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please report errors to info@wildharerc.com

Wild Hare R/C
88” Giles G202 and MX2 Fast Build
Assembly Manual

For assistance contact Wild Hare R/C
6508 Cardinal Drive, Flower Mound Texas 75022
817-430-0107 Fax 817-490-1279

Warranty Information

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 or extreme aerobatics 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.

Specifications

Wingspan	88 inches
Length	80 inches tail to cowl face
Wing Area	1400 sq. inches
Weight	16.5-17 lbs.
Recommended engine	DL-55, DA-50

Additional equipment required

Computer Radio with at least 8 channels strongly suggested, 6 channels is minimum.
2 Elevator servos minimum 150 oz/in. of torque each e.g. Hitec 7985 or HD 9110/9150
2 aileron servos, total torque required not less than 150 oz./in. per wing, Hitec 7985 or HD9150
Rudder servo(s) at least 180 oz./in. Such as Hiteg 7985, 7955, HD 9150
Throttle/choke servo standard BB servo such as Hitec 425 or HD 3001
Radio operated engine kill switch or servo operated choke strongly suggested
Radio battery pack(s) at least 1500 mah capable of delivering 10 amps for short periods without significant voltage depression..
Switches for receiver and ignition.
Miscellaneous servo extensions.

The ARF kit also includes a tailwheel assembly, aluminum wing tube (1.250") 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, titanium gears are preferred. Metal servo arms are strongly recommended.***

In this manual the two planes "Giles G202" and "MX2" are referred to as "Giles/MX2". The two planes are nearly identical in specifications and assembly.

Special Information About This Aircraft

This Giles G202 and MX2 are high performance aircraft. If you are considering purchasing either of these planes, keep in mind that to fly safely and properly it will require a significant expenditure on servos, batteries, and other equipment for the control system.

This a large airplane with high stresses. The control systems for it will require large amounts of electrical power for the plane to fly properly. You will need heavy duty metal gear servos, extensions, and power supply.

If you do not already have a familiarity with how to equip a large aircraft, it may not be the right plane for you at this time. You can call Wild Hare for advice if you have setup questions, but you should be 100% confident in your setup before flying this plane.

This manual will be kept brief because it is assumed that the reader has extensive experience with large radio controlled aircraft.

Things can go wrong on any remote controlled aircraft, always fly safely and away from people.

Optional Accessories

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

Hardware kit. Your kit has only basic fasteners included, but our hardware kit includes all the things you need to assemble the Giles/MX2 except for engine, muffler, spinner, glue, prop, and electronics. The hardware has been tested to be completely compatible with our kits. it contains;

Heavy duty ball links and control horns.
Composite pushrod materials to make pushrods as explained in this manual.
Wild Hare pull-pull kit for rudder.
3.5" Dubro or Sullivan wheels and 3/16" axles and 4 wheel collars..
20 or 24 oz. gas tank plus tygon line, tee, and fuel dot
2-56 throttle and choke pushrods with nylon clevises plus EZ connectors
Many miscellaneous small parts such as nuts, washers, horns, springs, etc.

Spinner. The Giles/MX2 requires a 3.5" spinner. Wild Hare normally keeps Dave Brown Vortec spinners in stock, they are cut to fit a large prop such as a 22-8 Bunny, and are normally available drilled for a DL-55/DA-50 and a 6 bolt pattern as is used on the TOC-53.

Switches. The Giles/MX2 has 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. Wild Hare also sells Smart Fly switches and A123 lithium-nano-phosphate batteries which are highly recommended.

Servos. Wild Hare sells servos from Hitec and HD Power, both are quality products. We flight tested this plane with HD Power 9110 servos on elevator and HD 9150s on ailerons and rudder. It is absolutely essential that you use good servos.

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

Carbon-fiber accessories - We have available carbon fiber landing gear, tail-wheel bracket and CF wing and stab tubes. These parts reduce weight and add strength, a very nice investment.

Assembly sequence

The fast-build nature of this plane has changed the natural order of what should be done when. It used to be that the first thing to do was mount the engine, now the landing gear comes first. Below is the approximate sequence for assembling this plane.

1. Open and inspect everything, add any updates or corrections noted. ****
2. Mount the landing gear and tailwheel.
3. Mount the horizontal stabs and rudder
4. Mount the engine to the firewall.
5. Install control horn studs in all surfaces.
6. Install the canopy/hatch
7. Install the servos
8. Install the pull-pull cables (where needed)
9. Install wings and fuel system
10. Install radio and controls
11. Set CG and control throws
12. Recheck and fine tune balance and throws, range check, test run engine.

