

WIND CATCHER RC FPVWRA SPEC WING V1.0

updated on 1 September 2019

Included in the kit

1 Left and 1 Right wing, NACA 0014 airfoil
2 balsa elevons
2 control horns with 4 screws
2 Z-rod
2 linkage stoppers
1 3D printed motor mount
2 3D printed winglets
2 – 3mm x 460mm (18”) carbon fiber rod main spar
1 – 1mm x 10mm x 190mm (7.5”) carbon fiber strip secondary front spar
2 – 1mm x 10mm x 500mm (~19.7”) carbon fiber strip leading edge
4 – 2mm x 500mm (~19.7”) carbon fiber rod trailing edge, optional to install
6 feet of laminate.

CG is 6.75 - 7” from the nose and should be the location of the 3mm main spar carbon fiber rods.
6.75” is recommended for FPV or beginner line of sight. More stability.
7” is recommended for more agility and line of sight. More agility.

You will need:

Razor, metal ruler, screw driver, allen wrenches, fine tip permanent marker, small drill bits, Starbond CA glue, Goop, Gorilla glue, hot glue gun, 3M – M77 spray adhesive

Build Tips:

Dry fit all parts before gluing.
Read instructions.
Some things must be dry fit before gluing them in place.
Dry fit all parts before gluing.

Quick Build

If this is your first time building a wing or need more detailed instructions, please see the Detailed Build area.

- Glue the two wing halves together.
- Cut channel for leading edge 1mm x 10mm x 500mm (~19.7”) carbon fiber strips. Channel is placed 3/4” from the leading edge.
- Cut channel for 3mm x 457mm (18”) cf rod on top and bottom of plane. Channel placed 7” from the nose.
- Cut channel for 1mm x 10mm x 190mm (7.5”) cf strip for front secondary spar. Channel placed 3 ½ inches from nose of plane.

- Dry fit all cf. Ensure none are sticking above foam. Use motor mount to hold 7" main spar rods in place.
- Use Starbond CA to glue all cf in place. Use activator (kicker) to cure CA immediately.
- Optional: Cut channel and install 2mm rod in trailing edge.
- Cut to shape balsa elevons and install with Goop hinge technique
- Install laminate.
- Install control horns, Z-rod, Linkage stopper, and servos.
- Install winglets
- Install Battery and other electronics.
- Install motor to find CG. Battery and motor might need adjusting to set the CG in the correct location.

Detailed Build

Glue the two wing halves together.

This kit meets the requirements for FPVWRA Spec Class.

Be sure when assembling that you keep the frame in the specification for Spec Class.

See the FPVWRA.NET website for details.

There are several methods to gluing your wings together. The most important is that you use an adhesive that will adhere to the EPP very well. I recommend Gorilla Glue (the foaming variety), however do not add water when using it for the wings to get maximum adhesion. If you are not in a hurry, place the glue on both wings. I have been successful using pins and rubber bands to hold the wings together while the glue sets up. The great thing about Gorilla is that you have a lot of time to get everything in place. If using the pins and rubber bands, do not let the rubber bands apply a lot of pressure. They need to be only tight enough to be sure the wings do not move around while the glue is setting up and possibly foaming a little bit. Be sure even pressure is applied on top, bottom, front, and back of the plane and that both wing halves are flush all the way around and aligned properly. Once cured, use a utility knife to cut away any extra glue that foamed out.

TIP: Put something like plastic or paper under the plane. Glue might drip down.

If you are in a hurry, you can apply Gorilla glue to the middle and Starbond CA glue along the outside parameter of the wing. Then use kicker to set the CA glue. The Gorilla will setup over time. Be sure the plane is kept level and square while the Gorilla sets up. This method will allow you to start putting your CF into the plane right away. Be careful that some Gorilla might leak out while you are working on the plane.

I've heard a few people use the third method using only Starbond CA to glue the wings together with kicker.

NOTE ABOUT CUTTING THE FOAM FOR THE CARBON FIBER

If you cut too much foam out, don't worry. When it comes time to glue, you can use Gorilla glue with the smallest hint of moisture in it to help fill the gap and glue in the cf strips. Do NOT glue any parts until instructed to do so.

*NOTE for Lee: ADD PICTURE of CF placement

Cut channel for leading edge 1mm x 10mm x 500mm (~19.7")carbon fiber strips. Channel is placed 3/4" from the leading edge.

Measure 3/4" from the leading edge. Use a fine tipped permanent marker to mark where the 1mm x 10mm x 500mm CF strips will be placed. Using a sharp razor cut a 1mm channel 10mm deep.

