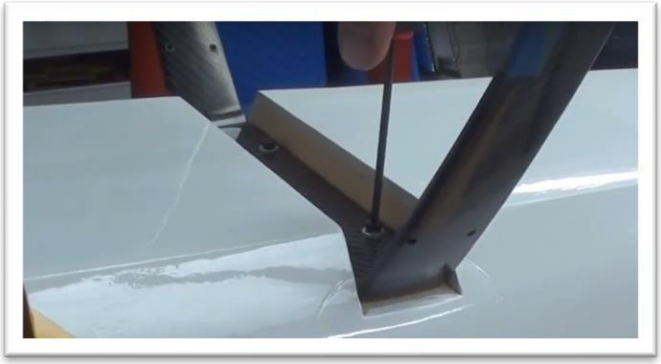
Landing Gear

Landing gear parts contents are shown below.



Install the landing gear with the thicker portion of the airfoil to the front. Use a socket head screw and washer through the outside and a nylon lock nut on the inside of the fuselage.





Fit the filler block to the bottom of the landing gear. You may need to sand a cove down the center of the block to fit without rocking.



The filler block can be held in position with strips of covering material, packing tape, or it can be glued in place.



Slide the cuffs over the landing gear and secure with screws. Be carefull to not break the screws. If the screw seems to be difficult to insert use a drill to open up the hole. (Some people have found they prefer a dob of silicone inside the cuff hold them secure.)



Install the axles in the landing gear. Rotate the axle so the collar set screw flats are accessable when the wheel pant is installed. Secure with nylon lock nuts.



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Test fit the wheel and wheel pants with a wheel collar on both sides the wheel. Make sure the wheel is centered and has ample clearance around the tire. Trim the inside edge of the wheel pant as needed. Tighten the inside wheel collar.



Install the wheel and wheel collars on the axle allowing the wheel to rotate freely.



Mount the wheel pants to the landing gear with a washer and socket head screw. We recommend using a thread locker on these screws.



Take the time to fully disassemble the tail wheel assembly then reassemble it with thread locker on all screw threads.







Install the tail wheel assembly on the fuselage using washers and socket head screws. We recommend using a thread locker on these screws.



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Control Horn Installation



Carefully locate the servo pockets and aileron control horn mounting slots in the wings. Use a covering iron to secure the covering around these areas before cutting into the covering. Use a new hobby knife blade to cut though the covering. Cut from the corners of the pocket towards the center of the pocket so the covering can be folded in and sealed around the edges. Locate the aileron control horn mounting slots and trim away the covering.



Carefully locate the elevator servo arm openings and elevator control horn mounting slots. Use a covering iron to secure the covering around these areas before trimming away the covering.



Use sand paper to roughen the lower portion of the control horns on both sides. Roughen one side of the base plate. This will help the epoxy bond to the control horn parts.



Test fit the control horn in the slot. Trim or file the slot as needed to achieve a snug fit. Make sure the shoulder of the control horn is fully seated down against the control surface.



Notice that the control horn base is not symetrical. The thinner edge should be positioned towards the hinge line.



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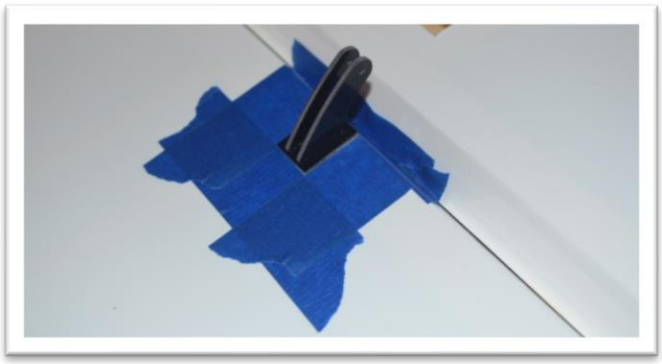
Assemble a ball link (without a flange) to the control horns using a socket head screw, washer and nylon lock nut. Assembling the ball link to the control horn at this step will help keep the control horn halves aligned during installation. Insert the control horn assembly into the surface again testing the fit.



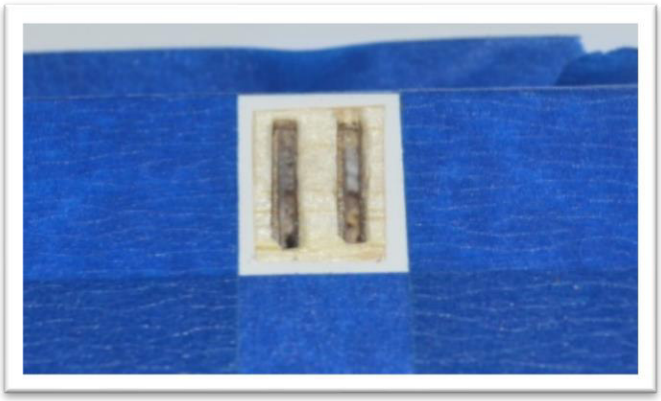
Check the alignment of the control horn to the hinge center line. The linkage hole in the control horn should be aligned with the hinge centerline.



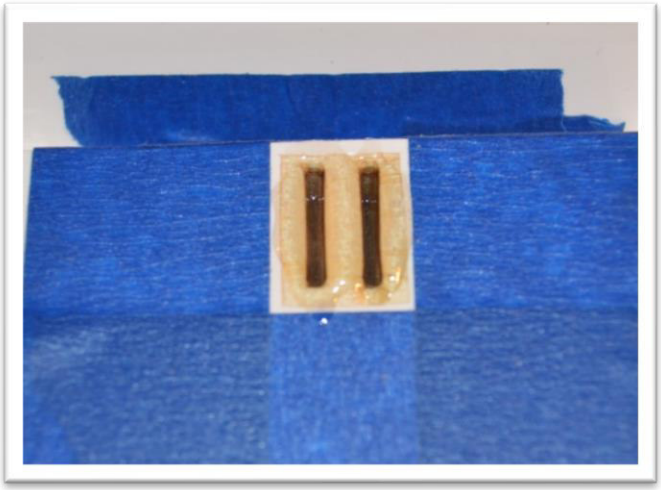
With the control horn in position apply painter's masking tape around the control horn base. Put the tape up to the base edge. Not under or over it.



