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Wild Hare R/C Standard Assembly Manual

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Warranty Information

Wild Hare R/C, division of Wild Hare Hobbies, Inc. guarantees this kit to be free of defects in both material and workmanship at the time of purchase. This warranty does not cover any components damaged by use or modification. **In no case shall Wild Hare Hobbies, Inc. liability exceed the original cost of the purchased kit**. Further Wild Hare Hobbies Inc, reserves the right to change or modify this warranty without notice. This warranty extends only to the original purchaser.

In that Wild Hare has no control over final assembly or materials used in final assembly, no liability shall be assumed or accepted for any damage resulting from the use by user of the final user assembled product. By the act of using the user assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying such as racing the modeler is responsible for taking steps to reinforce the high stress points.

Read through this manual before starting construction. It contains important warnings and instructions concerning the assembly and use of this model.

Warning. This is not a toy. If not properly controlled it can cause injury or death and property damage.

Never ever stand or sit in front or to the side of a running engine. Never allow anyone else in this area.

Things can happen, this is a danger zone. Always stay behind a turning propeller.

These are big airplanes with powerful engines, they can kill you. After starting keep the engine at an idle until all nearby personnel are behind the propeller.

Specifications

See addendum for your specific aircraft

Additional equipment required

Computer Radio with at least 8 channels strongly recommended
Elevator, aileron, and rudder servos.
Throttle/choke servo standard BB servo such as Hitec 425
Radio operated engine kill switch or servo operated choke strongly suggested
Single or dual radio battery packs, preferably high current output cells. Total capacity will be based on how much flight time is required, the number of servos and the size of the plane.
Switch[es] for receiver and ignition batteries 2 or 3.
Miscellaneous servo extensions. 22 ga. Wire with gold connectors

The kits include a tailwheel assembly, wing/stab tubes, hinges where they are used, and miscellaneous small hardware for mounting the cowl, wings, stabs, and landing gear.

Please remember, this is a big airplane with high stresses on the controls. You must use high performance servos, pushrods, linkages, horns, etc. **Flexing in linkage or loose hinges can and will cause flutter of the control surfaces which will destroy the airplane in just a few seconds.**

Metal gear servos are required. Proper installation of hinges, control horns, linkage, etc. is critical.

Optional Accessories

Wild Hare R/C makes available accessories that can enhance this kit's usefulness.

Hardware kit. Your kit has some basic hardware, but our hardware kit includes all the things you need to complete your plane except for engine, muffler, spinner, glue, prop, and electrical/electronics. The hardware kit is from US suppliers and all the hardware has been tested to be completely compatible with our kits. it contains;

HD control horns (based on Dubro parts)
Sullivan golden clevises with retainer clips
Carbon fiber pushrod materials to make pushrods as explained in this manual.
Wild Hare pull-pull kit for rudder
Dubro or Sullivan wheels and 3/16" axles and 4 wheel collars..
Gas tank, Dubro, plus tygon line, tee, and fuel dot
2-56 throttle and choke pushrods with nylon clevises
Many miscellaneous small parts such as nuts, washers, horns, springs, etc.

Spinners. Wild Hare normally keeps Dave Brown Vortec spinners in stock, they are cut to fit a large prop and are normally available drilled for a DA-50 and a 6 bolt pattern as is used on DA-100, 3w, Evolution, etc. Larger spinners can be drilled for DA-150 pattern.

Switches. Wild Hare planes have holes laser cut in the fuse sides to accept the Maxx products charge-jack switch, a very nice way to switch your receiver and ignition batteries.

Servos. Wild Hare sells servos from Hitec and JR. We have flown the planes with servos ranging from the economical analog servos the higher priced JR 8611 and Hitec 5985/5955. We have found that better servos really do make a plane fly better, and we recommend that you use the best servos that you can afford no matter where you buy them. Analog servos are acceptable for sport flying, but to get the most from our planes we suggest coreless digital servos.

