



Yak 55 Assembly Manual

Thank you for purchasing the RedWing RC Yak 55. We have provided you with the highest quality kit and flight performance possible. We wish you great success in the assembly and flying of your new RedWing RC Yak 55.

Caution!

1. You should not regard this airplane as a toy.
2. To ensure safety, please read this instruction manual thoroughly before assembly.
3. Building and operating a model airplane requires diligent practice and correct guidance. An inexperienced flyer can cause serious injury and property damage.
4. Seek the assistance of an experienced RC pilot or model airplane club for help with assembly, operation and maintenance to assure your flying experience is both enjoyable and safe.
5. Fly only in AMA (Academy of Model Aeronautics) approved areas.

Redwing RC warrants this model to be free from defects in both materials and workmanship from date of purchase. This warranty does not cover any component parts damaged by use or modification. In no case shall RedWing RC's liability exceed the original cost of the purchased kit. Further, RedWing RC reserves the right to change or modify this warranty without notice.

In that RedWing RC has no control over final assembly or materials used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

We, as the kit manufacturer, have provided you with a top quality, thoroughly tested kit and instructions, but ultimately the quality and fly ability of your finished model depends on how you built it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

Specifications

Wingspan: 73"

Wing area: 1005 in²

All up flying weight: 10½ to 12 pounds, depending on hardware and building style

Overall length: 66"

Engine: any 30 to 36cc engine (DLE 30, DLE 35, PTE 36 recommended)

Radio: 6 channel recommended (4 channel possible)

CG: 25 to 30% back from LE at root

Servos: 150 in-oz torque, metal gear. Digital servos are recommended.

Assembly

Prior to assembly, inspect entire framework. Pay particular attention to covering and seams in covering. Temperature extremes in shipping containers sometimes cause wrinkles or loose seams to form. Most wrinkles and loose seams can easily be fixed by taking a little time with a sealing iron or heat gun. Persistent wrinkles are generally caused by air trapped under the covering. These can be removed by puncturing the covering with a pin to create an escape for the air. Vibrations during shipping can loosen glue joints. These can be repaired with CA glue.

Notes on Assembly

Assembly order is non-critical. Many steps can be done whenever the builder wants to do them. For instance, hinging of all surfaces can be done at the same time. Same goes for control horns. They can all be done at the same time. Installation process for both hinges and control horns will be described once. The order described in this manual is intended to minimize the time it takes to assemble this kit.

It is recommended that the landing gear be installed early to keep the fuselage from rolling. Wheels and pants can be installed at any time. Some builders may prefer to install the wheels and pants last, just to keep the airplane from rolling off their work bench.

Hardware required to finish the kit

30 cc class engine with muffler (DLE-30, DLE-35 or PTE-36 recommended)

Standoffs for engine (normally included with engine)

Propeller: 19"x8" or suitable size for engine used

Spinner

Servos:

5 for flight surfaces (XQ 4013 or XQ 4016 available from RedWing RC)

1 for throttle (metal gear recommended)

Receiver: 4 channel minimum. 6 channel or more recommended

Transmitter: 4 channel minimum. 6 channel or more computerized recommended

Optical kill switch on ignition recommended (available from RedWing RC)

Battery:

3000 mah LiFe can be used for both ignition and receiver (available from RedWing RC)

If desired, a separate battery of at least 1000 mah capacity can be used for ignition.

Switch: 2 HD switches (available from RedWing RC)

Servo extensions:

Aileron: two 12" heavy duty and two 6" (available from RedWing RC)

Elevator: two 24" heavy duty (available from RedWing RC)

Throttle: 12" heavy duty (available from RedWing RC)

Servo safety clips for each extension (available from RedWing RC)

Tools, etc. required to finish model

Screwdrivers: Phillips and common

Wrenches: metric open end or box

Ball drivers or allen head wrenches

Drill with assorted bits

Pliers or crimping tool

Hobby heat gun and hobby sealing iron

Modeling knife (X-acto with #11 blade, or equivalent)

Wire cutters

Pen or marker (Sharpie, or equivalent)

Scissors

Thin, medium CA and CA accelerator

15-30 minute epoxy with mixing cups and mixing sticks

Gorilla Glue or Tightbond II for hinges (if don't want to use epoxy)

Blue threadlock

Rubbing alcohol and wipes or paper towels

Q-tips are handy, but not a necessity

6 pound sledge hammer – not really, just checking to see if you are still reading this

Notes on radio installation

While this airplane can be flown with a simple 4 channel transmitter, it is recommended that at least 6 channel computerized transmitter be used. The 4 channel transmitter would require the use of Y-harnesses on both aileron and elevator servos. The 6 channel transmitter allows plugging each servo into its own channel. Servo sub trim and end points can then be adjusted to optimize the servo control horn configuration.

At neutral, aileron servo arms should be parallel with the aileron hinge line. Elevator servo arms should be vertical.

Turnbuckle type pushrods are included for the ailerons and elevators. Turnbuckles have a left hand thread on one end and a right hand thread on the other. They are convenient as they allow finer adjustments than a conventional clevis. They also allow adjustment without disconnecting anything. However, initially they are easier to set up if you center the servo arm, center the control surface and hold the turnbuckle up to both ball links to see how far to thread the turnbuckle in. Thread the turnbuckle this amount into each ball link. This will have the pushrod length close to what is needed. It can be further adjusted after installing the servo arm on the servo.

Make a point to install the turnbuckles in the same direction on all control surfaces. For instance, use the right hand thread at the servo and left hand thread at the control horn. If they are all installed the same way, then rotating the turnbuckle clockwise or counter clockwise has the same effect on all control surfaces. For instance, turning clockwise shortens the pushrod and pulls the control surface down.

Recommended control setup has control surface ball links installed on the outer hole of the control horns and the other ball link attached at the second from the outer hole on the servo arm. Adjust servo end point on the transmitter to give desired control throw. Rudder will need about 125% on the servo travel to maximize throw. This will improve control resolution over using the outer holes on the servo arm and having to reduce servo throw to less than 100%

Make sure elevator halves center to the same place. This is done by positioning the servo arms so they are both vertical when the elevator stick is neutral. Adjust the length of the turnbuckle pushrods for neutral elevator. Maximum throw in both directions is set with servo end point on the transmitter.