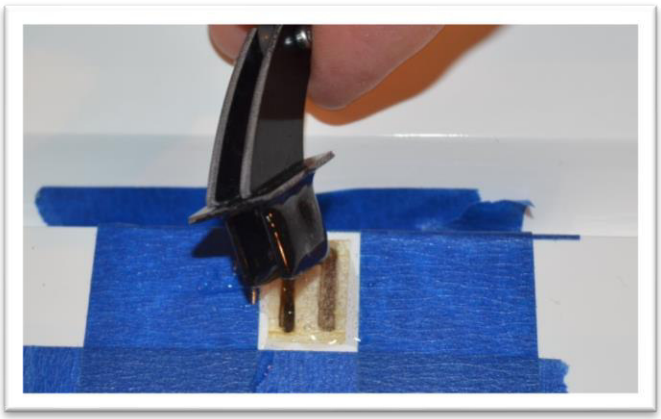
Remove the control horn leaving the tape in position. Using a new hobby knife blade lightly cut through the covering but not into the balsa sheeting.
Cut inside the tape edge about 1/16".



Prepare all control surface and control horns before gluing. Using 30 minute epoxy will provide plenty of working time to glue in all control horns at one time. Apply epoxy to the slots in the aileron. Use a pin to help push epoxy down into the slot.



Apply epoxy to the control horn assembly and insert it into the aileron slots.



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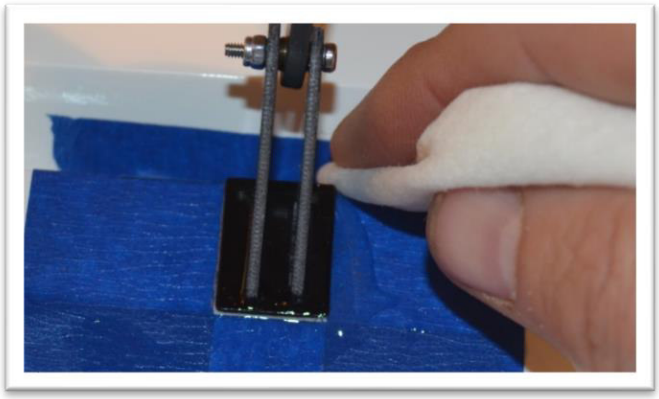
Wipe away excess epoxy using a paper towel soaked with denatured alcohol. Use an upward rolling motion as you wipe the excess epoxy to lift it from the surface. This helps reduce smearing the epoxy.



Check the alignment along the hinge line as you did when you test fit the control horn. Reposition as needed.



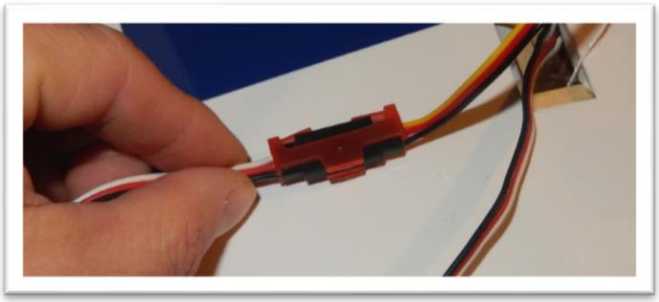
Allow the epoxy to partially cure. Peel away the masking tape after the epoxy is securely holding the control horn in place and still soft enough to easily remove the tape. Set the wing aside and let the epoxy fully cure.

Aileron Servo Installation

Connect the servo to a receiver and power supply. Turn on your transmitter. Set trim and sub trim to zero. Install a servo arm on the servo about perpendicular to the servo's side. Use the transmitter's sub trim to make it exactly perpendicular to the side of the servo. Be sure to setup one arm to the left and one arm to the right.



Connect a servo extension wire to the servo lead. Use a safety clip to secure the connection. Attach the servo extension wire to the installation string and gently pull the wire through the wing as you insert the servo into the wing.



Insert the servo into the pocket with the drive spline towards the front of the wing. Pre-drill for the servo mounting screws using a 1/16" drill. Remove the servo and apply a drop of thin CA glue into each mounting screw hole. This will harden the wood around the screws and provide a more secure installation. Allow the CA glue to dry before reinstalling the servo.



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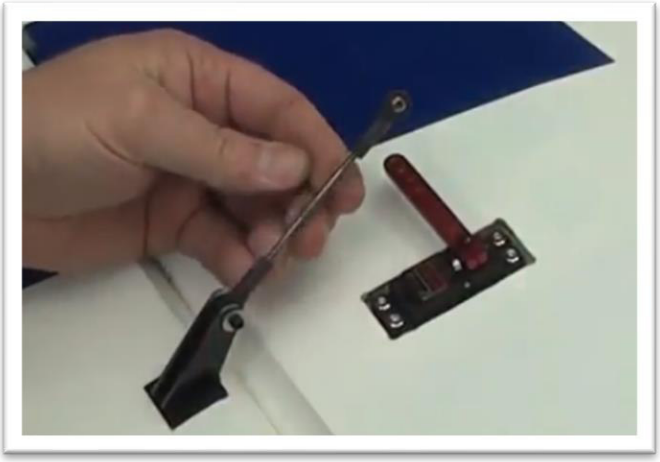
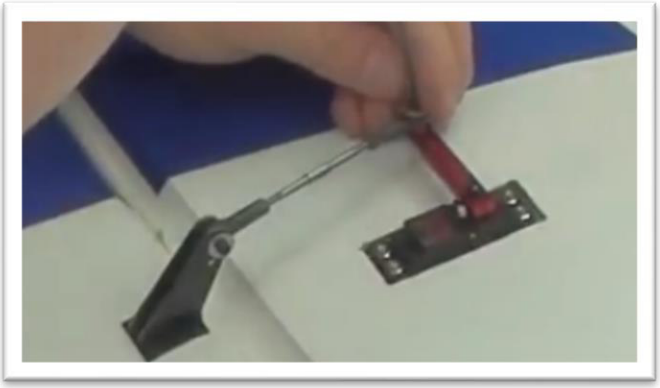
Assemble the connection rod to a servo ball link with the flange. Then connect the connection rod to the control rod ball link. Make note that one end is a left hand thread and the other is a right hand thread. Screw the connection rod into each ball link equally.