Carbon-fiber wing tube is stronger and lighter than an aluminum tube.

Pilot and instrument panel dresses the plane up and is required to avoid penalty in in upper IMAC classes.

Table of Contents

Note well: This manual is a general reference for all Wild Hare aircraft meant to explain general assembly. Please refer to the aircraft-specific addendum for details about your particular plane.

** ***These Items require user supplied materials and creativity. These steps assume that the user will be installing mounts, retainers, and other assemblies to suit his particular building style. For example no servo mount is supplied for the throttle, we have no way of knowing what type of engine you will use or what is the best location for the throttle servo.***

If you need advice on any of this, call us or email support@wildharerc.com and we'll be happy to try to try to answer your questions.

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Step 1. **Open and inspect everything**

This section should be fairly self explanatory.

In the large box you should have a fuselage with hatch., wing tube and stab tube, the elevator/stab assemblies, the rudder, cowl, wheel pants, canopy, landing gear and one or more packages with the tail wheel assembly and other miscellaneous hardware. The hinges can be found the elevators and ailerons**, but they are not glued, you have to do that.** The hinges for the rudder are packed separately. We have had good luck with Pro-bond Ultimate and Gorilla glue, both of which are glues that expand as they dry cure and fill the voids in the hinges and their sockets. See the section on hinging for detailed technique for installing these hinges with minimum mess.

Check everything for shipping damage and/or manufacturing defects. **If there is a problem, report it to us NOW**, not after you start building the plane. **SAVE ALL PACKAGING UNTIL YOU ARE SURE THERE IS NO DAMAGE! PACKAGING IS REQUIRED FOR ANY DAMAGE CLAIM.**

Before proceeding to any assembly, now is a good time to go over the whole plane and fix any cosmetic flaws. Some cosmetic flaws are to be expected, this fact is reflected in the price. Keep in mind that as the level of finish goes up the cost of the model increases dramatically.

Known issues and improvements

There are a few areas where, at this unassembled stage, you can improve the final results of your assembly project. There are many items that cannot be addressed on the assembly line due to cost and possibly because not every improvement would be welcomed by every builder. Here are a few items that have come up over time.

First, check the fit of wings and stabs to the fuse. Now is the time to report any problems.

Go over the covering with a heat gun or iron. The covering tends to get loose over time and with changes in temperature and humidity. It may have come out of the box with wrinkles, you can be assured that it did not go into the box that way. Also, in particular use a covering iron to iron down all covering edges, this is an area where production line built airplanes always need help. Pay close attention to the leading edges of the wings and stabs, be sure there are no forward facing seams. A piece of transparent packing tape can be a big help

to seal along the LE if there is an exposed seam. When using a heat gun, I keep a soft cloth in one hand and I use it to rub down the covering while it is hot. Covering tends to be secured only around the edges, if you rub a spot after heating it with the gun it will stick down much better and bubble less later. If you can get someone to help you, the best way is to go over every inch of the covering with the heat gun while your helper follows you and rubs the warmed covering down onto the wood underneath with a soft cloth. Use the heat gun alone on open bay areas like the wings.

Clean out the hinge holes. Without removing any wood, use a very sharp X-acto knife and remove any covering that may have been pushed into the hinge holes. It is very important that the glue sticks to the wood and not to the covering. **See the section on hinging before you do this**.

Check all hard points to be sure they are securely glued into the control surfaces. These planes are built on an assembly line and occasionally the assemblers go light on the glue in this critical area.

Hardening holes. The fuselage sides on these planes are made of balsa and lite ply. The control horn hard points are made of a soft pine or fir type wood. Any soft wood like this will benefit from hardening with thin CA. It's a good idea whenever you drill a hole that must accept a wood screw or the hinge screws to put a drop (or more) of thin CA into the hole and then if necessary re-drill the hole. The CA will wick into the wood and harden it, adding strength in that area.