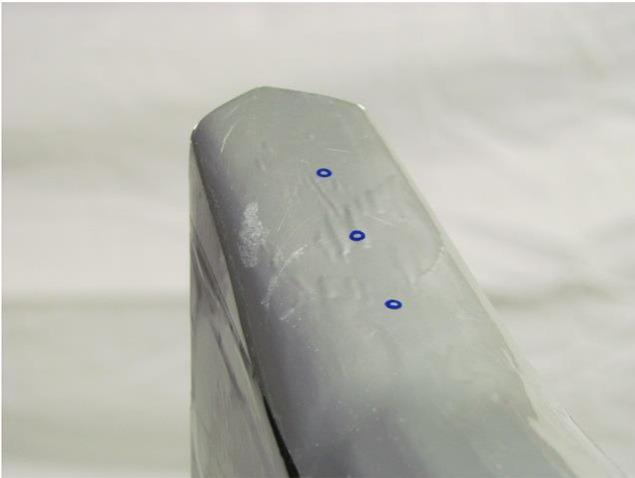
Select an inner hole on the throttle servo arm that requires servo throw of greater than 100% in both low and high throttle directions. 120% in each direction is possible. This gives much better throttle control than using an outer hole on the servo arm and throw of less than 100%.



Main gear is installed using nuts and bolts that are inserted in predrilled holes. Bolts go through landing gear cover, main gear, then fuselage bottom. Nuts are installed inside the fuselage and accessible via the canister tunnel. Note: remove covering from landing gear cover at four bolt positions.



Place tail wheel bracket in positions and mark location of the mounting holes. Note: locate the bracket as low as possible on the tapered section at the back of the fuselage. Location shown is too high and will result in difficulty when setting up tail wheel steering. It was actually installed about 3/4" lower.



Drill holes for mounting screws.



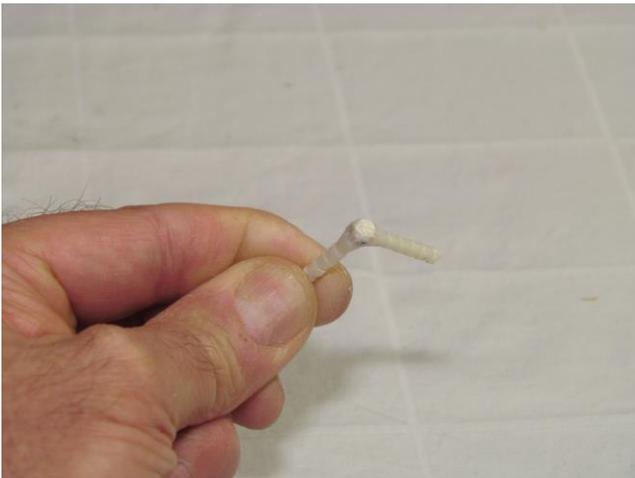
Install tail wheel bracket only. Note: wheel and steering linkage will be installed later.



Several different types of adhesive are acceptable for installing hinges. Epoxy, Gorilla Glue and aliphatic resin (Titebond II) all work. One benefit of the aliphatic resin is it cleans up with water until it cures. A dental syringe is an excellent tool for injecting glue into the holes.



Remove all hinges from their pre-drilled holes. Scuff barbs on all hinges with coarse sandpaper or similar tool.



Place a small amount of lubricant on the pin of the hinge and flex the hinge back and forth to coat the pin with lubricant. Lithium grease was used in this model. You can use the same Lithium grease to keep your door hinges from squeaking.



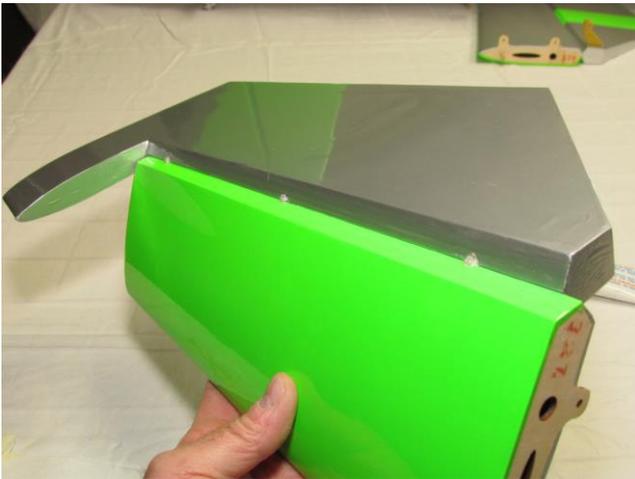
Inject a small amount of adhesive into the hole in the flying surface. Also add some adhesive to the barbs of the hinge. Insert the hinge into the hole until the pin is at the hinge line.



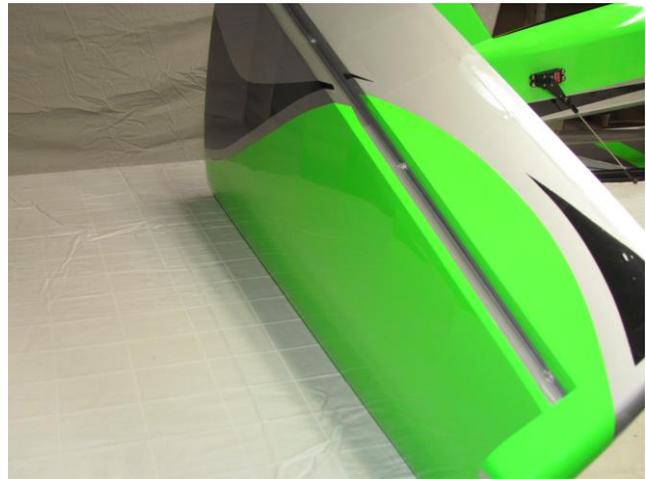
Install all hinges in the flying surface. Make sure all hinges line up the same. If you would like, proceed directly to installing the hinges in the control surface at this time. Inject adhesive into all holes and onto the barbs of all hinges. Make sure all hinges will go in holes. Push rudder into position.



Once all hinges have been installed, clean off excess adhesive. Flex hinge back and forth to help align the hinges in the holes. Rudder hinges have been completed. Note: minimal hinge gap and throw is bevel to bevel. If necessary, increase gap slightly to achieve full control surface throw.