Check the length of the assembly with the servo to estimate the length. When you get close to the correct length connect the flanged ball link to the servo arm with a washer and socket head screw. (Always adjust the connecting rod length with the servo powered up and centered.)



At this point the aileron may not be aligned with the wing.

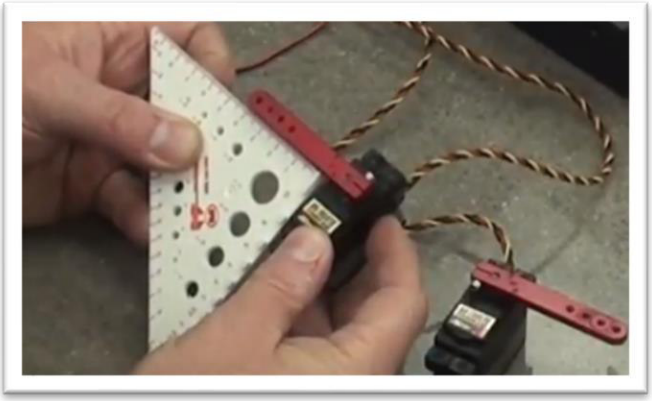


Adjust the connecting rod to align the aileron and the wing. Because of the left and right threads on the connecting rod the length of the rod can be adjusted without disconnecting it from the servo or the control horn.



Elevator Assembly

Connect the elevator servos to a receiver and power supply. Turn on your transmitter and set trim and sub trim to zero. Install a servo arm on the servo about perpendicular to the servo's side. Use the transmitter's sub trim to make it exactly perpendicular to the side of the servo. Be sure to setup one arm to the left and one arm to the right. Do not tighten the servo arm screw.



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The servo will be mounted inside the horizontal stabilizer with the wire towards the front of the stabilizer. The servo mounting screw holes have already been predrilled.



Fold the servo wire towards the top of the servo. Insert the servo into the pocket. (It's typically easier to get the wire end of the servo in first.) Once the servo is fully seated into the pocket insert servo mounting screws. (Socket head screws or a magnet attached to your screw driver may make inserting screws a little easier.)



Connect the servo to your receiver and battery. Turn on your transmitter to center the servo. Attach the servo arm square to the side of the servo. Don't forget to tighten the servo arm screw and the pinch bolt if you servo arm has one.



Assemble the connection rod to a servo ball link with the flange. Then connect the connection rod to the control rod ball link. Make note that one end is a left hand thread and the other is a right hand thread. Screw the connection rod into each ball link equally.



Check the length of the assembly with the servo to estimate the length. When you get close to the correct length connect the flanged ball link to the servo arm with a washer and socket head screw. (Always adjust the connecting rod length with the servo powered up and centered.)



Adjust the connecting rod to align the elevator and the stabilizer. Because of the left and right threads on the connecting rod the length of the rod can be adjusted without disconnecting it from the servo or the control horn.



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Rudder Assembly

Pull-Pull Rudder

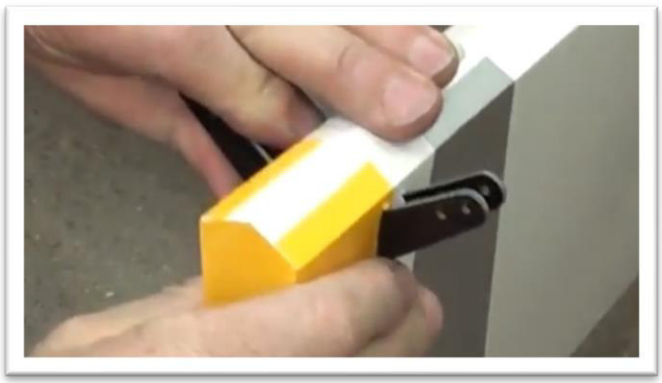
Use sand paper to roughen up the center of the control horns on both sides and one side of the bases so the epoxy will adhere better. File a radius on the corners so the control horn can be rotated through the rudder slot.



Carefully locate the rudder control horn mounting slots. Use a covering iron to secure the covering around these areas before trimming away the covering. Cut the rudder covering to expose the control horn slots on both sides of the rudder.



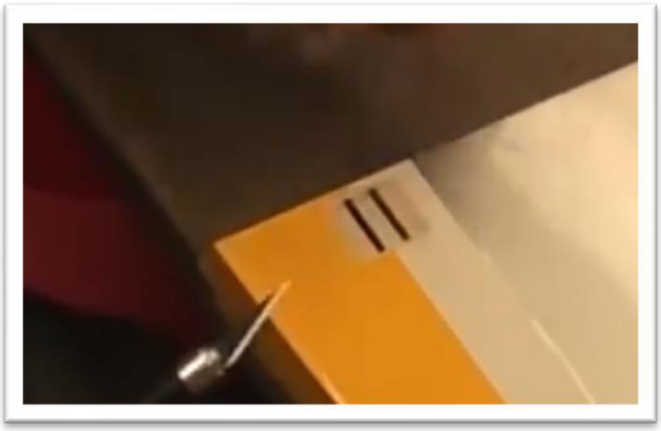
Test fit the control horns in the slots. The slots my need minor cleaning as glue sometimes seeps into the slots during the building process. Do not remove too much material. The control horns should fit snug.



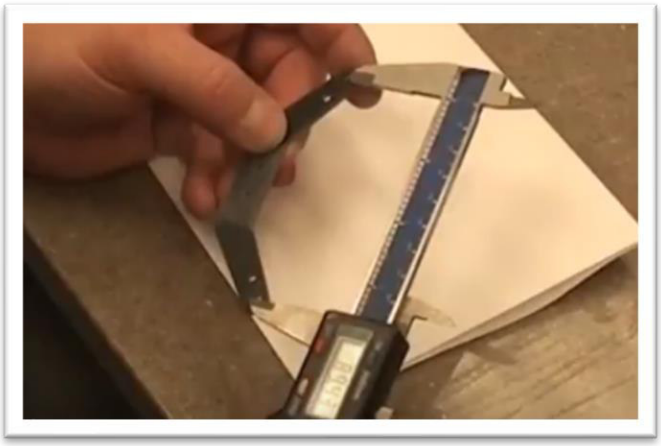
Slide the control horn base on. Then lightly score the covering around the base. Be careful not to cut into the balsa.