Canopy Hold Down — The canopy hatch as supplied is held on with 4-40 socket head screws which screw into blind nuts that are pre-installed. We found in testing that these tend to unscrew when subjected to vibration. The most reliable fix for this is to use a nylon screw threaded directly into the wood. The text covers how to do this.

Firewall reinforcement — First, be sure the firewall is properly glued, this is one weak spot of assembly line construction.

Set the fuselage on its side on an angle with the nose down. Put something under it, glue may drip. Dribble thin CA into the joint between the firewall and the motorbox side. Let it dry, then repeat until the wood will no longer absorb any Ca. Turn the fuse over and repeat.

Next, do this if you are using a heavier engine. It's a good idea to install triangle stock in the corners where the firewall meets the sides, also with epoxy, in the case where you may be using a heavier engine. .

Re-glue servo trays — One of the areas that the factory can do better is gluing the servo trays. You should use some thin CA to securely glue these into the fuse and wings. Servo trays are under a lot of stress, be sure they are secure.

Dowels installed in the wing roots and at the front of the hatch cover are also areas that often can use some additional glue.

In general a drop or two of CA anywhere that wood meets wood is an aid to making your new plane last a long time and retain its value. There is no reason a plane like this cannot make hundreds of flights without noticeable degradation.

Flight trimming— Every airplane requires some trimming to achieve maximum potential. This includes balancing, radio setup, adjustment of throws, and flight trimming. Be patient and allocate sufficient testing time to get all the flight modes working as they can. It is important that all servos work properly and all linkages are tight, almost all trim problems can be traced back to some type of equipment trouble. If the plane is set up straight and square and both sides are identical it will fly much better that if it's just thrown together. Invest in a throw gauge for the surfaces, it's impossible to set the plane up properly without one.

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Step 2. **Engine mounting**

The first thing to do, before anything else goes in the fuselage, is to get the engine mounted and aligned with the cowl. Here's how I have done it. This is the hardest and most time consuming step in building this plane. Take your time and be patient, you can do this well and everything else should be easy. **Do this first before you hinge the rudder.**

Note that on most planes the firewall already has a proper amount of right thrust built in, do not use any other offsets. When you shim the engine out from the firewall use shims of equal thickness on all 4 corners so that you do not introduce any other thrust angles. See detailed aircraft addendum for additional info.

With no cowl or hatch on the fuse find a place in your workshop where you can stand the fuselage up on its tail so that the motor mount is pointing at the ceiling. Secure the fuse so it stands like that and won't fall over. I wrap masking tape around it and tape it to the side of the workbench.

Set the engine on it's rear radial mount (assuming it has one) on the motor mount firewall so the crankshaft is pointing up at the ceiling. Some single cylinder engines will sit nicely on their motor mount plate on the firewall, others have too much weight in the cylinder and will fall over. If yours falls you will need some method of keeping the engine sitting on its mounting lugs without falling over. In the photo at the right we are showing an engine with its cylinder removed, we do not suggest this method but it sure does make it easy.

A simpler solution to the problem is to put good quality double sided tape on the firewall approximately where the mounting lugs will sit. The sticky surface will hold the engine in place and keep it from tipping over. Make sure the tape thickness is the same at all mounting points.

Now mount the cowl using the supplied screws and washers. The cowl must be slipped over the engine without disturbing the engine's location. Now secure the cowl to F1.

With snigle cylinder engines it will be necessary to cut out the cowling to clear the cylinder to mount the cowl. Cut a little bit at a time rechecking clearance until the cowl will fit over and mount on the cowl. Removing the spark plug will make this simpler, seal the plug hole and exhaust port with masking tape to keep debris out.

Place your spinner back plate over the crankshaft or prop bolt so that it is centered. You can now just move the engine around to get the spinner back plate centered on the cowl face.

Remember I said this part will require patience, but when you get it just right the plane looks great.

