



## 61" Raven Assembly Instructions

## Up Your Game! Fly AJ Aircraft

From all of us at AJ Aircraft, we thank you for your business. Our custom designs, combined with top grade materials, are assembled with precision and care to provide you with one of the best airframes in the industry. We have gone the extra mile to make the final assembly of your airplane as simple and painless as possible.



Once your airplane is complete, we know it will provide you with countless hours of thrilling flight. Prepare yourself for a new experience in R/C flight as you *Up Your Game with AJ Aircraft!!*

Building the airplane is very straight forward. The rudder cables are pre-installed, hinges are pre-installed but not glued, and pre-installed blind nuts in the wing tips for the included SFG's make it easy to get this bird in the air in no time flat.

The 61" Raven is the perfect "throw in your car for a few flights at the field" airplane. After flying this baby just once, we think it will be your go-to plane and put a smile on your face every time you fly it!

## Safety Precautions and Warnings

All of AJ Aircraft's airframes have gone through many stages of extensive testing to ensure a high-quality kit which results in a safe and reliable airframe when assembled properly. Poor assembly practices along with substandard equipment will lead to an unsafe model.

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 caliber, you should solicit the help of an experienced pilot until you have become comfortable with it. 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 it 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

## Contents of Kit

- AJ 61" Raven fuselage reinforced with exclusive Carbon-Kevlar technology.
- Pre-hinged main wings
- Side Force Generators (SFGs)
- Pre-hinged horizontal stabilizer
- Pre-hinged rudder
- Color matched, fastener-free plastic canopy
- Color matched fiberglass cowl & wheel pants
- Carbon fiber wing tube
- Carbon fiber main gear
- Lightweight tailwheel
- Lightweight foam wheels and steel axles
- Matching set of side force generators
- Pre-drilled firewall with installed blind nuts
- Individual bags of high-quality hardware

## Recommended Items for Completion

- Motor – Power by AJ Aircraft:
  - **5S** – SunnySky-4120-550 / SunnySky X Series V3 X4120 550K
  - **6S** – SunnySky-4125-515 / SunnySky X Series V3 X4125 515KV
- Batteries:
  - **5s** 3700 - 4400 mAH LiPo
  - **6S** 3000 - 4000 mAH LiPo
- Hook and loop battery strap.
- ESC - Castle Talon 90A
- Propeller – Falcon 14x7, 15x6 (Electric ONLY)
- Receiver - 6 Channel Full Range
- Four high torque mini servos
- 2.5" Spinner
- Servo extensions:
  - (2) x 6" for ailerons
  - (1) x 24" for elevator
  - (1) x 24" for rudder (push/pull only)
- Servo Arms:
  - (2) x 1.25" for ailerons
  - (1) x 1.25" for elevators
  - (1) x 2.5" for pull/pull rudder
  - (1) x 1.25" for push/pull rudder

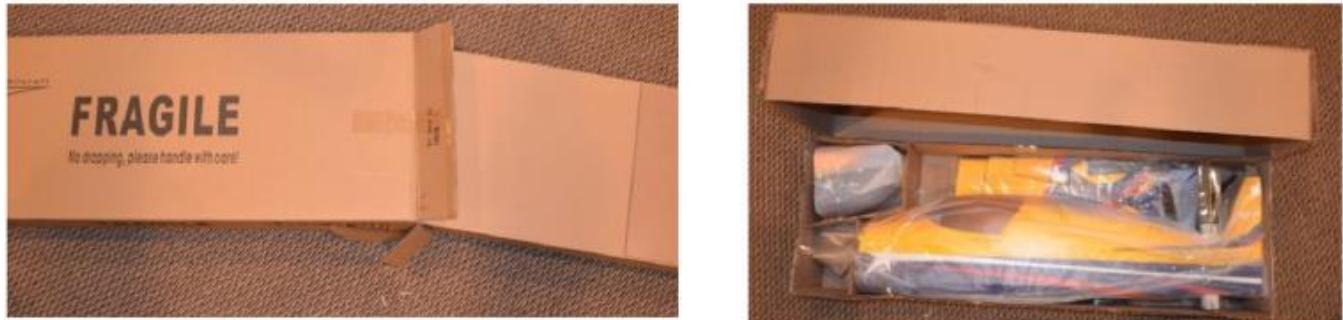
## Tools Needed

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)  
Needle Nose Pliers  
Measuring Tape & Ruler

## Unboxing

Your airplane is packaged in a double box to help protect it during shipping. The best way to open the box is to cut the tape on the end folds of the first box and slide the second box out. The lid on the second box is taped closed – carefully cut the tape around the perimeter of the box lid and remove the lid.



## Optional Configurations

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.

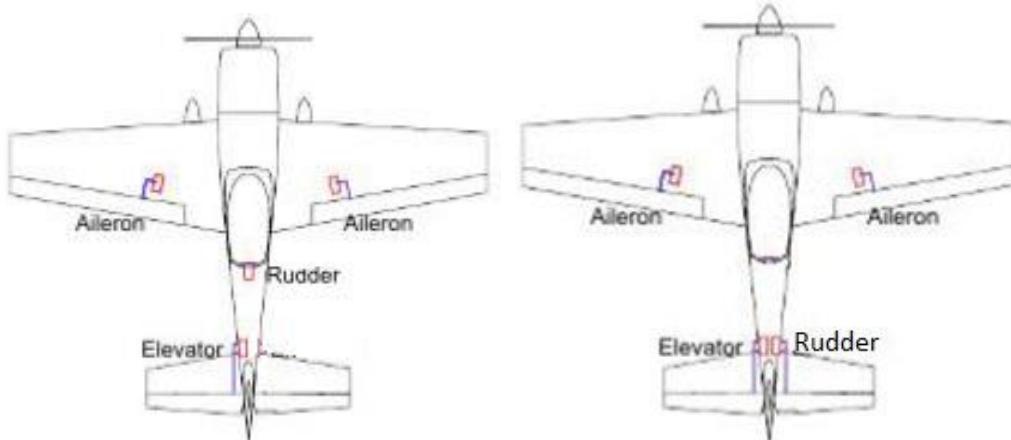
Edge Wing



Double Taper Wing



You have the 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 setups.