Remove the control horn and base. Then remove the covering from under the base.



To help locate the control horn in the rudder you will need to measure finding a centered position. Measure between holes on the control horn then divide by 2. (90mm/2 = 45mm)



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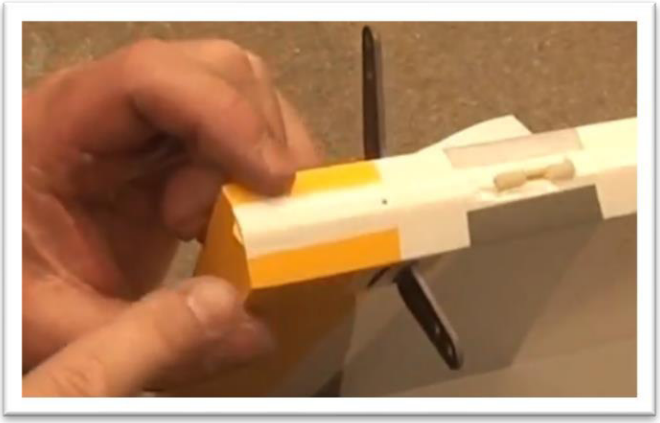
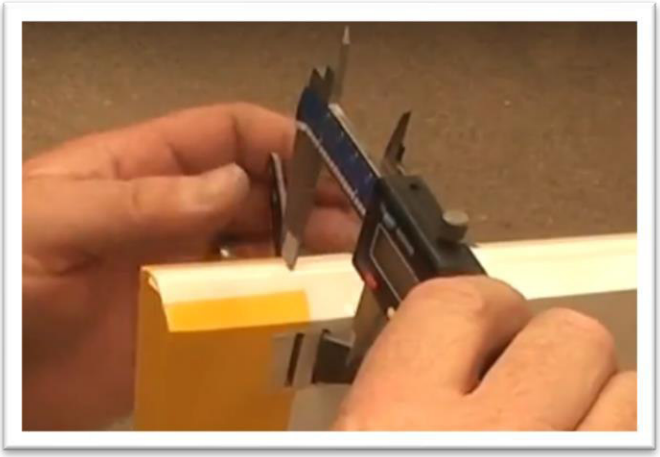
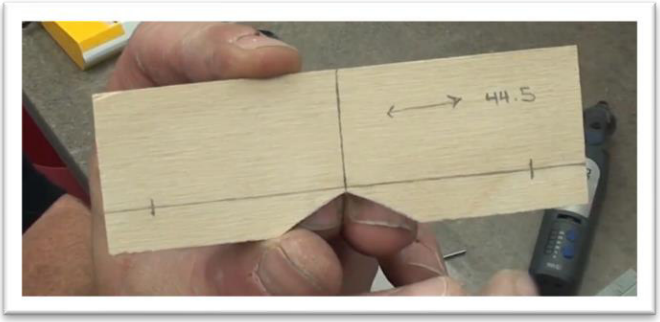
Mark the center of the rudder along the hinge line.



Locate the control horn position by measuring from the center point to the control horn holes.



An alternative method of locating the control horn makes use of an alignment fixture. This helps center the control horn as well as keeping it square to the rudder. Draw two lines perpendicular to one another. Cut a notch for the rudder on center and symetrical on a centerline. Measure from the centerline to locate two holes to connect the control horn.





Test fit to the rudder making sure the control horn is centered and square to the rudder.



Use 30 minute epoxy to secure the control horn in the rudder. Get the control horns started in the slots then apply epoxy to the center portion of the control horns.





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Slide the control horns into position and apply epoxy to the opposite site to adhear the other base in position. Assemble the alignment fixture with the control horn and rudder making sure the control horns are square to the rudder centerline.



After the epoxy has fully cured install the rudder onto the fuselage. Slide the tail wheel assembly tiller rod through the rod end mounted to the bottom of the rudder. Align the hinges and thread the hinge wire through all the hinges.



Thread the brass cable eyes about half way into the ball links. The ball links with the flange will be connected to the servo arm. The ball link without the flange will be connected to the control horn.



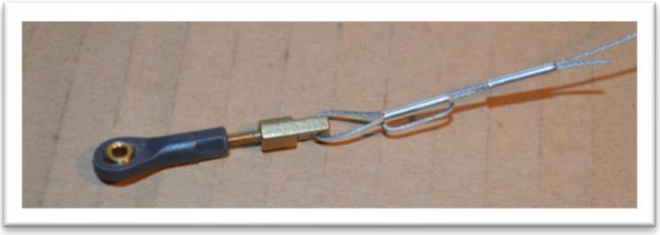
Start the cable assembly at the servo end inside the fuselage. Thread on 2 crush sleeves and the brass cable eye.



Loop around the cable eye and go back through a crush sleeve.



Loop around the first crush sleeve and back through the sleeve again. Slide the second sleeve over the tail.



Adjust the loops and crimp the sleeves with the non-serrated surface of standard plyers.



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Connect your rudder servo to your reciever and a battery. Power up the your radio system and center your transmitter settings. Install a servo arm perpendicular to the side of the servo. Use a square and the transmitter's subtrim to set the arm as accurate as possible as you did with the elevator and aileron servos.

Insert the rudder servo into the fuselage pocket with the drive spline towards the front of the fuselage. Predrill for the servo mounting screws using a 1/16" drill. Remove the servo and apply a drop of thin CA glue into each mounting screw hole. This will harden the wood around the screws and provide a more secure installation. Allow the CA glue to dry before reinstalling the servo and mounting screws.



Connect the ball links to the rudder control horn using a screw, nylon lock nut and a washer. Pull the slack out of the cables and make sure the cables cross once inside the fuselage.



Center the rudder and position it aligned to the vertical stabilizer. Tape the rudder to the vertical stabilizer to hold it centered.