Once the spinner back plate and engine are in the right position, remove the cowl and mark the location where the engine is standing before removing it. You can now drill the engine's actual mounting holes in the firewall. On a DA-50 I draw a circle around the base of each standoff, then I use a large washer to help me find the center of that circle.

The final step is to install the engine using either blind nuts behind the firewall or, as we show with a DA-50, bolts through the back of the firewall into the standoffs supplied with the engine or which you have made or bought elsewhere. Fine adjust the engine spacing so that the spinner back plate fits perfectly by leaving the standoffs a little short and using washers to set the final spacing.. Remember that the firewall is already set with proper thrust angles, any drilling must be square to the firewall and not parallel with the fuselage line. If you messed up and drilled the holes in the wrong place, you can plug the drilled holes with 1/4" dowel pieces and CA, and start over.

Like I said, the rest is very easy.

The photos on this page show a different airplane but the idea is the same.

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Step 3. **Hinging the control surfaces**

Hinging is a very simple matter. We recommend that you hinge all the control surfaces in two steps allowing the glue to dry between steps.

Before you start gluing anything, test fit each control surface. Aileron to wing, elevator to stabilizer, rudder to fin/fuse, with the hinges in place. Make sure the hinges go in the holes smoothly and that there is ample room for the hinge "knuckle" so there is no large gap between surfaces. The hinge lines are beveled. The point of the bevel should be at the center of the hinge pin, this assures that the hinges are aligned and centered on the hinge line.

You may want some extra control surface throw for heavy duty 3d. To do this leave a small gap between the control surfaces to allow more deflection. If you do this you should probably seal the gap with some matching or clear covering material.

Once you are certain that they all go together smoothly, take one surface and remove the hinges. Glue the hinges into the holes securely using the glue you prefer. I have had good success with **Gorilla Glue** (available at any Home Depot) because when drying it foams up slightly and fills the gaps between the hinge and the mounting hole. Check hinge operation every few minutes, as the glues sets wipe off any excess that oozes from the glue joint.

Using Gorilla glue here is the procedure for hinging.

1. Iron down the covering on the hinge line so there are no loose edges or seams.
2. Put a piece of 2" wide masking tape across each hinge hole so the hole is centered in the tape.
3. With a sharp razor knife cut away the tape and covering material from each hole so only wood is exposed.
4. Again using your sharp razor knife cut the tape along the pointed bevel edge so the tape can later be pulled away with the hinges installed.
5. Pour some Gorilla glue in a cup. With a toothpick (break off the pointed end) pick up as much glue as you can get to stick to a 1" section of the toothpick and then swab the inside of 1 hinge hole until the sides are generously covered with the glue. Wipe off any excess.
6. Insert the hinges until the point of the bevel is centered on the hinge pin. Make sure the hinges can be worked, and that the bent hinge is perpendicular to the edge (see picture).
7. Allow the glue to set for at least two hours, but keep an eye on

it for the first 15 to 30 minutes to be sure the glue's foaming action does not push one of the hinges out of the hole.

8. After the glue is set flex the hinges back and forth to break away any glue that might have stuck to the knuckle.
9. Repeat steps 1 through 5 on the other surface
10. Join the two surfaces by pushing the exposed hinge ends into the other surfaces.
11. Allow to dry for 4 hours.
12. At this point you should be able to flex the surface back and forth. You can now remove the masking tape.
13. Clean off any residue from the hinge and put a drop of 3-in-1 oil on the knuckle. The surface should move freely.

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Step 4. **Mounting the hatch and canopy**

The hatch mounts to the fuselage by tabs on each side that are attached at the rear of the hatch. The holes for mounting the hatch are pre-drilled and 4-40 blind nuts are already installed, you only need to find the hole under the covering and open it up with a knife or a hot nail.