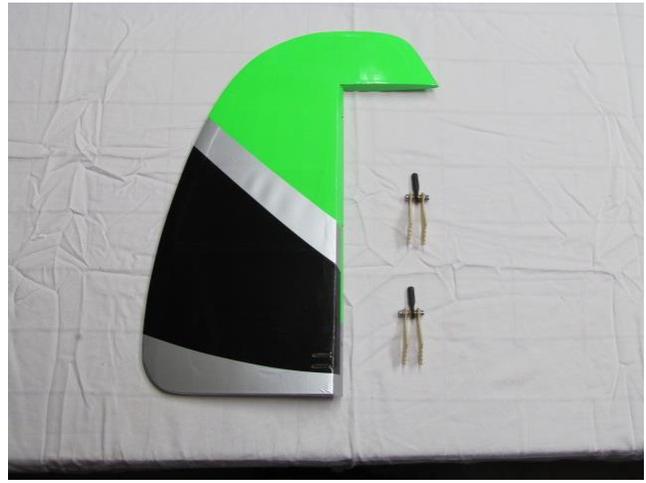
Repeat process for elevator hinges. Note: minimal hinge gap and bevel to bevel throw.



Repeat process for aileron hinges. Note: minimal hinge gap and bevel to bevel throw.



Remove covering over aileron servo openings and control horn slots. Covering can be removed by either cutting it off with an X-acto or similar knife or by melting it with a pencil type of soldering iron. The soldering pencil seals the covering to the structure, but leaves some excess that needs to be cut off.



Note slots for rudder horns near bottom of rudder.



Openings in fuselage for elevator mounting, elevator servo and rudder pull-pull cable exit.



Slots for elevator control horns have been marked, but not cut yet.



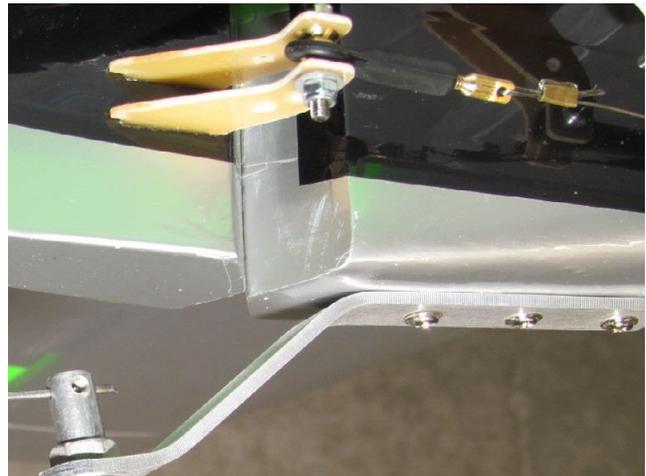
Assemble aileron control horns and tighten bolt. Scuff bottom of control horns (glue area) with coarse sandpaper for better adhesion. Inject epoxy into both control horn slots. Apply additional epoxy to both sides of each control horn. Insert control horns into slots and clean up excess epoxy that oozes out of slots.



Elevator control horns have been installed. Note: excess epoxy has not been cleaned off yet.



Rudder uses two pairs of control horns for pull-pull cables. The horns install directly opposed from each other, thus will not fit unless trimmed. The horns on the left have been marked. The horns on the right have been trimmed. Verify both sets of horns fit prior to gluing in place.



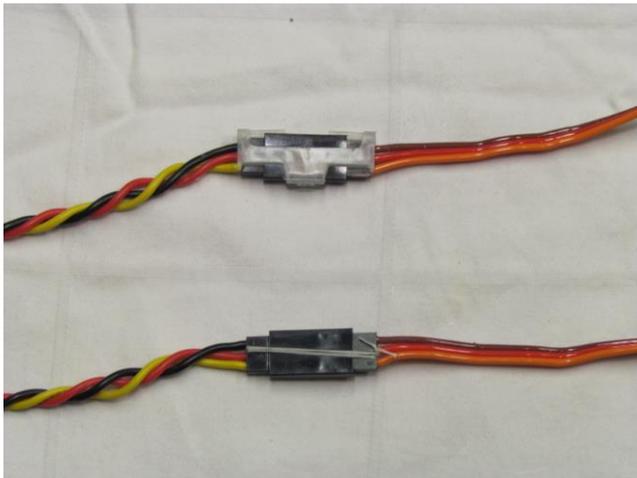
Install both pairs of rudder control horns with epoxy. Pull-pull cable will be installed later.



Verify control horns have cured prior to installing servos.
Install isolation grommets and brass bushings in all servos. Note: brass bushings are installed from the bottom.



Set aileron servo in position. Drill all four holes for mounting screws. Install screws, then remove and move servo out of the way. Place a drop of thin CA glue in each hole to toughen threads in the plywood.



Reinstall aileron servos. Use 12" extension on servo lead. Don't forget to use some sort of restraint on the connector. Restraints are commercially available. Dental floss can be wrapped around the connector and tied 3 or 4 times. Some people like heat shrink tubing. If heat shrink is used, avoid overheating the connector.



Install aileron servo. Note: servo spline is closer to the leading edge of the wing.



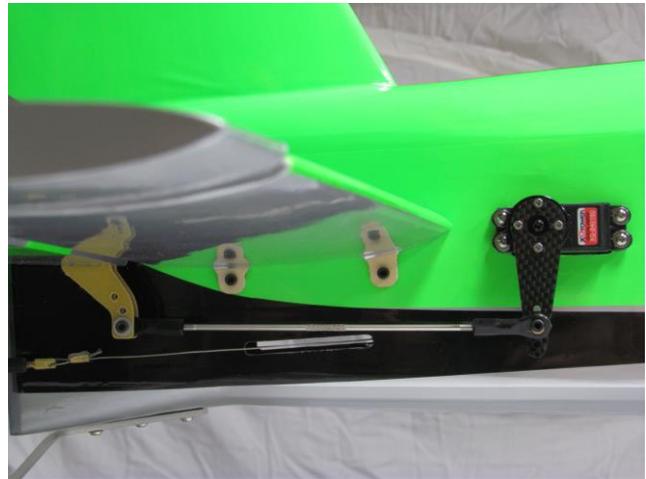
Prepare servo arms. Carbon fiber arms are provided for all control surface servos. The round wheels that come with the servos can be used. If desired, aluminum wheels can be purchased from RedWing RC for an additional cost. These wheels are drilled and tapped to fit the arms. We will be using the short turnbuckle pushrods for ailerons.