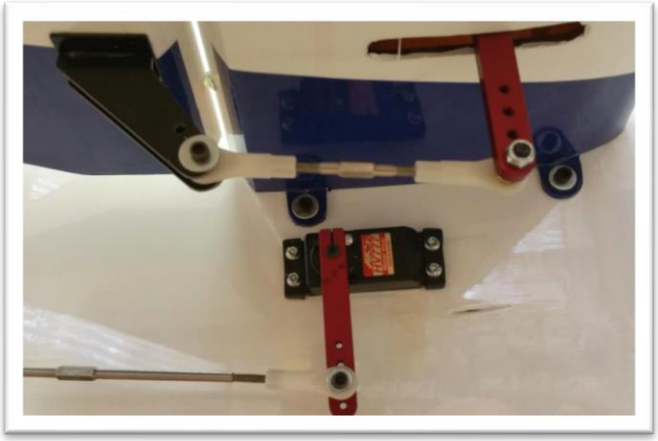


Repeat the cable eye installation process on the rudder end of the cables with the servo powered up and centered. Pull the cable snug. You don't need to make the cable guitar string tight.

Remove the tape from the rudder/vertical stabilizer. Adjust the brass cable eyes to center the rudder and achieve the desired cable tension.

Push-Pull Rudder Control (Laser Only)

If using push-pull rudder control, you will need to cut open the covering on one side of the fuse directly below the stab tube hole. Mount the servo with the output shaft towards the tail of the airplane. Install the rudder control horn as shown above for the rudder pull-pull setup. Use the supplied turnbuckle and rod end hardware to connect the servo to the rudder using the same centering process used on the elevators and ailerons.



The pull-pull cables can be removed and the covering will need to be patched.

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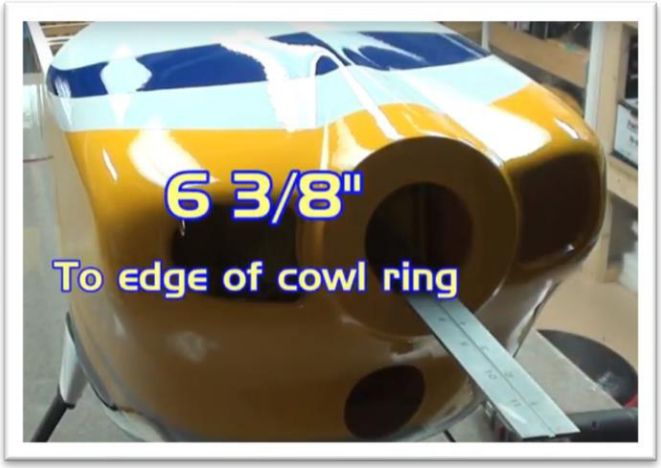
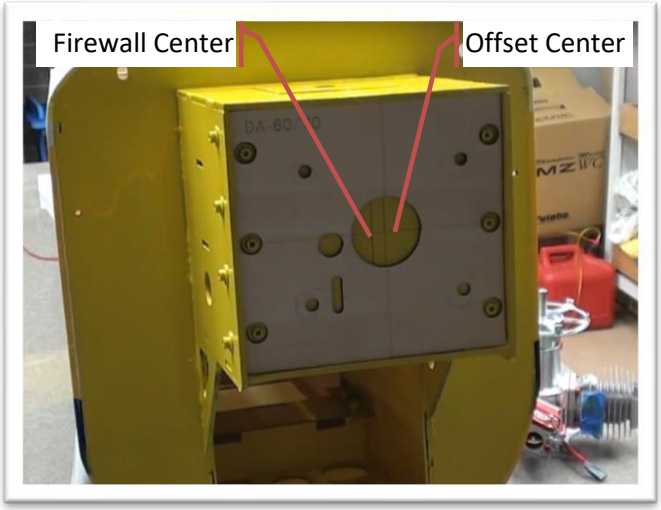
Gas Engine Installation

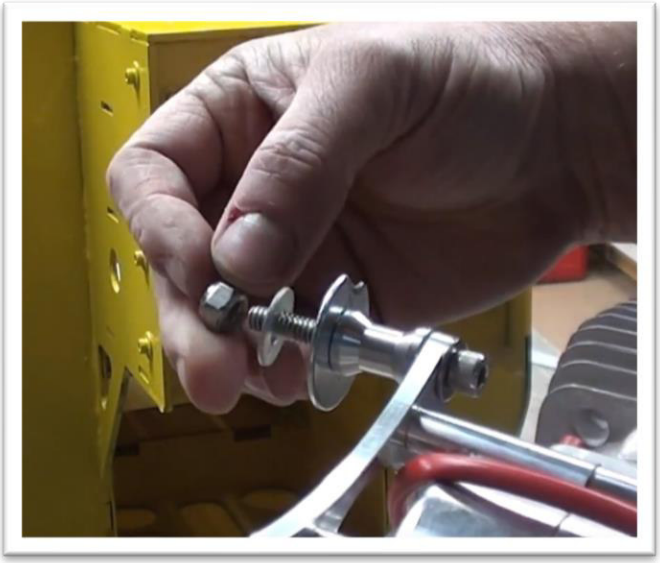
Plan your engine mounting by determining the length of the engine, standoff, spacers or washers needed. The distance between the cowl and the firewall is 6.375" (162mm). There may be slight variation in the manufacturing process of the cowl so please check this dimension. Remember to add a gap between the spinner and cowl. The kit does contain engine standoffs but these may not be suitable for every engine.

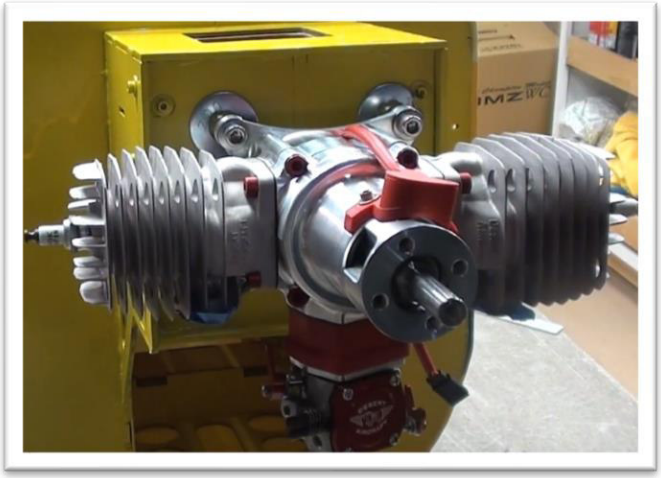


Shown below is the supplied DA60/70 or 3W-50 engine mounting template in place. You may modify this template for other engines or layout mounting holes directly on the firewall. Notice the two centerlines on the firewall. One is the firewall center and the other represents the engine mounting centerline offset to compensate for the built in engine thrust angle. When lying out mounting holes use the offset centerline. This will position the spinner in the center of the cowl opening.