I have had my share of problems with those small screws falling out from vibration. I have found that replacing the 4-40 screw with a 1/4”-20 nylon screw (included in the hardware kit) is much more secure. To do this you will need to;

Remove the blind nut and redrill the hole in the hatch tab to 3/16”
Tap the 3/16” hole with a 1/4”-20 tap
Harden the threads with thin CA
Re-tap the threads after the CA is fully hardened
Drill the hole in the fuse side out to 1/4”

You can paint a 1/4” nylon screw head to match your plane’s covering.

Trim the canopy to fit the hatch. Leave a small lip in the front, it makes the attachment more secure. Attach the canopy with whatever is your favorite method. Some people use tape, some glue the canopy down, some use small screws. This is up to you. If you use small screws add some hard wood such as 1/16” ply to back up the balsa wood of the hatch, or harden the balsa with thin CA.

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Step 5. **Install horizontal stabilizer**

This step is easy.

Trim the covering around the holes in the fuse for the stab spar tube and the two retaining screw holes on each side. You should also cut away the covering over the holes for the elevator servos, but don't cut out the rudder servo covering yet.

Slide the spar through the fuse, and slide the stabilizers onto the tubes from each side.

Retain the stab to the fuse with 4-40 screws, washers and lock washers supplied with the kit. I advise you to use washers and lock washers or a little red RTV or blue loctite on the threads. Don't use a lot, and **don't use red loctite**, or you won't be able to get the screws out without tearing out the blind nut.

The assembled h-stab with controls is shown below.

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Step 6. **Install control horns on all surfaces**

We recommend Dubro #866 or similar control horns with a 8-32 screw used for the horn. In our hardware kit we supply a version of this horn set with parts for one complete airplane.

No “A” nuts (the large nuts that aresupposed to seat against the surface) are necessary even though they are shown in some photos, all you need is the 8-32 stud properly installed into the hard point.

You should decide whether you care if the screw head shows on the upper surface. The hard points are already pilot drilled, but need to be made larger for the 8-32 stud. The stud threads into the hard point and makes its own threads so it should be tight when it threads in. I have found that grinding a small flat on one side of the tip of the 8-32 stud makes it thread into the hard point more easily.

IMPORTANT NOTE: Do not drill the hardpoints larger than 9/64. The screws must thread snugly into the hardpoints. If you drill it larger the screw can wobble in the hole and allow the control surface to flutter with disastrous results.

You should harden the hole after drilling with thin CA.

If you don’t care about the screw head showing, drill all the way through the hard point in the aileron and elevator with a 9/64 drill. Also drill the hard point in the rudder with the 9/64 drill. Countersink the drilled holes in elevators and ailerons on the top.

On ailerons and elevators install the 8-32 stud from the top, screw it all the way in until it is snug. Install the rest of the horn assembly from the bottom.

Or;

Another way to do it does not allow anything to show on top. **Very carefully and slowly** drill from the bottom side with a 9/64 drill, following the pilot hole so you don’t change the angle. I use a hex drive quick change bit and put it in my power screwdriver which turns slowly and is easy to handle. Pull the bit out every 1/8” or so and blow out the shavings.

While drilling observe the top surface of the hardpoint visually. When the drill reaches the covering on top you should be able to see it bulge before the covering is pierced. As soon as you see it, stop drilling and withdraw the drill, blow out all the shavings. Harden the hole with thin CA and allow to set completely.

Now take your 8-32 stud and thread it into the hole from the bottom. Screw it in by hand or with a power screwdriver, again observing the other end, until you can see the tip of the screw through the covering.

Now, cut off the head of the stud/screw and thread the rest of the hardware onto the screw.

Here's a tip. When you cut the head off with your Dremel, it will be hot. Don't let it fall on your legs or on the covering or it will burn through the covering (or your skin or pants).

Rudder tiller;

After the upper hardpoint has been drilled through with a 9/64 drill, install the tiller bar so that it is showing the same amount of threads on each side of the rudder. Once the stud is installed cut the head off with your Dremel. The stud should be tight in the hole, if it is loose you should add a nut and washer on each side to secure the stud.