The technique that works for me is to use a metal straightedge. Cut on the left side and then the right side of the fine tipped mark. Cut only 10mm deep. Then use a tiny flat head screw driver to dig out the 1mm thick foam strip. Dry fit the 1mm x 10mm x 500mm strip into the channel and cut away only what is in the way. Do this for both the left and right side leading edge of the plane.

Cut channel for 3mm x 460mm (18") of rod on top and bottom of plane. Channel placed 7" from the nose.

There are two 3mm x 460mm CF rods that will be the main spar. One will be placed on top and the other on the bottom. Both will be placed 7" from the nose. The ends of the 3mm rods should be touching the leading edge spars when everything is in place.

Cut a thin channel on the surface of the plane for the 3mm rod to sit in. They will flex downward in the center of the plane using the motor mount. The ends of the 3mm rod will stick up past the foam at first. You will need to find the fulcrum point which usually sits about 75% from the middle of the plane and remove more foam from under the rod. Remove the motor mount and rod before removing more foam. This step might take a while as you test fit often. Test often and remove only small amounts of foam at a time. Only remove the foam that is preventing the 3mm rod from sitting below the foam surface. Do not cut the channel too wide or too deep. Take your time.

Cut channel for 1mm x 10mm x 190mm (~7.5") front secondary spar. Place channel 3 ½ inches from nose of plane.

Measure 3 ½ inches back from the nose. The 1mm x 10mm x 190mm spar will be placed here. Cut a 1mm wide channel 10mm deep using the same method as the leading edge spars. This 190mm spar should also be touching the leading edge spars once it is in place.

Due to placement of electronics you might want to move this spar a little bit forward. The important part is that this spar is somewhere in the recommended vicinity and it needs to be touching the two leading edge spars.

Dry fit all CF.

Lightly wet sand all the carbon fiber with 120 grit sand paper to give the adhesive a better chance of gripping the CF.

Use motor mount to hold 3mm main spar rods in place. Ensure none are sticking above foam.

This is your last chance to be sure all the carbon fiber is in the correct location and none of it is sticking above the foam. Adjust as needed. The front secondary spar and main spar need to be touching the leading edge spars so it is creating a trapezoid shape. This box like structure helps keep your electronics and plane safe and helps reduce tearing caused from various stresses during a crash. Nothing is indestructible, however this method of cf placement will help.

Use Starbond CA to glue all cf in place. Use activator (kicker) to cure CA immediately.

Do NOT glue area near the motor mount. Leave about ½ inch to the left and right side of the motor free of any glue.

Having a friend helps if the CF does not want to stay in place. Don't glue your fingers together or to the plane. Use plenty of Starbond CA glue on both sides and under the CF. We suggest you leave the CF in place and run the glue bottle tip along both sides and the top of the CF. If you applied too much CA glue, use a paper towel and **quickly** run it across the top of the plane to take up any CA before it cures. If you are certain the CF looks good, spray the CA kicker (activator) on the wet CA. Glue one piece of carbon fiber at a time.

If you do not have CA kicker, Baking Soda works great as a catalyst.

If you accidentally removed too much foam while cutting it away, use the foaming Gorilla glue with a hint of water to help fill the gaps.

We suggest to also fill the gap on the top and bottom of the 3mm rod main spars. Add gorilla glue with a drop of water. Cover the gap as quickly as possible with clear packing tape or wax paper. Then cover with the shells the wings came with. Add a lot of weight, however don't distort the wing with too much weight. Leave it sit over night to cure properly.

The gorilla glue will expand and fill the gap. The shells will help keep the foaming glue conform to the airfoil. The clear tape or wax paper should peel off easily once the gorilla glue is cured.

Optional: Cut a Vchannel and install 2mm rod in trailing edge.

The 2mm rods on the trailing edge will help reduce twisting of the frame on a fast racing plane. It will also help reduce some of the tearing from crashing and help keep the frame more rigid. The plane will fly okay with out these rods and you won't see a performance difference at low speeds.

Cut a shallow V channel and install 2mm rod in trailing edge. 2mm rod will cross over top main 3mm spar rod. This point will be measured perpendicular from the 3mm main spar rod to the trailing edge of the plane. The 2mm cross over point on the main 3mm spar will be 1 ½ inches from the trailing edge. The other end of the 2mm cf rod will be placed 1/4" from the trailing edge near the tip chord (outside) of the wing. The exact location of the 2mm trailing edge rod is not too important. If you decide to install it in another way, be sure you do not block the motor mount.