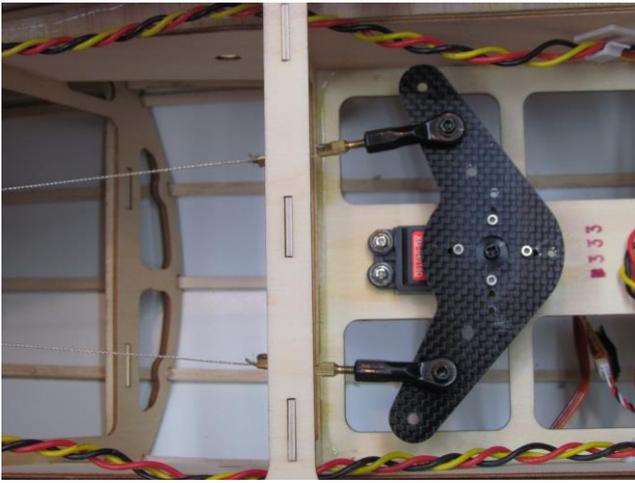
Verify servo is centered. Install control arm on servo. Servo arm should be parallel to hinge line. Manually center the aileron. Hold turnbuckle pushrod up to the two ball links to see how far the turnbuckle has to be threaded into each ball link. Thread turnbuckle into ball links. Note: the turnbuckle has left hand and right hand threads.



Install elevator servo with a 24" heavy duty extension. Servo spline is closer to the rudder. Be sure to restrain the connector on the extension. Temporarily install servo arm and turnbuckle pushrod. Longer turnbuckles are used on elevator linkages.



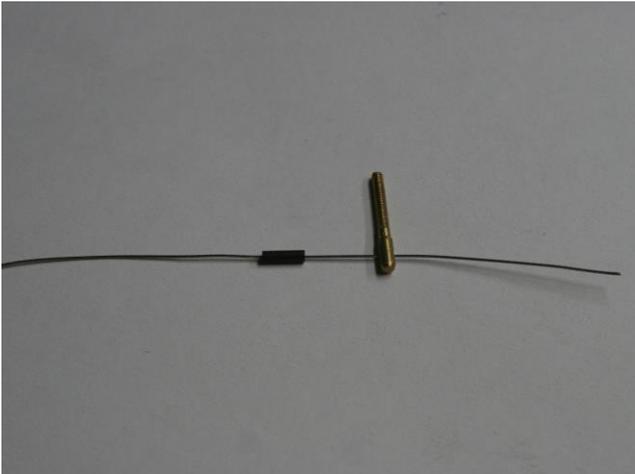
Install elevators. Center elevator and servo. Hold turnbuckle up to elevator ball link to estimate how far to thread turnbuckle in. Thread turnbuckle into elevator ball link (need to take servo arm off servo to do this. Reinstall servo arm. Readjust turnbuckle as required to center elevator when servo arm is vertical.



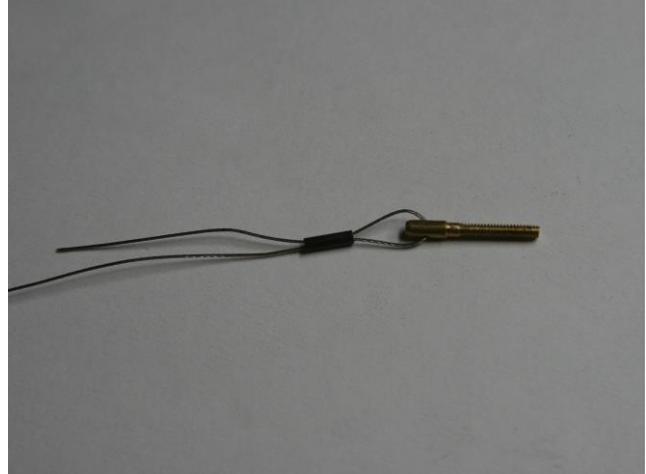
Install rudder servo. Note: spline faces front of airplane. Ball links should be on second to last hole in the arm. Servo arm sweeps toward back of airplane.



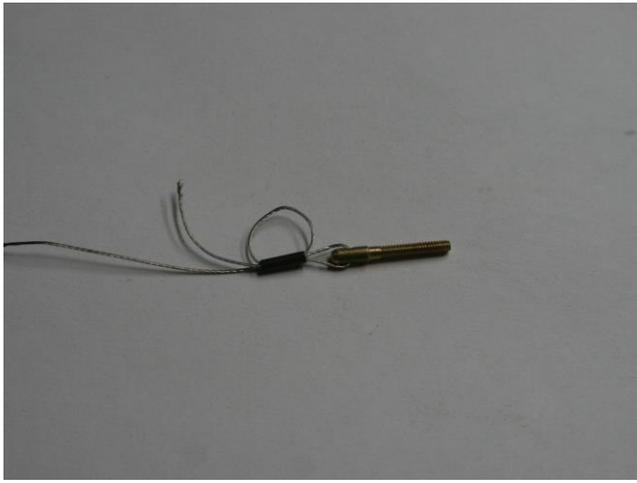
Prepare pull-pull cables. Measure distance between ball link on rudder horn and ball link on servo arm. This can be done by inserting a balsa stick (anything that will fit) through the cable outlet hole to the ball link on the servo. Be sure to cross from one side to the other. Add $\frac{1}{2}$ " to allow for $\frac{1}{4}$ " thread into each ball link.



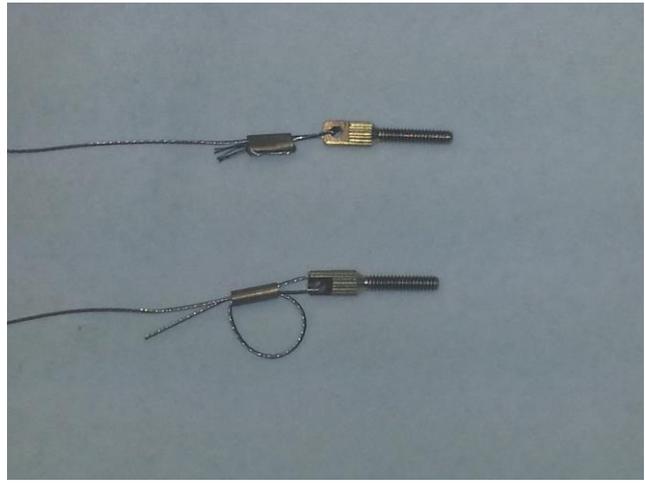
Insert cable through crimp, then to threaded connector.