After the tiller bar is installed, if you need to adjust the position you can do this without damaging it by double-nutting two 8-32 nuts and use a wrench to turn the stud into the hard-point.

Now install the horns exactly the same distance from the rudder surface. If using the DuBro horn set for this you should re-drill the horn in a location that is even with the hinge center line. Both horns should be drilled at the same point. Then trim the excess from the horn leaving at least 1/8" of material at the end.

Most Wild Hare planes will want the cables to run straight.

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Step 7. **Installing the servos**

1. Elevator servos.

Trim away the covering from the rear sides of the fuselage or from the servo bay(s) in the elevators to expose the servo trays. Attach a servo extension to the servo cord long enough to reach the receiver, and tie this servo connector together with dental floss or whatever you prefer. If the plane you have has h-stab mounted servos and you expect to be disassembling the plane frequently you may find it useful to mount the servo extension in the fuselage side for easy assembly.

Slide the extension through the servo hole and fish the end through the fuse with a piece of wire with a hook or whatever you want to use. Servos should be secured with all screws.

There are othen fuselage formers that have lightening holes in them. If you run the extensions through these holes it keeps the wires from flopping around in flight.

2. **Aileron servos**.

Cut away the covering around the servo tray and install the servo and extension. You should find a tunnel inside the wing to route the wiring.

I have found that gluing a servo extension to the side of the fuse makes a handy place to plug in the aileron on each side. It must be done where there is an opening in the root rib. There may also be two locations provided to mount an MPI “Double link”.

3. **Rudder servo**.

Do this last, after everything else is done and the plane is otherwise ready to fly.

Balance the plane and determine if weight is needed in the tail.

If tail weight is required, mount one or two servos in the tail below the elevator servos in the same manner as the elevator servos.

If tail weight is not needed, I suggest that you mount one or more powerful digital servos-

such as a JR 8611a or Hitec 5955 in the servo tray and use pull-pull cables to actuate the rudder.

Throttle and (optional) choke servo installation.

We recommend that a servo be used to operate the choke as well as the throttle. This provides an extra level of safety by acting as a secondary engine kill mechanism in case of failure in the throttle control system.

It is impossible for us to anticipate every potential throttle layout for every engine. Keep in mind that if you use a canister, don't let the servos hang down into the canister compartment, this will protect them from the heat.

Never attach pushrods to the engine with a metal connector. There must be an insulator between the engine and any extension or it can act as an antenna transmitting RF signals. Our hardware kit is supplied with metal pushrods with nylon clevises which have always provided adequate isolation from RFI in our test planes.

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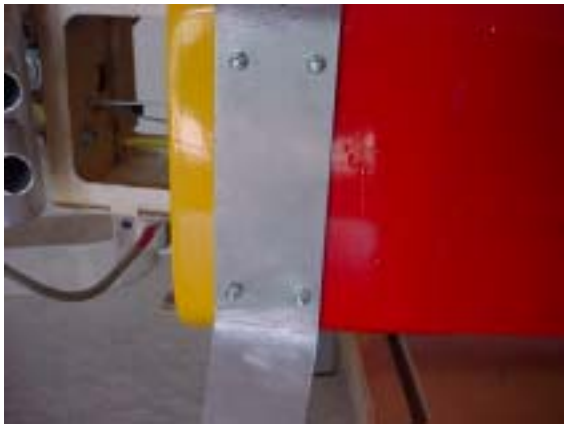
Step 8. **Install the landing gear**

There should be drilled holes in the landing gear plate under the covering, these should match up with the holes in the landing gear. Simply open these holes and bolt down the landing gear using nylock nuts. Some of our planes will use different LG mounting methods, refer to the addendum on your plane for clarification.



To mount the wheel pants you simply drill through the back of the landing gear and through the wood backing plate. Install a 4-40 blind nut in that wood backing plate.