It is extremely important that the engine runs properly and is reliable. More crashes are caused by engine failure than by all other reasons combined.

****** Once you start assembling the plane it can not be returned, so be sure that everything is acceptable to you before you start to cut, drill or glue anything.**

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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 and attached canopy, wing tube and stab tube, the elevator/stab assemblies, the rudder, cowl, wheel pants, landing gear and packages with the tail wheel assembly plus miscellaneous nuts and bolts. The hinges are pre-installed in the elevators and ailerons. The rudder is also hinged but not attached.

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. THE ORIGINAL PACKAGING IS REQUIRED FOR ANY DAMAGE CLAIM. Claims for any damage or defects will not be considered once you start assembling the plane.**

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.

Firewall reinforcement — First, be sure the firewall is properly glued, this is one weak spot of assembly line construction. To reinforce it set the fuselage on its side on an angle with the nose down. Put something under it, glue may drip. Drip 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 on the opposite side of the firewall. It’s also a good idea to install triangle stock in the corners where the firewall meets the sides, also with epoxy. After doing this we have never had a firewall fail in normal use.

Re-glue servo trays — One of the areas that the factory can do better is gluing the servo trays. After you have cut away the covering over each servo tray you should use some thin or medium CA to securely glue these into the fuselage and wings. **Note that the servos are recessed slightly beneath the covering, so the servo hole will appear larger than it actually is. Once the covering is cut away you will see a doubler installed with an appropriate sized hole.** These holes sometimes require trimming, they are sized for the smallest servo in the class and

some servos will be a bit larger requiring trimming.

Builder's Tips

Gas planes tend to vibrate more than one might expect. **Fasteners come loose** if not properly retained. Always use washers/lock washers. When possible use nylock nuts. You can put a little RTV silicone in the threads of screws to help keep them from coming loose. Do not use loctite on small screws, you may never get them out. An exception is engine mounting screws which should have red loctite.

To open the large holes in the covering use a sharp Xacto knife. Cutting covering dulls the blade quickly so have spare sharp blades available. Experts at covering use a new blade for every cut. That is overkill but be aware that your blade will dull quickly making smooth clean cuts impossible.

To open small round holes (such as for screws and for the control horn studs) neatly use a hot soldering iron, this creates a much neater opening.

Do yourself a favor and order a bag of socket head/washer head servo mounting screws from microfasteners.com, part # STW0207 (7/16") or STW0209 (9/16"). You will use them everywhere. $5 well spent.

On wheel collars I replace the small allen head set screw with a conventional 6-32 socket head screw SCA0604 also from Micro Fasteners. This allows you to get the screw very tight and prevents lost wheels, works with the Dubro wheel collars in the WH hardware kits.

It's a good idea to install the control horn studs in the hard points before you mount the h-stabs and rudder. Once installed on the plane handling the surfaces is not as easy.

When making adjustments to controls and balance, make small changes and try to make only 1 change at a time. This seems tedious but it can prevent a lot of troubles.

The canopy/hatch is held on by 2 x 6-32 machine screws. I have found that button head socket head screws stay secure without the use of lock washers and are nearly invisible.

ENGINE LOCATION — The firewall is marked with a "+" to indicate the centerline of the engine mounting. This takes into consideration thrust angle and should be correct, however we are working with plywood and fiberglass and getting a perfect alignment with the cowl may require some fine tuning. We strongly suggest that you check the alignment of the engine to the cowl before making the installation permanent. You can do this by mounting the engine using just two bolts, then check the alignment. If the engine must be moved slightly, fill those two holes with dowel stock, adjust the location and re-mount the engine. **Samples have shown that the "+" mark is approximately 1/8" low, so you should place a template's center point 1/8" above the inscribed mark.**

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Step 2. **Attach the landing gear.**

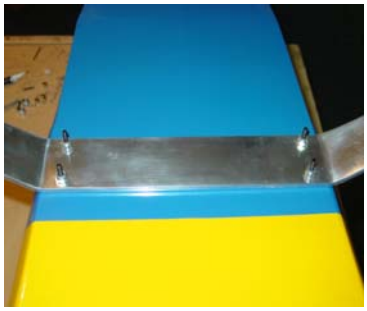
This step is first because it is easier to mount the engine with the plane sitting in its gear.

The main landing gear is bolted to the bottom of the fuselage with 4 8-32 x 1” screws and lock nuts. The holes are already drilled in the fuse, you just need to find them and open the hole in the covering with an Xacto knife or a hot soldering iron.