## 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.

## Covering

The covering on your Raven 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 seams. 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.

### Red/White/Blue Scheme:

- AJ Aircraft Covering (White) AJAC 2M W
- AJ Aircraft Covering (Dark Blue) AJAC 2M DB
- AJ Aircraft Covering (TRU Red) AJAC 2M TR
- AJ Aircraft Covering (Silver) AJAC 2M S

### Orange Scheme:

- AJ Aircraft Covering (White) AJAC 2M W
- AJ Aircraft Covering (Orange) AJAC 2M O
- AJ Aircraft Covering (Charcoal Pearl) AJAC 2M CP
- AJ Aircraft Covering (Silver) AJAC 2M S



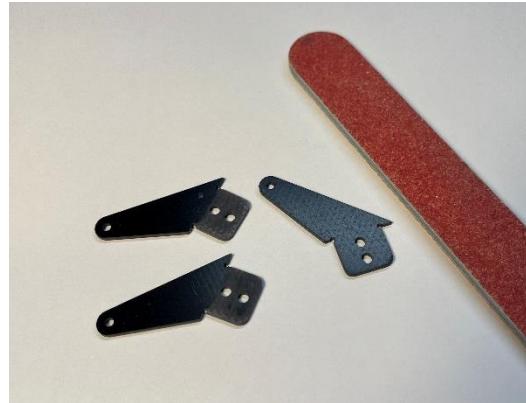
- At 200-220°F (93-104°C) the adhesive on the covering becomes active allowing the covering to be attached to the model. While 220° will fully bond the covering to the model it is well below the temperature that causes the covering to shrink.
- At 300°F (149°C) the initial shrinking of the covering begins.
- At 350°F (176°C) the covering 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.**

## Wings

Carefully locate the aileron control horn slots. Use a covering iron to bond the covering in the area the control horn will sit. Trim the covering away to expose the slots. Be sure not to cut through to the top side covering.



Use sandpaper to roughen the lower portion of the control horns on both sides. 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. (Be careful you don't poke through the other side of the aileron.)

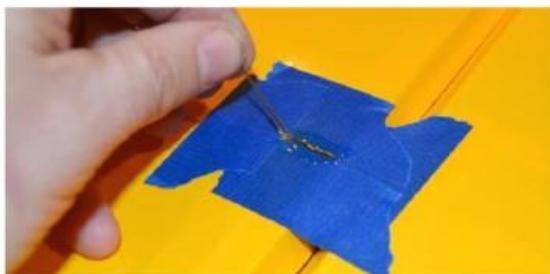


The control horn should go all the way in until the shoulder contacts the aileron. The linkage hole in the control horn should be aligned with the hinge centerline.

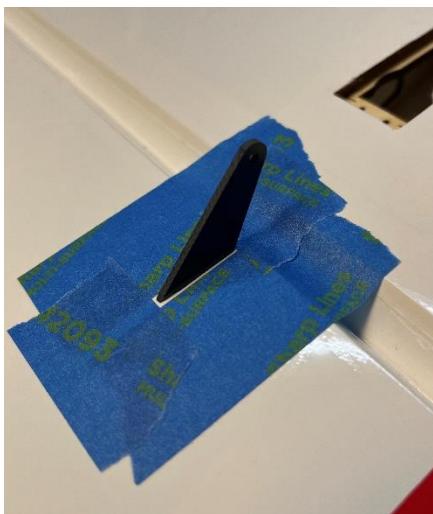
With the control horn in position apply masking tape around it. This will keep excess epoxy off the covering.



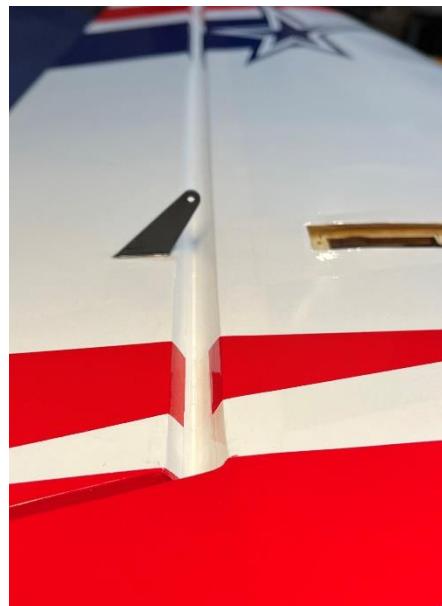
Apply epoxy to the slot in the aileron. Use a pin to help push the epoxy in.



Apply epoxy to the control horn and insert it into the slot. Wipe away excess epoxy using a paper towel and denatured alcohol.

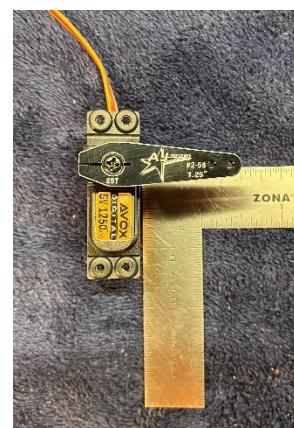


Check the alignment along the hinge line as you did when you test fit the control horn. Reposition as needed.



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.