Double cable back through crimp.



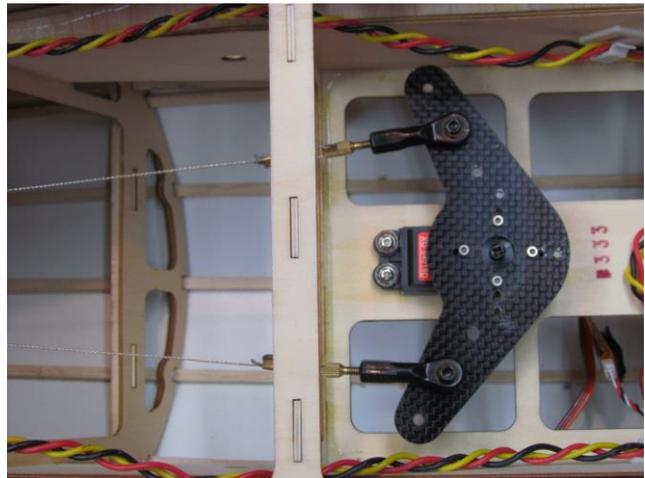
Loop cable back through crimp. Pull end to shorten loop prior to crimping.



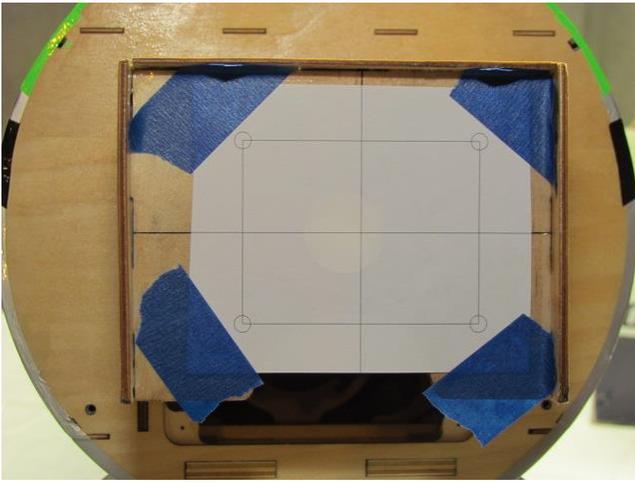
Crimp with either pliers or a crimping tool. Add a drop of CA after crimping. Assemble both rudder cables to the length determined earlier.



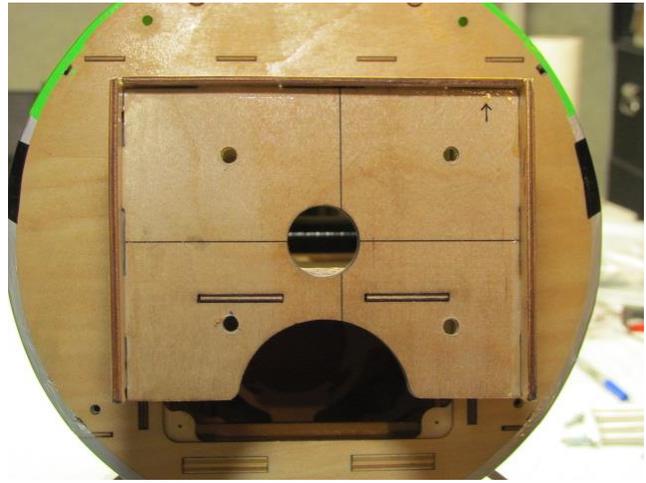
Thread one end of cable onto ball link on rudder horn. Feed cable through fuselage to rudder servo arm.



Remove ball link from servo arm. Thread cable end onto ball link. Reattach ball link to servo arm. Install second cable, making sure to cross the cables. Note: getting cables tight enough and centering rudder is a trial and error process. Cables need to be snug, but not “guitar string” tight.



Let's move on to the fuselage. Start by taping the drill guide for your engine to the firewall. Align the horizontal and vertical centerlines with the laser marked lines on the firewall. Drill through circles with appropriate size drill. Template shown is for a DLE-30.



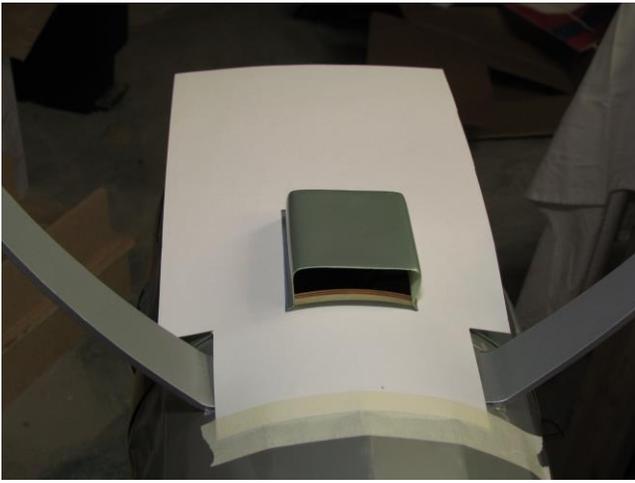
Remove template after drilling engine mounting holes.



Install standoffs using thread lock on bolts. Note: a 10 mm open end wrench fits on the flats of the standoffs. Temporarily mount engine. Mark locations of throttle linkage and fuel line on firewall.



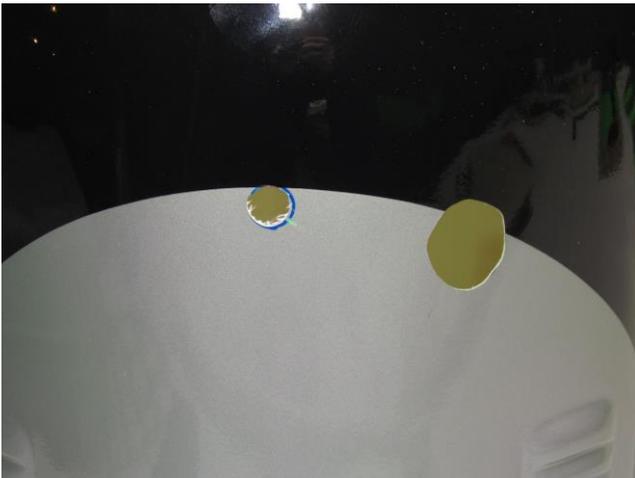
Remove engine and drill holes for fuel line and throttle linkage.