The tailwheel is inserted into a pre-drilled hole in the rear support plate, then two saddle clamps are attached with small wood screws to hold it in place.

After the rudder has been installed is the time to hook up the tailwheel steering linkage. The wheel is steered from the tiller by means of springs which protect the rudder servo(s) from damage from severe shock on takeoff/landing.

Note: These photos are from a different plane but the layout is identical.



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Step 3. **Attach the elevators/horizontal stabilizers and rudder.**

The H-stabs mount on an aluminum tube/spar and are retained to the fuselage by 2 4-40 screws on each side which go through a tab on the bottom of the stab into pre-drilled holes in the fuse.

The rudder has hinges glued into it. You will need to glue these hinges into the pre-drilled holes in the fin using a good hinge glue like Gorilla glue. Cut the covering away from the holes in the fin to expose the wood, swab some glue around in the holes to fully coat the sides and push the rudder hinges into the holes as far as possible, secure it with tape until the glue has dried.

Elevator servos mount in holes in the side of the fuselage as shown. There are also holes to mount rudder servos, do not get these two holes confused.

Step 4. **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 it is done on this fast build plane.

There is a “+” cross on the firewall. Templates are available for TOC-53 , DLE-55/DA-50 and possibly other engines. If one was not included with the plane please contact Wild Hare and we will send one out to you. The template has a center mark also. If you are not using a TOC-53 or DA-50 or equivalent you will need to supply your own template with a mark indicating the centerline of the crankshaft. **SEE errata note on page 8, engine location may need to be adjusted slightly.** Drill through the two center marks and mount the template to the firewall aligning the two center marks.

Drill the engine mounting holes with a 3/16” drill, then remove the template. It is helpful to back up the firewall with 1” aircraft ply squares and use CA to glue these squares to the rear of the firewall. This the screw heads or blind nuts from sinking into the lite ply firewall.

Mount the engine on spacers to put the spinner backplate 1/16” to 1/8” in front of the firewall. On a Dl-55 you will need spacers approximately 1/2” thick. On our test plane we simply cut 3/4” squares out of a piece of 1/2” plywood and drilled a 1/4” holes in them, it worked perfectly.

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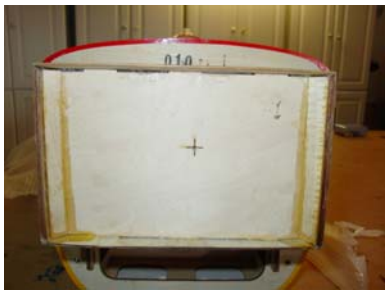

Mounting the Cowl — The cowl mounts via a ring that is glued into the fiberglass shell. This ring engages two plywood “hooks” at the bottom and is secured at the top by screws.

To mount the cowl slip it over the engine from the front and allow it to drop down slightly. When the cowl is flat against the F1 former lift it from the bottom to engage the hooks, then secure it from behind F1 with 2 8-32 screws with washers and lock washers.

In most cases you will be using a single cylinder engine mounted with the cylinder inverted. You will need to cut the cowl to clear the cylinder and to allow cooling air to pass over the engine. **Even if the engine will fit without cutting the cowl it still need the cooling air.**

The rear of the cowl has an area to exhaust hot air from the engine, this is all the venting that should be required.

The muffler outlet pipe(s) can be trimmed slightly to allow the cowl to fit over the muffler without cutting the cowl ring. Remove a little at a time so you do not remove too much.

Fitting the cowl and engine are the most time consuming steps. Take your time, the results will be worth it.

If at all possible do not cut the cowl ring.

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Step 5. **Install control horns**

Control horns are the stud type. An 8-32 steel screw is threaded into the pre-drilled hard point from one side of the surface (the bottom on aileron and elevators) and then the head is cut off leaving an 8-32 stud which provides a mount for the plastic control horn. The Wild Hare hardware kit includes control horns designed specifically for this plane or they can be purchased separately.

On ailerons and elevators for each horn mark a 8-32 x 2” screw 3/4 inch from its end. Thread the screw into the pre-drilled hole in the hard point until the mark is even with the surface. Then cut the head off the screw using a dremel with cutoff wheel or similar tool. Smooth away any burrs.

Thread the control horn onto the protruding stud. You may need to hold the shaft of the stud with a pliers to prevent it from rotating deeper into the hole. Screw the horn on to the stud until the top of the stud exits the horn. Final adjustment of horn height will come later as you adjust the servo linkage, but the distance from the surface to the bottom of the horn should be kept equal on both sides later.