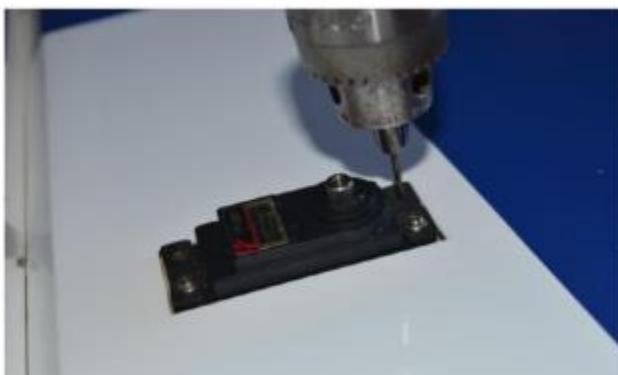
Connect the servo to a receiver and power supply. Turn on your transmitter. Set trim and sub trim to zero. Install a servo arm on the servo about perpendicular to the servo's side. Use the transmitter's sub trim to make it exactly perpendicular to the side of the servo.



Attach the servo 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.



Assemble a ball link to each end of a connecting rod. Use a socket head screw, a flat washer and a nylon lock nut to connect a ball link to the servo control horn. (The brass ball in the link is offset. The larger reveal side should be against the control horn and servo arm shown below.)



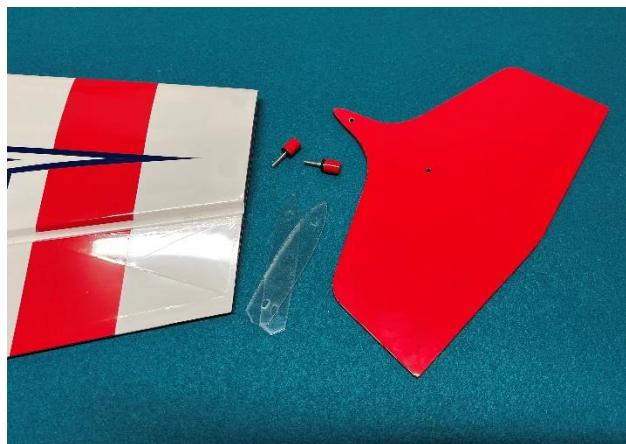
Check the length of the assembly to the servo arm with the aileron level with the wing. When the correct length of the assembly is found, connect the ball link to the servo arm. (Always adjust the connecting rod length with the servo powered up and centered.)



Remove the thumbscrews for the side force generators.



Assemble the spacer plate and the side force generator to the wing with the supplied 3mm screws and washers.



## Landing Gear

Landing gear parts bag contents are shown below.



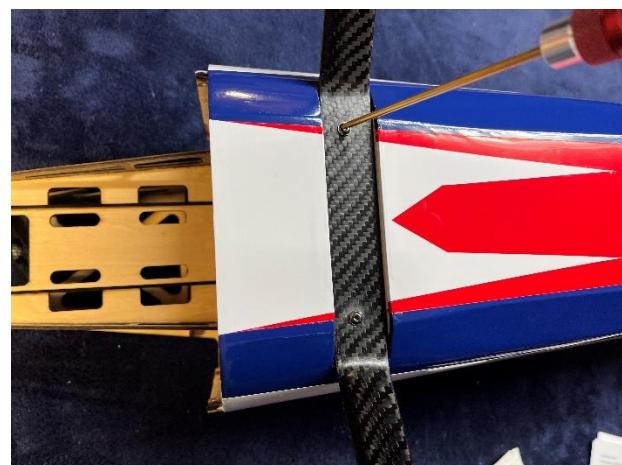
Determine which way is the Front of the landing gear – tapered edge is the Rear of the gear.



The landing gear screws (3mm) are supplied installed in the fuselage. Remove these screws.



Install the carbon fiber landing gear using 2 washers from the parts bag and the socket head screws. Apply a drop of thread locker as you install these screws.



The filler block can be held in position with strips of covering material, packing tape, or it can be held in position with hook and loop material as described below.



(If you use packing tape you may need to trim the width of the tape. Roll the tape out with the sticky side up. Lay a straight edge down on the tape and cut with a new blade.)



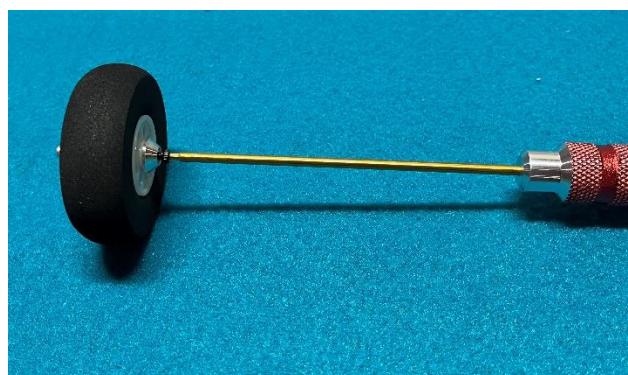
To attach the filler block with hook and loop adhesive tape attach two  $\frac{3}{4}$ " pieces on the landing gear next to the screws.



Then cut or sand recesses into the filler block to accommodate the thickness of the hook and loop tape. Start with shallow cuts and test fit it to the landing gear. If the filler block does not sit flush with the bottom of the airplane cut and sand a little more. Continue until you get a nice fit and the hook and loop tape has a firm grasp. It may also be necessary to cut some clearance around the holes for the screws and washers.



Install a wheel on the axle and use one of the cone-shaped retainers and one of the 2mm socket-head screws to attach the retainer.



Install the wheel and axle onto the landing gear using the 3mm button-head screws. Do not tighten the screws fully.