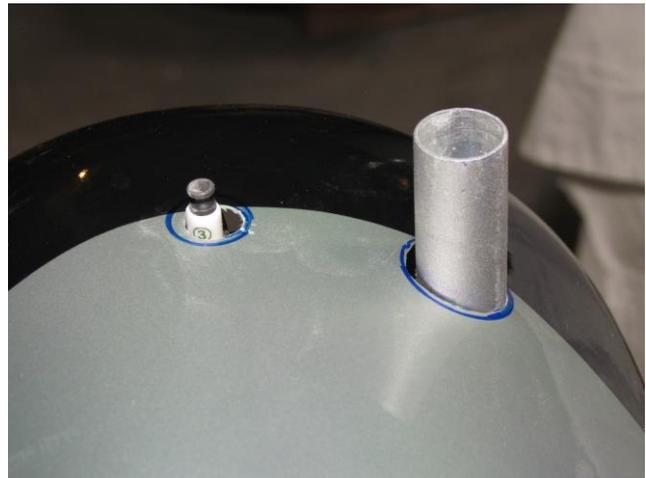
Reinstall engine without muffler and spark plug.
Install cowl.
Make template for drilling cowl holes out of heavy paper, make cutout for bulge in cowl.
Tape template in place.
Tape will be used as a hinge.



Remove cowl. Temporarily install muffler and spark plug on engine.
Mark location of muffler exhaust and spark plug on template. Cut holes in template.
Remove muffler and spark plug.
Reinstall cowl and mark locations of muffler and spark plug on cowl.



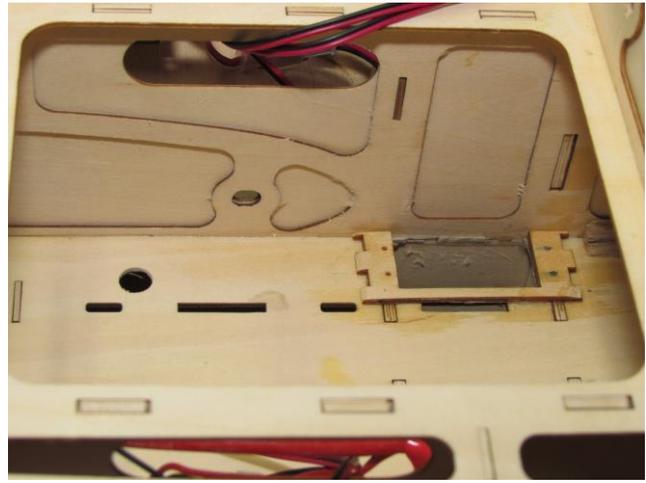
Remove cowl and cut preliminary holes. Don't worry about making them look perfect at this point.
Reinstall muffler and spark plug.



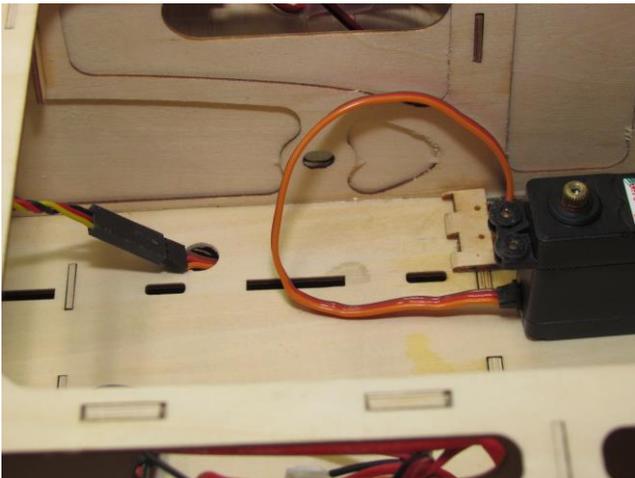
Reinstall cowl. If your template was accurate, muffler and spark plug should line up with holes.
Mark final hole sizes allowing for at least 1/8" clearance around muffler. Clearance for spark plug should include ignition cap.
Uninstall cowl again.



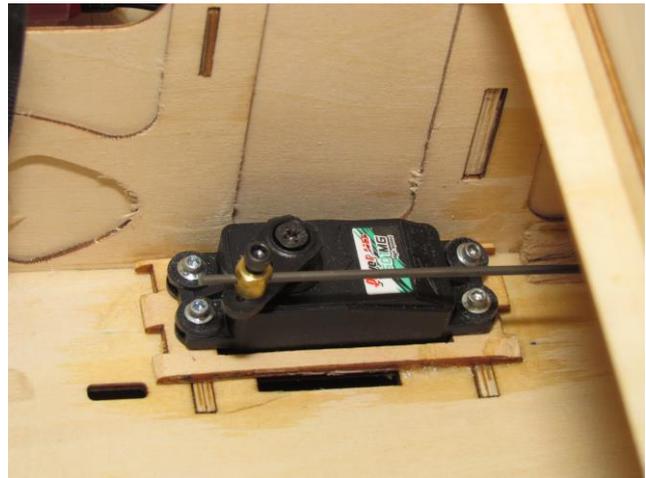
Enlarge holes per revised marks. This time smooth edges, etc. Hole for spark plug includes ignition cap.
Provide hole for air to exit cowl.
Test fit cowl and adjust openings if needed.
Remove cowl.



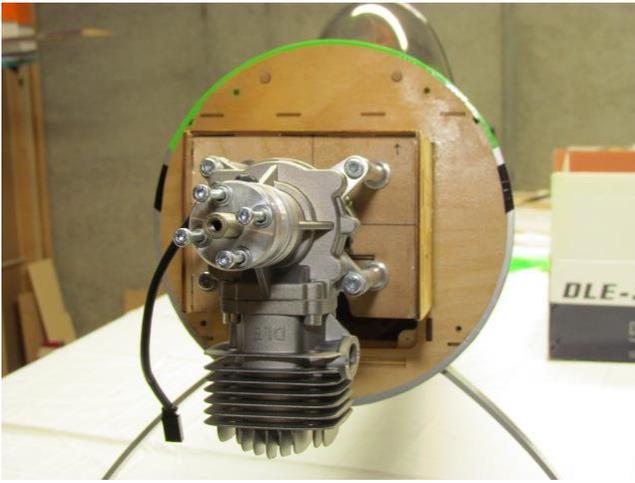
Cut hole in motorbox floor for throttle servo, just in front of wing. Verify location doesn't interfere with wing alignment pin or muffler (if canister).
Drill holes in plywood plate for servo mounting screws, then glue into place.
Circular hole aft of throttle servo is for throttle servo wire.