The tail wheel wire attaches to the hardwood plate at the bottom of the tail using two wood screws on each of two retaining brackets.. The hole for the wire is predrilled. Use springs from the tailwheel tiller for controlling the tailwheel. See the accompanying photo. The springs protect the rudder servo(s) from damage.

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Steps 9, 10, 11. **Installation of fuel system, radio and control linkages**

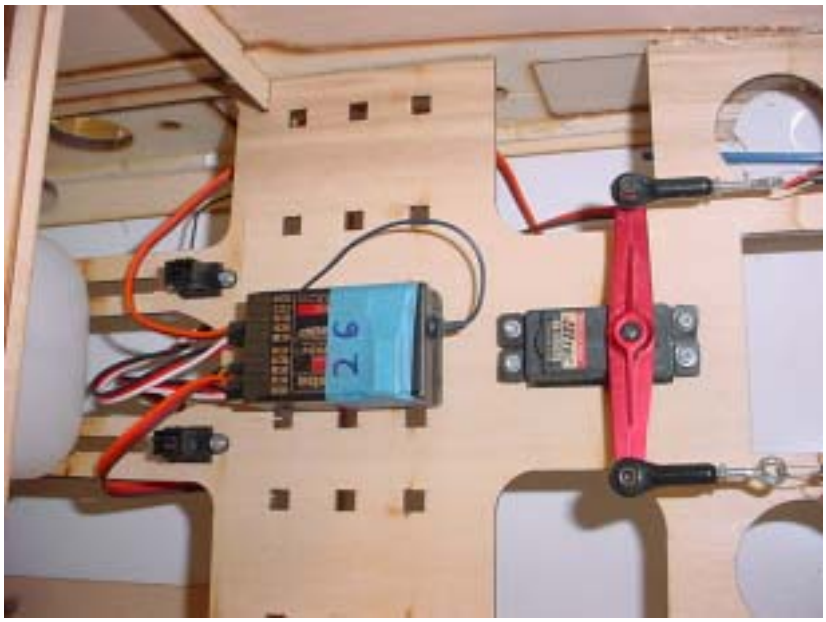
These 3 subjects are combined on one page because this is the part where you get to do things your way. We have only done a few things to get you started.

1. There are precut holes in both fuse sides that will fit the popular MPI integrated switch/charge jack assemblies available from Wild Hare. Some trimming of the holes may be required. **If you do cut into the fuse side for any reason do not cut the 1/4" balsa stringers at the top and bottom of each side.**

2. The fuel tank should be mounted as close to the wing tube as is practical, normally just in front of the tube. Putting it there minimizes changes in balance as the engine burns off fuel.

3. There is a tray which is meant to hold the receiver, battery pack(s), and one or more rudder servos if a pull-pull is chosen.

4. In case you need to add weight in the front of the plane for balancing, the sides of the motor box at the front are a good place to mount the receiver packs. Range check your radio with the engine running before flying to be sure no interference is being caused by the batteries being in close proximity to the engine's ignition system.



Please use good strong pushrods and other linkage parts. A sample of the assembly that we used is shown in the picture below. Notice we use carbon fiber pushrods and Dubro HD horns. The servo connection is done with Sullivan 4-40 or Dubro clevises, or with HD 4-40 ball links. Avoid using ball-links with plastic servo arms, they generate a twisting force on the servo arms that will fatigue and fail.

Making pushrods from our hardware kit is very simple and the resulting pushrod is extremely strong.

You will need a length of 3/16" carbon fiber or fiberglass tubing, a length of 4-40 all-thread rod, and some 4-40 nuts. All this hardware is included in our optional hardware kit.

First, set up your linkage using the clevises and the 4-40 all thread cut to the proper length. You can make all your pushrods at once, so get all those rods set to the right length. If you use a metal clevis, be sure the pushrod goes all the way into the threaded section, plus a little to allow a range of adjustment. With plastic clevises like Dubro or Rocket City, the rod should mark a 3/8" section at the pushrod end. Screw into the clevis until the marked section is completely into the clevis. This assures there is sufficient thread engagement.