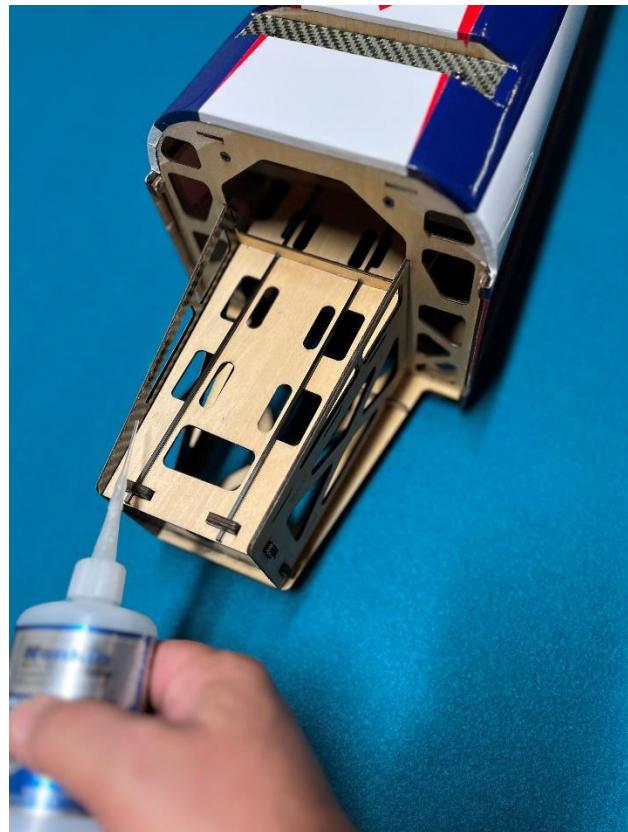
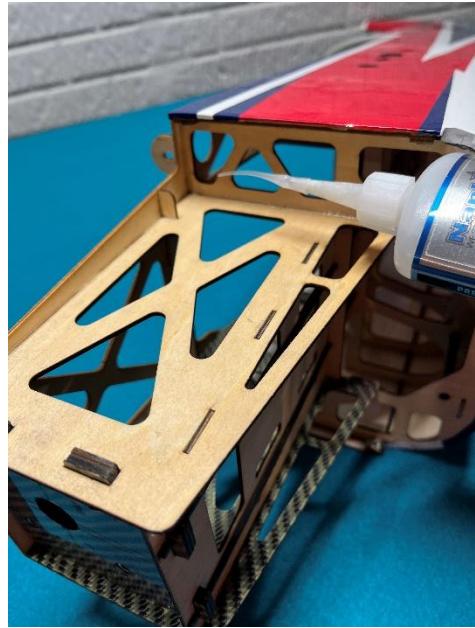
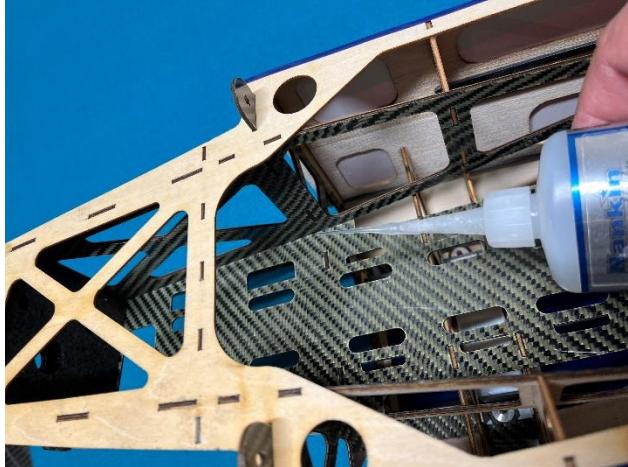
Install the wheel pant onto the landing gear assembly. The wheel pant is pinched between the gear-leg and the plate on the end of the axle. Align the wheel pant indentation with the raised oval section on the axle-plate and tighten the screws.



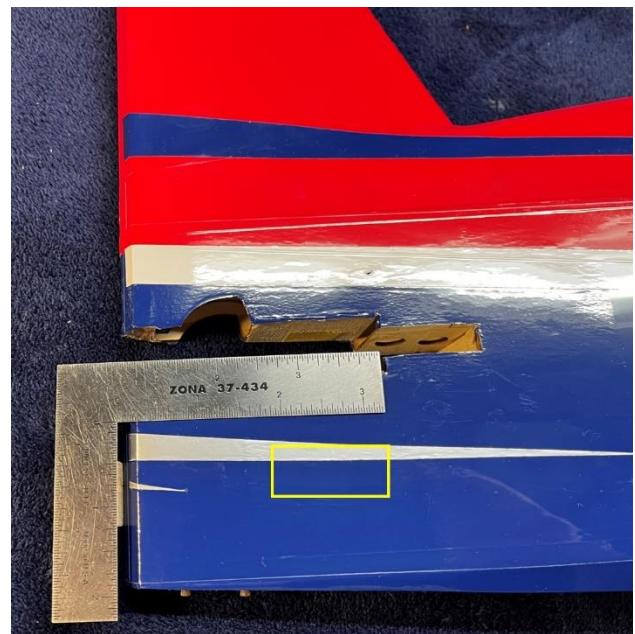
## Fuselage

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.