The engine should be mounted with bolts through the engine mounting plate, a flat washer, the fire wall, through another flat washer, then a nylon lock nut.





Use the throttle servo pocket on the bottom side of the engine box for twin cylinder engines. (Fuselage shown upside down.)



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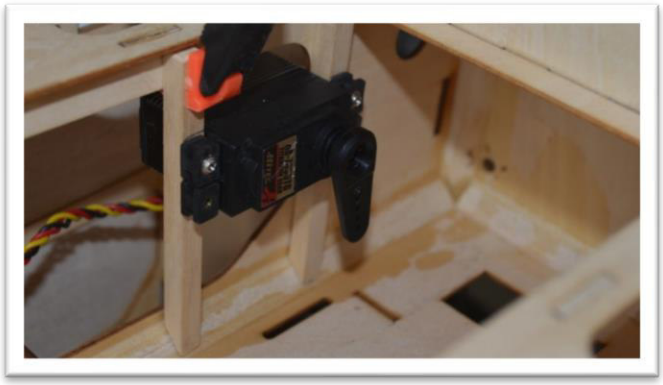
Single cylinder engines may require the throttle servo control rod to go through the firewall since the carburetor is typically behind the engine. You may use the servo pocket in the bottom of the engine box with the servo mounted from the inside or you may consider creating your own mounting location.



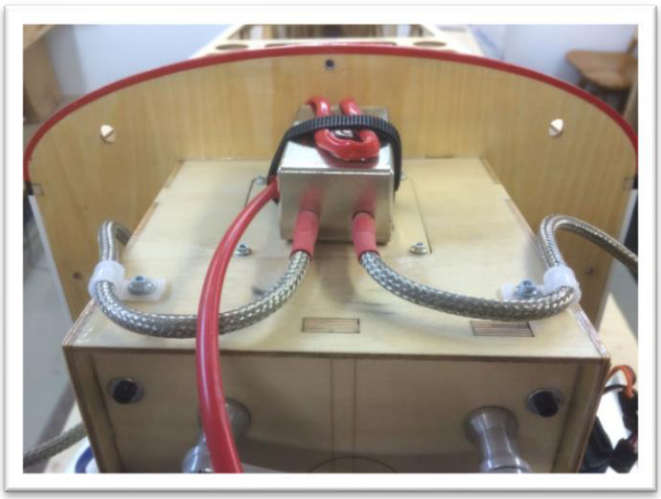




It's typically convient to mount the engines ignition to the side or top of the engine box. Be sure to secure the spark plug wires so they don't move around during flight. Excess movement can cause connector isses in time.







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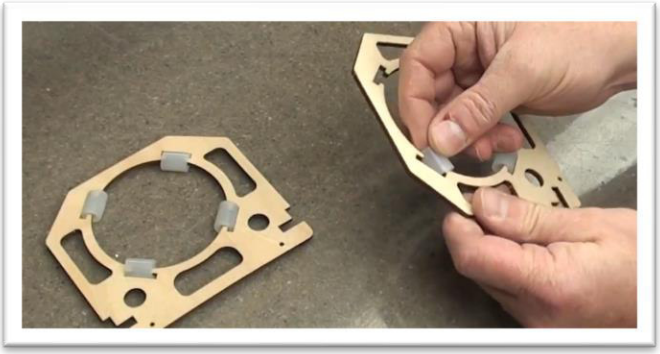
Exhaust Canister

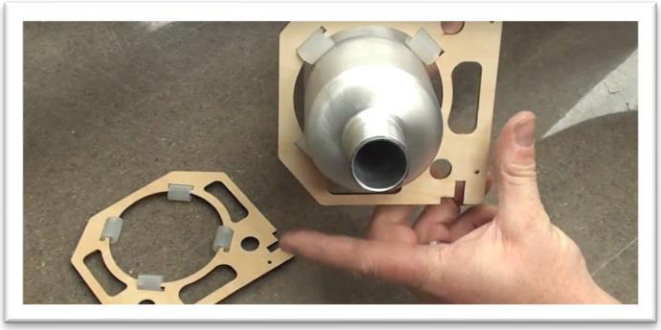
The kit comes with mounting brackts for 3 different size exhaust canisters. Select the appropriate bracket for your equipment.



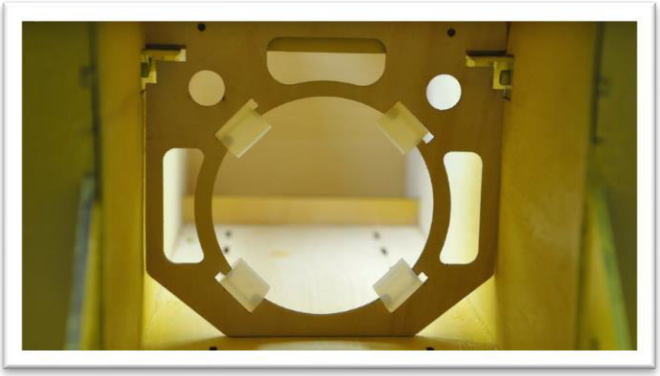
Slip the silicon tube cushions onto the mounting brackets.



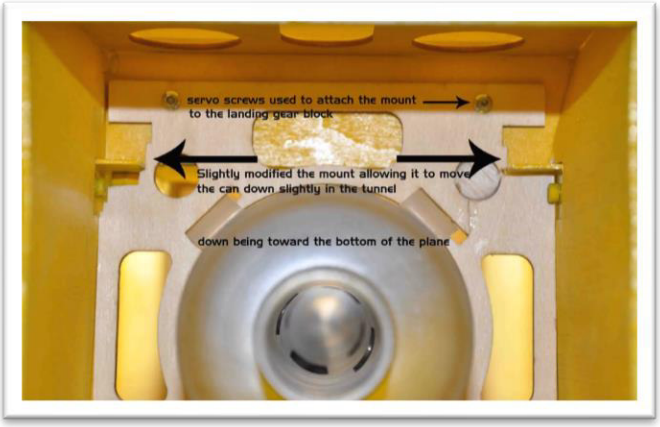
Check the fit to your exhaust canister.