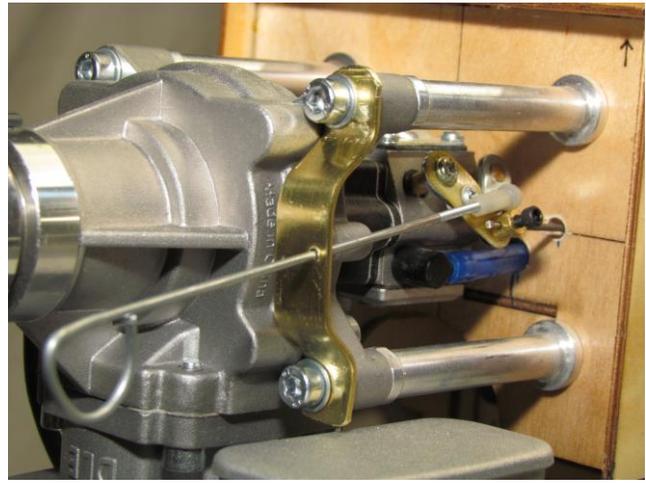
Feed throttle servo lead through hole for servo, then back out through circular hole.



Install throttle servo and throttle pushrod. Quick link type of connector was used on the servo arm.
Note: throttle pushrod is connected to an inner hole in the throttle servo arm.



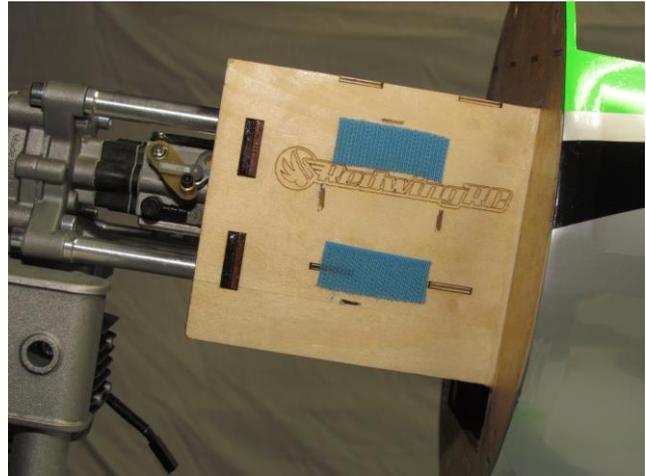
Reinstall engine. This time use thread lock on the mounting bolts.



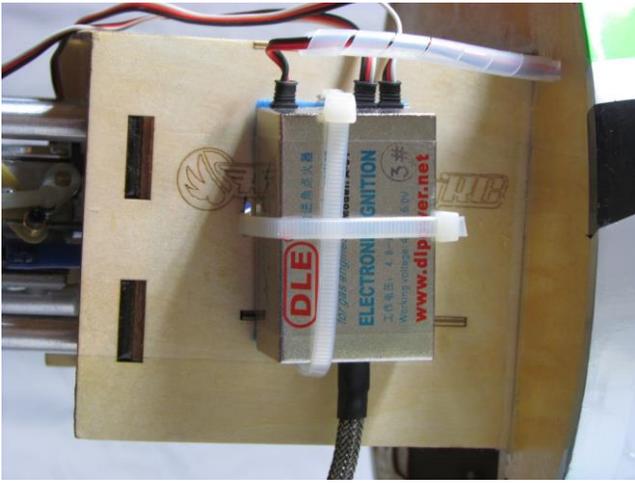
Connect throttle pushrod using a quick link type of connector.
Choke uses a ball link, mainly to clear the throttle arm.
Brass bracket for choke guide and choke pushrod are not included in the kit.



Install muffler with gasket. Use thread lock on bolts.



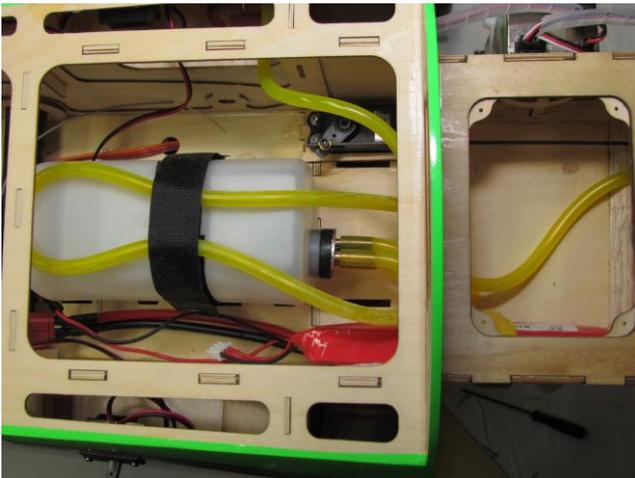
Ignition will be held on using Velcro and a couple of zip ties (not included with kit).
Install Velcro strips.
Cut holes through side of motorbox for zip ties.



Ignition installation completed. Note: power lead is protected with spiral wrap (included with engine) and goes into the radio compartment to the battery.
If desired, the ignition battery can be installed on the side of the motorbox.



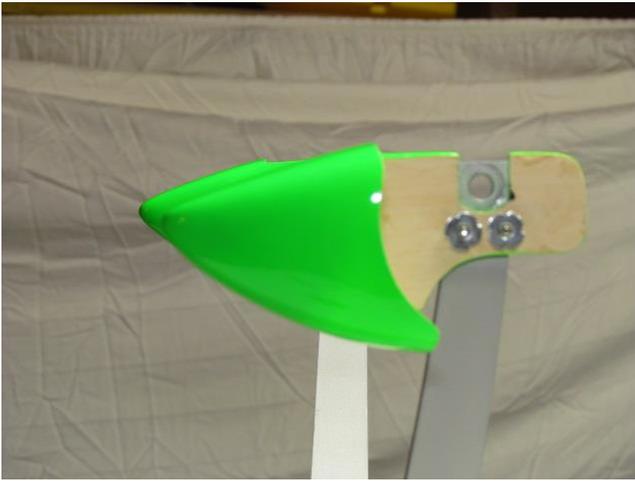
A 3000 mah LiFe battery (available from RedWing RC) is being used for both the radio and ignition. It is held in place with a couple of strips of Velcro and a strap that goes through the motorbox side and around the battery. Verify sheet metal screws used for attaching cover over access hatch don't hit the battery.