The servo pocket on the **right** side of the fuselage is used for the rudder servo if you decide to use a push-pull configuration. **Do not cut this pocket open if you plan to use the pull-pull cable for the rudder.**

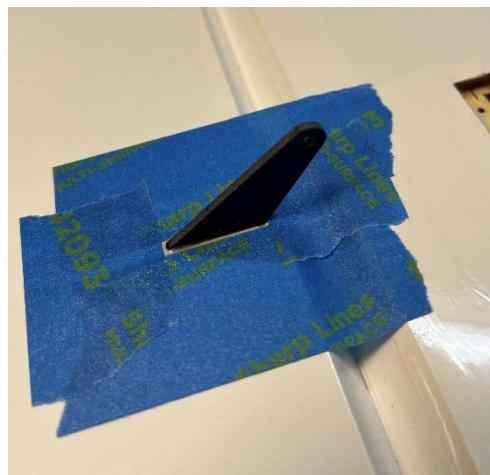
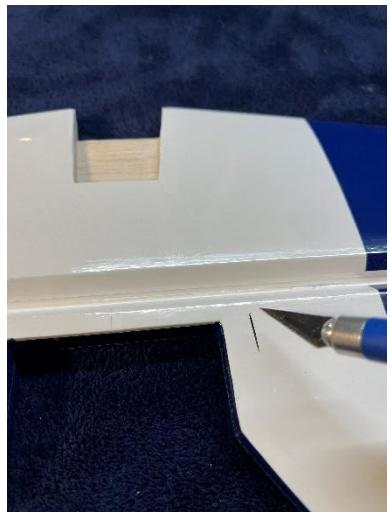
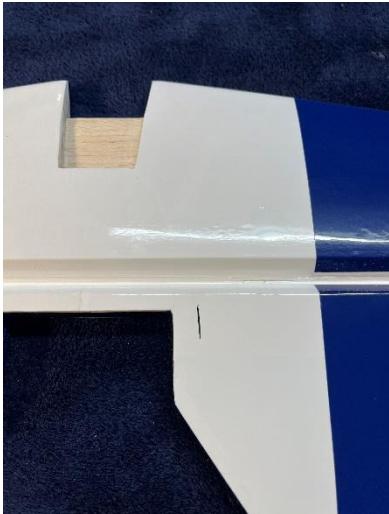


## Elevator

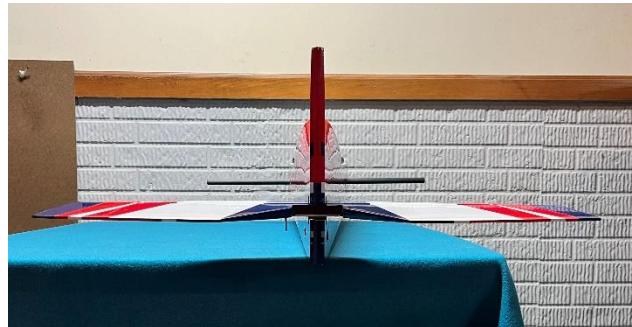
Install a control horn in the elevator using the same procedure used when assembling the ailerons.

Make sure you are working with the left elevator half.

- Use a covering iron to bond the covering in the area the control horn will sit.
- Trim the covering away to expose the slot.
- Sand the lower portion of the control horn.
- Test fit the control horn. The shoulder contacts the elevator and the linkage hole should be aligned with the hinge centerline.
- Mask around slot.
- Glue with 30 minute epoxy.
- Check the alignment again.
- Let cure.
- Remove masking tape.

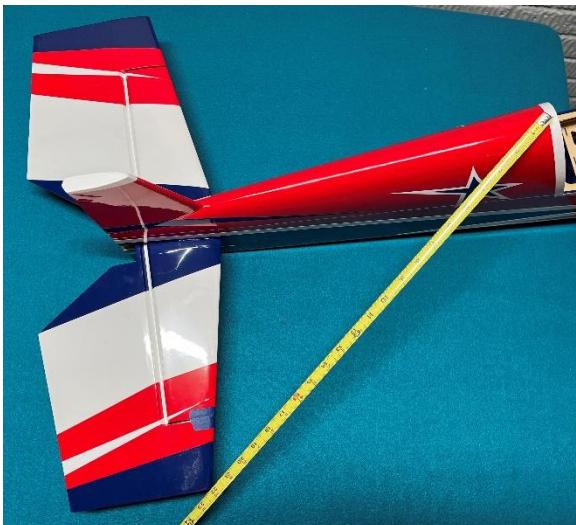


Slide the horizontal stabilizer through the fuselage pushing it all the way forward. Center it side to side using a ruler or tape measure.

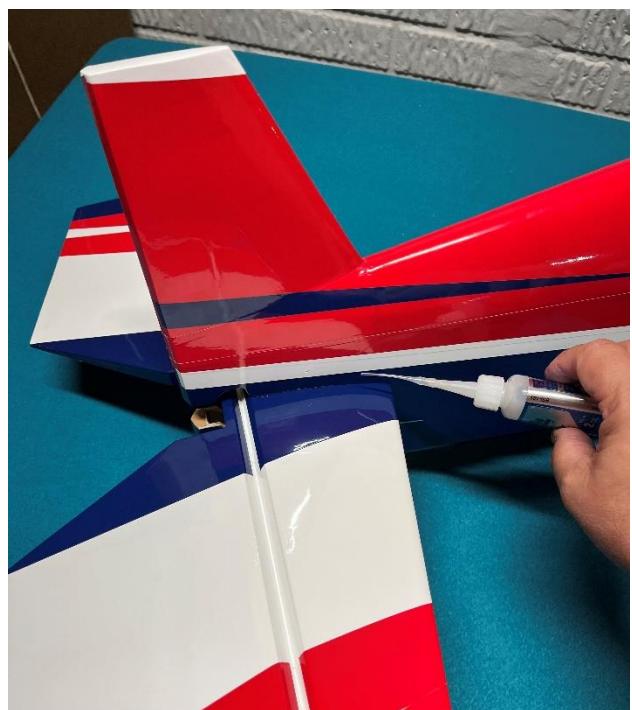


Position the stabilizer perpendicular to the fuselage and parallel to the main wing tube. Measure the distance between the canopy latch and the corners of the horizontal stabilizer. Adjust the stabilizer until the measurements on both sides are equal. Continue checking the stabilizer to ensure it is still centered side to side as described above. Extra time spent here will go a long way to improve the flight characteristics of your airplane.