The front bracet will be mounted to the front of the landing gear bracket.



When test fitting all of the components together you may find it necessary to modify the bracket and it's location to accomidate the header and muffler height.



Adjust the height of the rear bracket to aline the muffler to the header as straight as possible.



The location of the rear bracket and exhaust outlet may vary with the equipmnt you have chossen. Some customization may be necessary.



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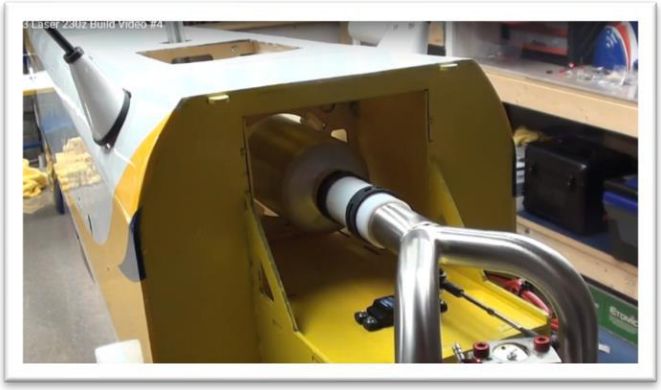
Assemble the exhaust canister with header using the coupling and clamps. Be sure to leave a gap between the header and canister inside the coupling to reduce vibrations. Test fit in the fuselage



Drill through the coupling and manifold and install flanged screws to secure the connections. Install the coupling clamps over the screw flange.



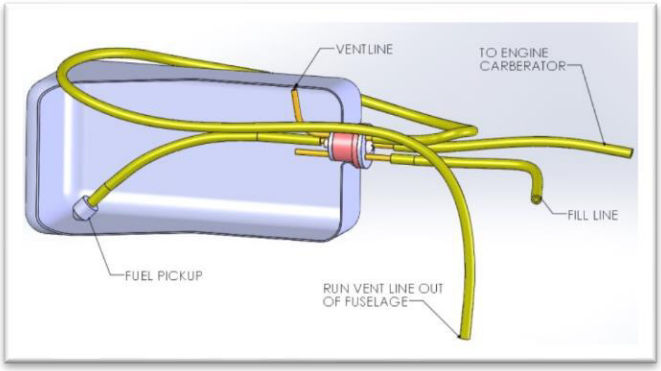
There are many opinions on how to make a maintain exhaust connections at the engine. We find that using an exhaust gasket Permatex Ultra Copper High Temperature RTV Silicone Gasket Maker works well. Apply a thin coat of silicone to both sides of the gasket. Let the silicone set up before tightening down the exhaust. This prevents the silicone from being squeezed out. A dab of silicone can also be applied to the exhaust bold to prevent them from backing out.



Fuel Tank

We suggest using a quality 24 oz (700cc) fuel tank and fuel line suited for gasoline such as AJ Aircraft, Fourtitude, Dubro, or Sullivan.

The fuel tank vent line should loop up over the tank then exit through the bottom of the airplane. The fill line should be capped by a fuel dot. The carburetor supply line should run through the firewall to the carburetor.



When assembling the fuel tank make sure the clunk moves around freely. Rotate the tank side to side and upside down to ensure the clunk does not get stuck.

Position the fuel tank in front of the wing tube. Placing a piece of foam under the tank will prevent fuel foaming from vibration. Secure the tank using the hook and loop straps running through the slots on the plywood tray. We recommend using at least a 1” strap if you intend to do high G, 3D maneuvers.

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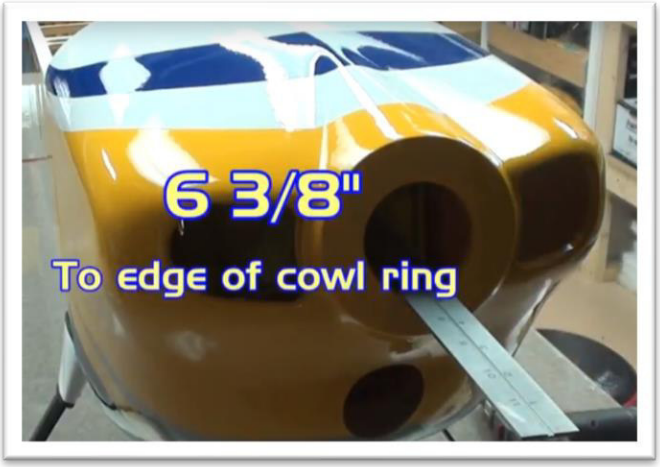
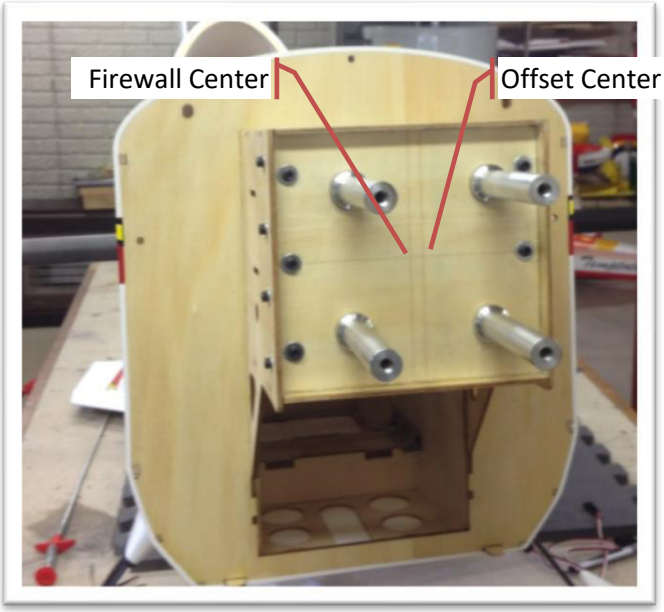
Electric Motor

Plan your motor mounting by determining the length of the motor, standoff, spacers or washers needed. The distance between the cowl and the firewall is 6.375" (162mm). There may be slight variation in the manufacturing process of the cowl so please check this dimension. Remember to add a gap between the spinner and cowl. If using the recommended Hacker Q-80, you'll need 3" standoffs to bring the motor forward to the cowl.