On the rudder thread a 3” 8-32 screw in from one side until there is an equal amount of thread showing on each side, then cut the head off.

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).

Here’s another hint. Instead of using 8-32 screws, I cut sections from an 8-32 threaded rod. To screw them into the hard point I chucked the threaded rod section into my cordless drill, this worked well and was fast.

Step 6. **Mounting the hatch and canopy**

The hatch mounts to the fuselage by tabs on each side. The holes for mounting the hatch are pre-drilled and 6-32 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 soldering iron.

The canopy is pre-attached at the factory. No additional work should be required, but you may want to add a panel and pilot to dress the plane up.

When you attach the hatch to the fuselage use lock washers and/or some type of thread locker such as RTV silicone in the threads to avoid losing these two screws. Or use button head screws which hold very well, also available from Microfasteners.

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Step 7. **Installing the servos, adjusting the linkages**

In attempting to write this chapter, I realized that this operation is something that each person will want to do their own way. I will merely offer information that I know to be accurate and of help.

Use heavy duty (22ga if possible) extensions with good gold plated connectors. Current flow with these powerful servos is very important and connectors introduce resistance which can negatively affect servo operation.

Set the plane up so it’s easy to attach and detach the wings, and the h-stabs also if you see that they will be on and off the plane frequently. I usually plug 6” extensions into the aileron channels to make it easy to plug in the ailerons.

The installed rudder tray can be used to mount a single servo in a pull-pull configuration. A Hitec 7985 is very good, a HD 9150 is better, and a Hitec 7955 is excellent.

You should use good servo arms. Hitec servos come with excellent quality black plastic arms that are perfectly acceptable. Other servos will require an aftermarket arm such as the Dubro heavy duty plastic arms or MPI aluminum arms which are really nice.

At neutral, the servo arms should be perpendicular to the servo to yield equal travel in each direction.

The control horn pivot point should be close to the hinge line, but there is no absolute necessity that they be directly over the hinge line, close is good in this case. The exception is the pull-pull rudder, if the control horns are slightly behind the hinge line (as they usually are) it’s a good idea (although again not absolutely necessary) to use a servo arm with an offset that matches. Wild Hare sells the MPI offset arms which do a very nice job.

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Step 8. **Install the pull-pull rudder controls**

Using a pull-pull rudder linkage has many advantages. It is simple and light and easy to make, here’s how to do it using the Wild Hare pull-pull kit.

Start with your control horns installed on the rudder tiller equidistant from the center of the rudder and with the servo that will drive the rudder installed. Trim the covering away from the slots in the fuselage.

Screw 4-40 eye bolts into the two ball-links on the rudder horns and into two other ball links. Attach those two ball links to your rudder servo arm, one on each side. Screw the eye-bolts into the ball link about 1/4”. This will leave room for adjustment later.

Cut the supplied cable in half, and attach one segment through the eye bolt in each end of the rudder servo arm, and use the supplied crimp sleeve to secure the wire. You should now have an assembly consisting of the double servo arm, 2 ball links, 2 eye bolts and 2 cables..

Install the servo arm on the servo. Fish a long wire from the rear of the fuse through the slot in one side and up through the fuse. Tape the cable end from that side of the arm to the wire and pull it back through the slot. Repeat for the other side.

You now have both cables hanging out of the slots. At this point you will need to have power to the receiver and center the rudder servo. Use subtrim to get the arm exactly square to the fuse centerline. With the fuse sitting on one side slip a crimp collar over the cable and thread the cable through the eye bolt on the top side of the rudder, then back through the crimp sleeve. Holding the rudder centered, pull the loose end of the cable as tight as you can get it and crimp the sleeve down on the cable to secure it. Cut off the excess cable. Repeat this procedure on the opposite side of the fuse.

At this point the cables will be a little loose. If you followed the instructions you will have about 1/2” of adjustment at each eye-bolt/ball link. Tighten the eyebolts into the ball links to take up the slack. You want the wires pulled tight, but not so tight that they place a strain on the servo mount. They are not guitar strings!

When you actuate the rudder the non-pulling cable may become slightly slack, this doesn’t hurt anything. There should not be any slack when the rudder is centered though they should not be “piano” tight.

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Steps 9. **Installation of wings and fuel system**

The Giles/MX2 is a low wing airplane. Some people don’t like a low wing position, they feel that because and thrust line are quite far apart the flight envelope is affected. To accommodate these individuals we have added an alternate wing location approximately 1.5” above the scale location. Basically there are two wing tube sockets and you may choose to use either one. The lower location is closer to scale, the upper location is more neutral and will have a little less coupling.