Measure each pushrod, and cut a piece of fiberglass (CF tends to split) tube that is 2" shorter than the rod. Slip the tube over the rod and tighten down a nut from each end so that you leave an equal amount of thread at each end to mount the clevis. Tighten the nuts slightly so they don't come loose and so there is a little tension on the rod inside the tube.

You're done. Install the pushrods.

This design yields a pushrod that uses solid steel when pulling and the FG tube when pushing.

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Step 12. Mounting the wings

Push the aluminum tube spar through the tube in the fuselage until it protrudes an equal distance on both sides. Carefully push each wing onto the tube until the anti-rotation dowels engage the holes in the fuselage side. As the wing approaches the fuselage guide the aileron extension through the access hole or if you used servo extensions glued to the fuse side just plug them in.

The wings mount to the fuselage with one or two 1/4”-20 screws on each wing through the fuselage side. I use nylon screws because they are more resistant to vibration. Most of the kits are supplied with nylon thumb screws which are very handy and do not tend to come loose like metal screws.

You can also drill the antirotation dowels to accept hairpins for safety (see photo). Use no larger than a 1/16” drill and pin to avoid weakening the dowel. Do not rely on the dowels alone, they are not meant to be used as permanent retainers but will work for a short time in an emergency.

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Steps 13 and 14. Balance the plane and adjust control throws

The first flight should be done with the plane balanced as specified on your plane's addendum. This can be changed later, but we want your first flight to be at a safe setting.

If your plane is tail heavy, consider moving batteries as far forward as possible, remove anything from the tail that might be adding weight, get a lighter tailwheel, heavier ignition battery. Remember that the farther weight is from the CG the less of it you will need. A small weight on a long arm makes a big difference. A heavy spinner has more effect that a bigger battery because it is farther from the CG. When making CG changes always do it a little at a time or you could find yourself flying a plane that cannot be landed.

Control Throws

We set the control throws as follows on planes in test. Please keep in mind the high rates specified here are for 3d, not for just faster response. The elevator in particular on high rates will cause instant stalling, tumbling, and all sorts of other things that can only be done at low speeds. **Do not use the 3d settings until you are thoroughly familiar with the plane on low rates.**

	High rate (3D)	**Low rate**
Ailerons	23 deg	**16 deg**
Elevators	40+ deg.	**12 deg. is plenty**
Rudder	45 deg.	**25 deg**.

Fly the plane on low rates at first. At high 3d rates it is very difficult to fly. The 3d rates are intended only for extreme aerobatics.

If you are not planning to use the plane for extreme 3d aerobatics, there is no need to have the high rate settings. You can do yourself some good by using shorter servo arms in this case. The shorter arms will use more servo travel and give the servo more leverage, effectively increasing servo power and improving trim resolution.

General Assembly Manual

Steps 15 (optional) canister installation.

Most of Wild Hare's newer planes have an integrated canister muffler tunnel. If you choose to use it you should be aware of a few details.

On the bottom of the fuselage under the tunnel there are holes in the bottom that are covered over by Ultracote. Remove the covering from these holes to allow hot air it exit after it flows over the muffler.

The best canister setup will (where possible) use a muffler with a rear exhaust, this will not interfere with installation of the cowl. A front exhaust muffler which exits ahead of the rear edge of the cowl will interfere with the cowl ring. In this case the best solution is to make the outlet pipe as short as practical and make an opening in the cowl ahead of the ring, but do not cut the ring.

When installing the cowling, rotate the muffler to get the outlet pipe out of the way, install the cowl, then rotate the muffler back to it's proper orientation.

Mounting the canister is best if it is supported in its center, so that G-forces acting on it do not tip it either way.

A complete canister installation kit is available from Wild Hare for certain engines and airframes.