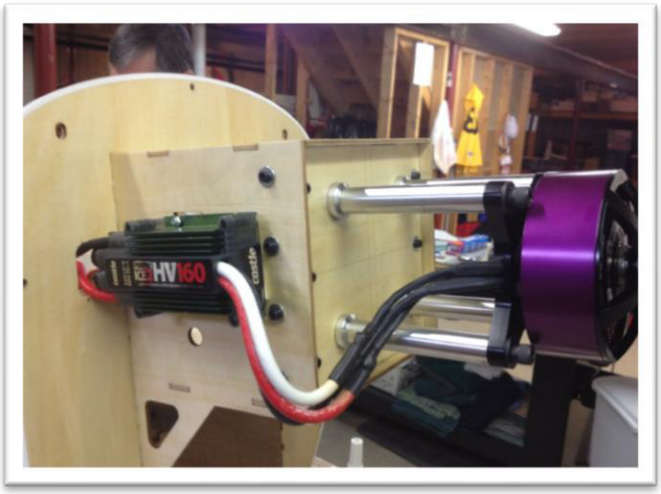
Notice the two centerlines on the firewall. One is the firewall center and the other represents the motor mounting centerline offset to compensate for the built in thrust angle. When laying out the standoff mounting holes use the offset centerline. This will position the spinner in the center of the cowl.



opening.

Mount the motor to the standoffs using the hardware provided by the motor's manufacturer. We recommend using large washers on both sides of the firewall. Don't forget to apply a removable thread lock to all bolts, unless using nylon lock nuts.

Mount your ESC to either side or the bottom of the motor box.



Cut a hole in the main former for the power wires of the ESC to get through into the fuselage.

Temporarily connect the 3 motor wires, ESC, receiver, and battery. Setup your radio and ESC to check the motor rotation. Switch 2 of the 3 wires if the motor rotates the wrong direction.

Connect your motor and ESC with bullet connectors or directly solder the wires together.

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Cowl Mounting

Cut air vents as desired for your engine cooling needs. The vents can be trimmed with small scissors and a motor tool with a sanding drum attached. Use masking tape to reduce chipping on the outside of the cowl while cutting. Please use a vacuum and mask while sanding to reduce dust inhailation.





You may find it helpful to reinforce the cowl with hard balsa sticks if you end up with thin area.



At the bottom edge of the firewall there are 2 tabs that will be used to mount the cowl. Drill a 1/8” hole in the center of each tab.



Apply some CA glue to the hole and press a 4-40 blind nut into each tab.



Use masking tape to transfer the mounting locations to the cowl. Apply tape to the fuselage extending over the mounting tab. Mark the center of the blind nut on the masking tape. Fold the tape back so the cowl can be installed.

Slide the cowl in place and position it using the spinner back plate as a guide. You may find it necessary to shim the cowl ring where it meets the fuselage to maintain proper fit after you tighten the screws.



Fasten the cowl from inside the fuselageusing 3 screws and washers . (One centered and 2 near the sides.)



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Unfold the tab position tape markers you created. Flip over the fuselage and drill holes in the cowl for the mounting screws. (Be carefull not to drill into the tabs and blind nuts. Install 4-40 screws and washers to finish the installation.)



Horizontal Stabilizer Mounting

Run the elevator servo extension wires through the conduit located inside the fuselage and then out the sides of the fuselage. (Label the servo extensions so you don't get them mixed up.)





Apply a few drops for thin CA glue to the alignment pin to ensure it's secured. (Allow to dry before installing on fuselage.)



Slide the horizontal stabilizer tube through the fuselage.



Attach an extension wire to the elevator servo lead. Use a safety clip to secure the connection.



Slide the stabilizer and elevator on to the tube. Use 4-40 screws and flat washers to secure it in position.



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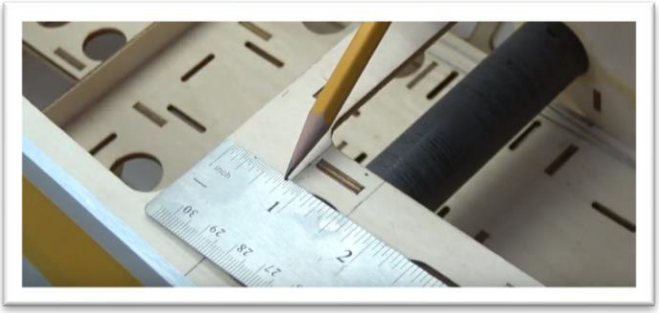
CG & Setup

Take the time to properly balance and trim your aircraft.

The Laser CG should be between .75” to 1.5” (19mm to 38mm) ahead of the wing tube.

The Raven CG should be 2.25” (57mm) ahead of the wing tube. This applies to both wing configurations.



You can adjust your CG depending on your flying style. If you fly aggressive 3D aerobatics you’ll want to find a more of a tail heavy or neutral CG. When flown level inverted it requires little to no elevator input to maintain altitude.

If you enjoy sport & precision aerobatics you’ll want a slightly nose heavy CG.

To test the CG, fly left or right at about 3/4 to full throttle and pull to a 45 degree up-line. Roll inverted and let go of the elevator stick. A correct nose heavy CG will slowly arc to the level. A neutral CG should nearly hold the up-line. And a tail heavy CG will steepen the up-line.

While the final setup is of personal preference, these are some general guidelines to make your first flight a success.

Use the suggested throws below as your starting point then fine tune to your flying preferences after your first few flights.

Control Throws		
Low Rates		
Elevator	15 degrees	30% Expo
Aileron	15 degrees	30% Expo
Rudder	15 degrees	30% Expo
Medium Rates		
Elevator	35 degrees	30% Expo
Aileron	35 degrees	40% Expo
Rudder	35 degrees	50% Expo
High Rates		
Elevator	45-50 degrees	60-65% Expo
Aileron	45+ degrees	50% Expo
Rudder	Max	50% Expo

Center of Gravity
Laser .75-1.5” (19-38mm) Measured from front of wing tube forward.
Raven 2.25” (57mm) Measured from front of wing tube forward.

Enjoy your new plane!

We at AJ Aircraft sincerely hope you enjoy flying the AJ Laser 230z and Raven.

Feel free to create a support ticket at aj-aircraft.com if you have any problems, questions, or suggestions.

Once you get a few flights in, we would greatly appreciate your review submitted to our web site! See you at the field!



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