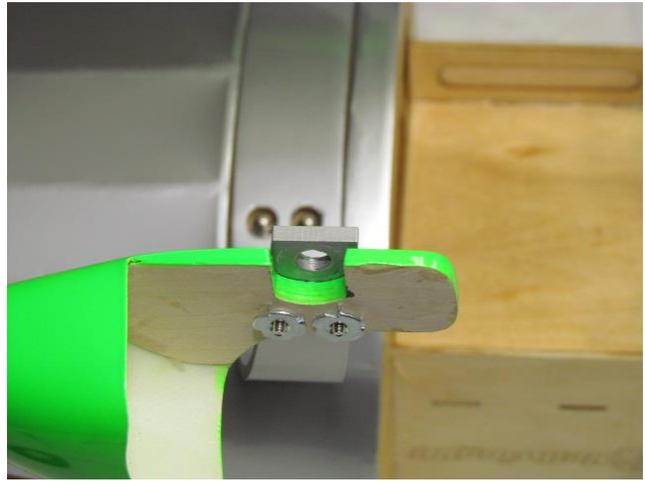
Assemble and install fuel tank. Tank is strapped in with Velcro.
Vent line loops back over the end of the tank prior to exiting out the motorbox bottom.
This is a 3 line tank. The other lines go to the carburetor and fuel dot for filling and emptying tank.
Attach covers over motorbox top and canister tunnel.



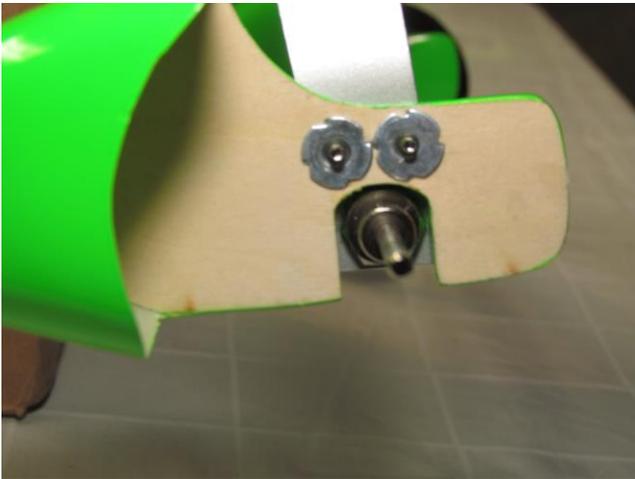
Reinstall cowl. Upper bolts are accessed from the canopy side. Bottom bolts are accessed from inside cowl and are difficult to install. Exhaust opening can be used to access bolts.
Bottom nuts and bolts can be replaced with rare earth magnets. Use one magnet on cowl ring, one on the fuselage. Remember to arrange magnets to attract, not repel.



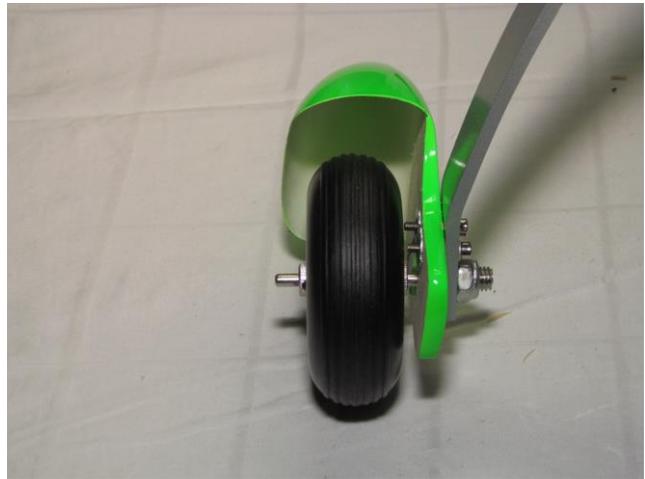
Temporarily install wheel pants.
Bolt holes are slightly oversized. Make sure pants line up properly before completely tightening bolts.



Add a drop of medium CA to collar of blind nut prior to fully tightening it.
Remove wheel pants to simplify installation of axles.



Install axles with flat sides horizontal to prevent interference with wheel pant positioning.
Reinstall wheel pants.
File flat spots on axle at wheel collar location.
Install wheels and wheel collars.



Use wheel collars to center wheel within wheel pant.



Drill bottom of rudder to accept steering pin.
Only insert steering pin about $\frac{1}{4}$ " into rudder.
Install tail wheel and axle.
Install steering pushrod, leaving at least $\frac{1}{2}$ "
extending past the steering pin, otherwise it may
disengage at extreme rudder throws. Note slight
bend in pushrod.



Washer was soldered on to center the wheel on
the axle. Wheel should be centered on the
vertical portion of the wire axle.

Prior to Flying

Verify center of gravity is within the recommended range. Starting point is 25 to 30% (5" to 6") back from the leading edge at the root. Adjust to suit your personal flying style and preferences.

Control Throws:

	Surface	Throw	Expo
Normal Flying	Aileron	25°	25%
	Elevator	20°	20%
	Rudder	30°	20%

3D Flying	Aileron	40°	40%
	Elevator	45°	40%
	Rudder	50°	35%

Once again, these settings are a recommended starting point. Adjust to suit your flying style and preferences.

Note: Futaba flyers should use negative values for exponential.

Balance the propeller. It is a good idea to balance it end to end and balance the hub. Redwing RC has a video that demonstrates how to balance the propeller hub.

<http://www.redwingrc.com/video/propvid.htm>

Verify that all hardware (bolts, screws, wheel collars, etc.) are tight.

Check engine operation. It should run smoothly at all throttle settings. Do not attempt to fly unless the engine is operating reliably.

Range check the model according to your radio manufacturer's recommendations. Range check should be performed both with and without the engine running. Do not attempt to fly if there is a large reduction in range with the engine running until the cause for the discrepancy is determined.

Verify all batteries are fully charged.

Check that all control surfaces are centered. Trim levers on transmitter should be centered. All hinges should operate smoothly, with no binding. They should be tight and not pull out.

Verify that all controls move in the proper direction.