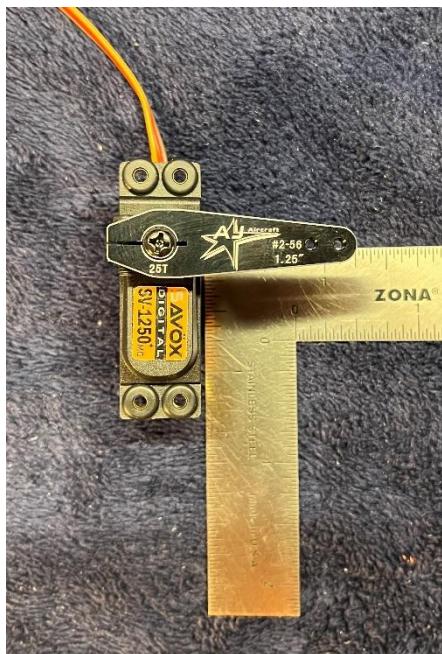
Once the horizontal stabilizer is positioned glue it in place with thin CA glue. Wick glue in on left and right sides, top and bottom. The use of an applicator tip is suggested to control the flow of thin CA glue and get it exactly where you want it.



Install and center the main wing tube. Look at the plane from the back forward to make sure that the horizontal stabilizer is parallel with the wing tube. Notice that the horizontal stabilizer is tapered which may obscure the actual alignment. If the stabilizer is not aligned use shims or sand inside the pocket until it's parallel.



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.



Attach a 24" servo extension onto the elevator servo lead and use a safety clip to secure the connection.



Insert a servo into the elevator servo pocket with the drive spline towards the front of the fuselage. 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.

Assemble a ball link to each end of a connecting rod. Use a socket head screw, a flat washer and a nylon lock nut to connect a ball link to the servo control horn.



Adjust the length of the connecting rod to the servo arm with the elevator aligned with the stabilizer. When the correct length of the assembly is found, connect the ball link to the elevator control arm on the inside as shown. (Always adjust the connecting rod length with the servo powered up and centered.)

## Rudder

The rudder control can be configured as a push-pull or as a pull-pull cable system. The pull-pull control horn is located approximately 3-3/8" from the bottom of the rudder.

The push-pull control horn is located approximately 13/16" from the bottom of the rudder.



## Pull-Pull Rudder Control

Carefully locate the control horn slot and cut away the covering on both sides of the rudder.

Use sandpaper to roughen up the center of the control horn so the epoxy will adhere better. File a radius on the corners so the control horn can be rotated through the rudder slot.



Test fit the control horn to the slot. Use a file to modify the slot as needed. Center it side to side and align the holes with the hinge line. The control horn should be symmetrical about the hinge line.



Apply masking tape around the control horn slot on both sides of the rudder.



Use 30 minute epoxy to glue the control horns in place. Center the control horn, peel the masking tape away, and clean up with alcohol.

Check the control horn alignment, centering it side to side and align the holes with the hinge line. The control horn should be symmetrical about the hinge line.



Position the rudder and control horn so gravity does not reposition the control horn as the epoxy cures.

The hinges should already be glued into the rudder. Give each of them a little pull to ensure they are securely attached. The vertical stabilizer is already slotted for the hinges. Use a covering iron to secure the covering along the edge of the vertical stabilizer. Look at the hinge slots closely to make sure the covering will not interfere when gluing the hinges. Cut away any covering that covers the hinge slot.



Slip each rudder hinges into a slot. Check the gap at the top of the vertical stabilizer and the rudder counterbalance. Push the rudder tight against the stabilizer closing the gap between the two of them. Move the rudder to its maximum desired deflection. Experiment with the hinge position finding the best fit before gluing.

Start with the top hinge. Flex the rudder slightly and apply a few drops of thin CA glue to one side. Flex the rudder to its maximum desired position. Then glue the opposite side and other hinges.



### Tailwheel

Install the tailwheel using 2 3mm screws. Thread the steering tiller through the ball-link protruding from the bottom of the rudder.



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.

Take 2 ball links out of the "Extra" parts bag. Thread the brass cable eyes about halfway into the ball links.



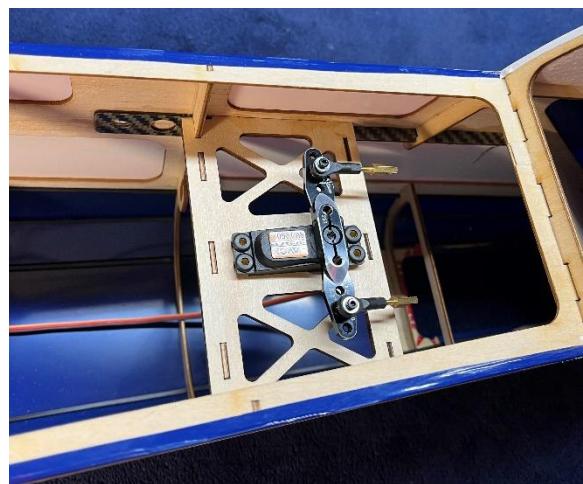
Connect the ball links to the rudder servo arm using a pair of holes that match the rudder control horn holes as close as possible.

Assemble the ball links to the control arm using the 2mm screws and lock nuts.