We also include a mount for throttle and/or choke servos. This mount is not installed because there are some choices to be made.

The fuel tank can be mounted on top of the canister tunnel just in front of the upper wing tube. Putting it there minimizes changes in balance as the engine burns off fuel. However that location restricts the area where the throttle servo would normally mount. If you feel that the servo location in this setup is too restrictive you have a few options.

If you are planning to use the lower wing tube location only then you can cut the upper socket away which will allow the tank to be mounted approximately 2 “ farther back; or

You can use a smaller fuel tank; or

You can mount the fuel tank in the canister tunnel (if it’s not otherwise being used).

Whatever you choose, we suggest that you work out the wing location, the servo location and the fuel tank location before you commit to gluing or cutting anything. A little planning here will help a lot. The most flexible layout will have the tank in the tunnel allowing maximum room for servos and allowing you to retain both wing locations.

The Wild Hare hardware kit supplies the complete fuel system. We anticipate that you will use a two line system. In this arrangement one line is the vent line and simply goes to the outside air. The other line connects to a Tee, one leg of the Tee supplies fuel to the engine and the other leg is used for filling. Drill a 3/8” hole and mount the body of the fuel dot on the fuse side where it will be convenient. The fuel dot glues into the fuse, there is no nut to secure it. Use some thick CA to hold it in place. The line from the Tee goes through the fuel dot and is plugged with the supplied plug.

When using a gas engine with Walbro type carbs (pretty much universal) there is a valve in the carb that prevents fuel from flowing into the carb when the engine is not turning over, so you don’t need to worry about flooding the engine when filling it, the 2 line system works just fine.

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Steps 10. **Installation of radio and controls**

These 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.

There are pre-cut holes in one or both fuse sides that will fit the popular integrated switch/ charge jack assemblies. These are available from Maxx Products, Cermark, JR, and probably several other vendors. Some trimming may be required. . **If you do cut into the fuse side for any reason do not cut the balsa longerons at the top and bottom of each side.**

Please use good strong pushrods and other linkage parts. A sample of the assembly that we used is shown in the picture on the next page. We use fiberglass reinforced steel pushrods and our own brand of control horns similar to the Rocket City parts. The servo connection is done with #4 ball links attached to heavy duty plastic aluminum servo arms.

Making pushrods that will withstand the forces involved in a large plane of this type is very simple once you see how it is done. If you have your own design, feel free to use it, but make sure it will handle the load.

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. We use fiber-glass tubing because CF tends to split under compression.

First, set up your linkage using the ball links 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. The rod should screw into the ball link far enough to be sure there is sufficient thread engagement. It’s a good idea to draw a mark on the threaded rod about 3/8” from the end, then thread the rod into the ball link at least until the mark disappears.

Measure each pushrod, and cut a piece of fiberglass tube that is 1 1/2” 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 ball link. Tighten the nuts slightly so they don’t come loose (loctite helps) and so there is a little tension on the rod inside the tube.

You’re done. Install the pushrods.

Note: With solid steel the full length the rod cannot pull apart. The fiberglass tube carries the load when the rod is pushing. The only place it can bend is in the region of exposed steel rod, so the less steel rod that is showing the better.

Follow the manufacturer’s recommendation on setting up the radio receiver and servos. Be aware that on large planes current demand may be a lot higher than one might expect, your wir-ing must be able to supply at least 10 amps to the servos without a large voltage drop.

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Step 11. Balancing and control throws.

Balance and CG are not fixed things, there is a wide range of acceptable CG that can be set up to the pilot’s personal tastes, but we want the first flight to be safe and controllable. This should be done with the plane balanced at the center to the front edge of the wing tube. After this you may adjust the CG **in small increments** to suit the pilot’s requirements, but for the first flight anywhere in the front half of the wing tube will be acceptable.

To check CG in flight adjust the plane for straight and level upright flight hands off. Then at a safe altitude roll the plane inverted and let go of the elevator control to see what the plane does. Most people like to see the plane descend gently. If the plane heads aggressively for the ground it’s nose heavy, if it climbs it’s considered tail heavy. A tail heavy airplane can be very difficult to control, and a very nose heavy plane will have a tendency to snap easily and will want to land at a higher speed.

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. The elevator in particular at these 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. On the first flight you are much more likely to have too much control throw than not enough, so plan accordingly. Adjust to your preferences after you become familiar with