Install the rudder servo into the fuselage and pre-drill for servo mounting screws using a 1/16" drill. Install the servo with the spline shaft towards the front of the airplane using the wood screws that came with your servos. Remove the screws and servo. 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.)



Start the cable assembly at the servo end inside the fuselage. Straighten out the cables and determine which cable is on the left and which cable is on the right. The cables should cross inside the fuselage once. The cable on the left at the rudder should be connected to the servo control horn on the right.



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



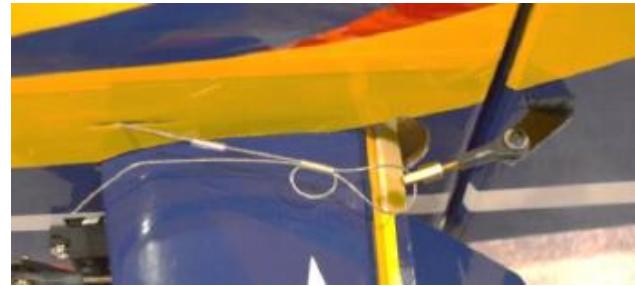
Adjust the loops and crimp the sleeves with the non-serrated surface of standard pliers.



Assemble 2 ball links and cable eyes to the rudder control horn using 2mm screws, a washer, and lock nut.



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.



Adjust the cable lengths to center the rudder by turning the cable eyes into the ball links.

### Push-Pull Rudder Control

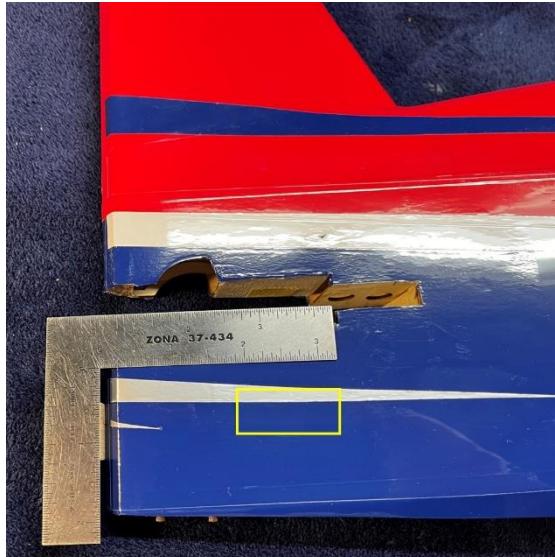
The rudder is built with control horn slots for the push-pull control system and the pull-pull control system. The push-pull control horn slot is located near the bottom of the rudder.



Cut the covering to expose the lower control horn slot on the **right** side of the rudder.

Install the control horn using the same process as used on the ailerons and elevator.

Locate and remove the covering from the rudder servo pocket on the right side of the fuselage.



Attach a 24" servo extension onto the rudder servo lead and use a safety clip to secure the connection.



Insert a servo into the rudder servo pocket with the drive spline towards the front of the fuselage. 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.

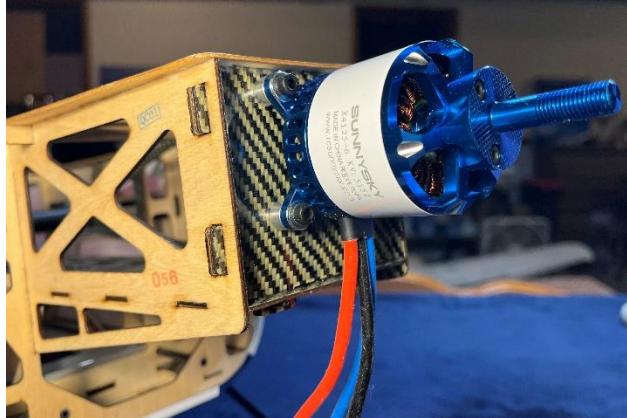
The picture below shows a mockup of the rudder push-pull system. The installation process of the servo and control horn is the same as the ailerons and the elevator.

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



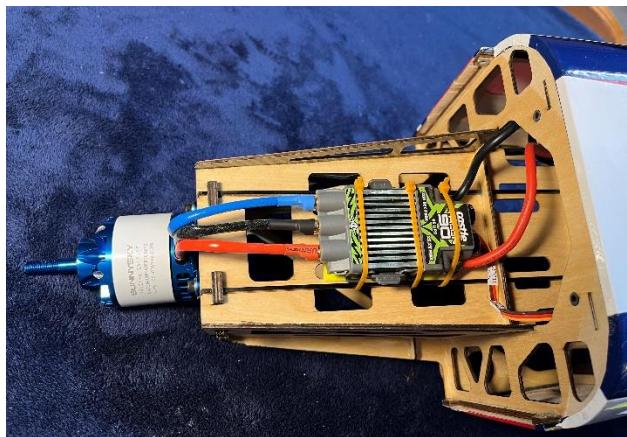
## Motor

The firewall is pre-assembled with 3mm thread inserts installed on a 53mm diameter bolt circle (41mm x 41mm sq).



Assemble the motor with removable thread locker.

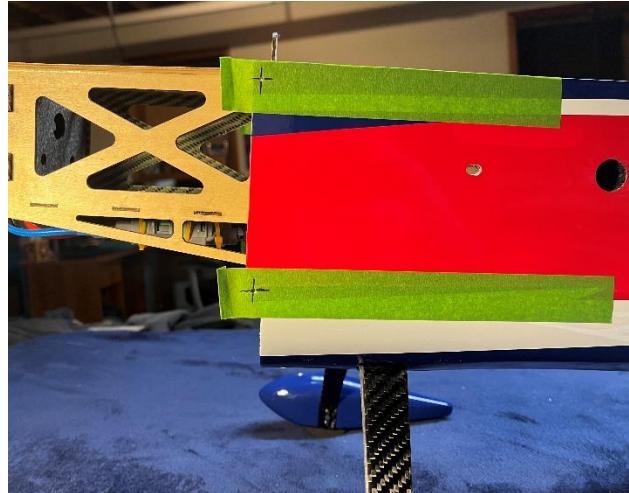
Solder battery and motor connections to your ESC before installing it if needed. Use nylon zip ties or a hook & loop strap to secure the ESC to the bottom of the motor box.



## Cowl & Canopy

The cowl will be mounted using 4 2mm button head screws through the tabs at the front of the fuselage.

Lay tape across the tabs and mark a point for the screw hole.



Peel back the tape so you can slide the cowl on – **with the canopy in place**. Center it using the spinner backer plate. Leave a .06-.09" (1.5-2mm) space behind the back plate. When you've found the cowl position you like securely tape it into position.



Drill a 1/16" hole through the cowl and the fuselage at the marks you made.



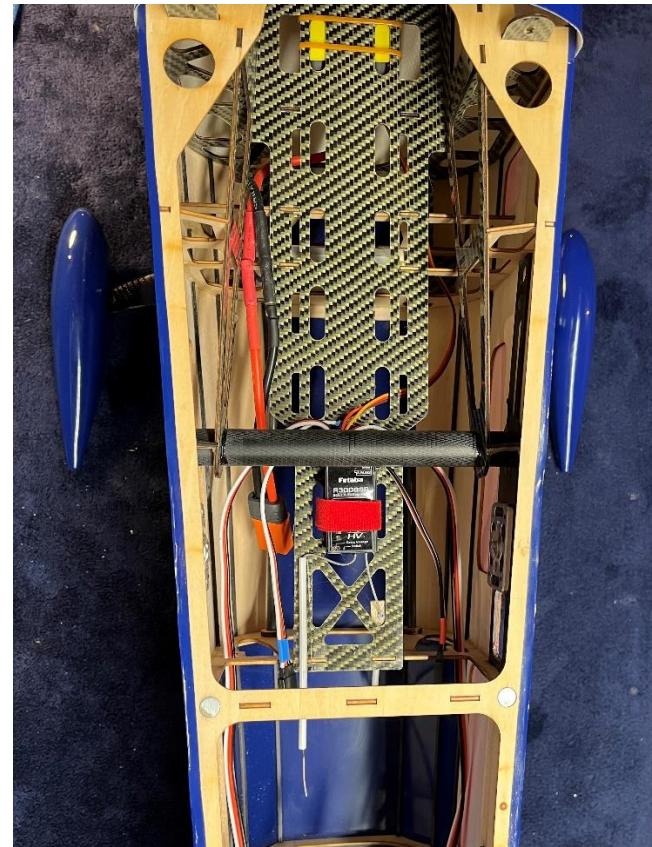
Remove the cowl and thread the 2mm button-head screws into the blind nuts on the fuselage tabs.



### Finishing Notes

Install your receiver using a piece of hook and loop tape on the receiver tray. Then strap it in place with the supplied hook and loop strap.

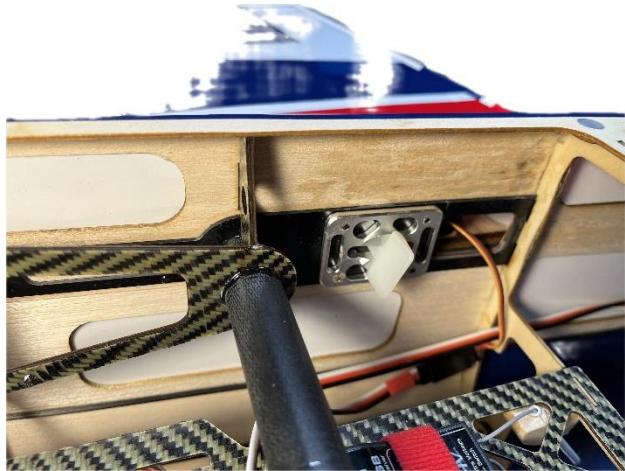
The battery can be held in position with the hook and loop tape. But will also need to be strapped with a heavy hook and loop battery strap.



Attach the wings by sliding the carbon fiber tube through the fuselage. Then slide the wing on making sure the alignment pins are engaged into the holes and the wing attachment twist-lock thumb screws pass through the slot in the side of the fuselage.



Turn the twist-lock thumb screw clockwise approximately  $\frac{1}{4}$  turn to engage the twist-lock into the retention groove.



Attach the aileron servo wire to a 6" extension and secure it with a safety clip. Tie the wires back away from the rudder servo. You don't want the wires to get snagged, disconnecting or causing rudder issues.



## Radio Installation & Setup

Take the time to properly balance and trim your aircraft.

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

Control Throws		
<b>Low Rates:</b>		
Elevator	20 degrees	30% Expo
Aileron	15 degrees	30% Expo
Rudder	15 degrees	30% Expo
<b>Medium Rates:</b>		
Elevator	30 degrees	40% Expo
Aileron	30 degrees	40% Expo
Rudder	30 degrees	40% Expo
<b>High Rates:</b>		
Elevator	45 degrees	50% Expo
Aileron	45 degrees	50% Expo
Rudder	Max Throw	50% Expo
Center of Gravity		
The optimal center of gravity (CG) for the 61" Raven is located $\frac{1}{2}$ " in front of the wing tube ( $+\frac{1}{2}$ ").		

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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 neutral CG. When its 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.

## Enjoy your new plane!

We at AJ Aircraft sincerely hope you enjoy flying the 61" Raven.

Feel free to create a support ticket at [aj-aircraft.com](http://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!