Once satisfied with the location, you can use Starbond CA to glue in place.

Cut to shape balsa elevons and install with Goop hinge technique

Builders have several techniques for carving, shaping, and installing elevons. Be sure that any alterations still meet FPVWRA Specification if you plan to race.

The elevons have a top and bottom. Find the leading edge (thicker part) of the balsa. There is a 90 degree bevel. This is the bottom of the elevon.

More experienced pilots who prefer high deflection of elevons might want to alter the bevel to allow more travel. If any altering is done, be sure it's even across the the length of the elevon. Use sandpaper on a block or a very sharp razor and make small alterations until the desired bevel is achieved. Personally, I like to do the alteration after the elevon is installed with Goop.

Place the elevon so the top leading edge is flush with the top trailing edge of the foam plane. Using a straight edge placed along the outside of the wing, align the trailing edge corner of the elevon with the wing tip using the straight edge. Use a pencil to mark this line and cut it away with a razor or saw. Cut the same angle on the other side of the balsa elevon. The left and right side of the balsa elevon should now be parallel with the center line of the plane, outside of the wing, and line up with the winglets when they are installed.

Lightly sand the balsa to get rid of any saw marks.

Do the same for the opposite side of the plane.

*NOTE for Lee: NEED TO HAVE PICTURE

GOOP hinge

There are many methods to hinging. We recommend using the GOOP method. It is thin, tough, and has a nice sleek look. It is easy to do once you get the hang of it.

Set the elevon exactly where it needs to be placed on the plane. There should be no gaps between the foam and balsa. Using masking tape to hold the left, right, and middle of the elevon in place. The tape will run parallel with the wing tip.

Place a long strip of tape above and below the hinge line leaving $3/8 - 1/2$ inch of foam and $3/8 - 1/2$ inch of balsa exposed. This is your last chance to be sure the elevon is in the correct position. Be sure it does not stick out too much where it would be rubbing on the winglet after the winglet is installed. Also be sure the top of the plane is flush with the top of the balsa.

Run a healthy bead of goop along the hinge line. Use an old credit card or plastic gift card to squeegee the goop in place. It should be a thin film about $1/32$ " thick covering all exposed foam and balsa. Work it back and forth with the plastic card. Do not scrap the glue off leaving the foam or balsa "dry".

Leave everything to setup and cure for about 10 minutes or longer. After 10 minutes, remove the tape. If the has already cured too far to lift the tape, use a new sharp razor to lightly cut the goop away from the tape. Be sure you do not cut the foam.

When removing the tape, use a sharp razor to cut the goop away from the masking tape. Be sure you are not cutting into the foam or balsa.

Do this for both elevons.

There are many Youtube videos showing this method.

Install laminate.

There are several techniques for adding film to foam planes. We suggest the following method:

Cut the film into four panels that will fit the left, right, top, and bottom of the plane leaving several inches sticking out in every direction. You could cut the film into two panels for the left and right side of the plane with the middle of the film folding over the leading edge of the plane.

Please make note that there is a shiny side and a matte side of the laminate. Be sure the shiny side is up.

Select one area such as the top left of the plane. Lightly spray that area with 3M – M77 aerosol spray adhesive. Let it setup/dry for about 10-15 minutes. Using a film covering iron set around 200 degrees Fahrenheit, apply one panel of laminate to the plane. When placing the laminate on the plane, be careful not to introduce wrinkles. The spray adhesive will still be tacky. Starting from the center of the

laminates, work your way out to the edges allowing the film to roll over to the opposite side of the plane several inches.

Do this for all four sides allowing the laminate to overlap other pieces of laminate. Do not be afraid to trim the laminate as needed when it's too long or in the way. Ensure the entire plane is covered with laminate.

When covering the elevons, be sure the laminate follows the contours of the gap between the foam and balsa on the underside of the plane. It is okay to allow the elevon to flop over completely laying over the top of the plane to allow easy access to the gap on the underside.

Once the entire plane is laminated, turn the film iron up to 300-350F and go over the entire plane again starting from the center of the laminate and work your way outwards. Do NOT sit on the laminate or foam in one place too long. The iron is hot enough to melt the foam.

Cut away any laminate that might be sticking out.

The winglets can pop off in the event of a harsh landing. Hot glue is the typical method for putting winglets back on. The covering will help protect the foam.

Patience is the key with laminate. This is a slow process.

Install control horns, Z-rod, Linkage stopper, and servos.

There are two theories of how the Z rod should be placed. Some people recommend aligning the Z-rod to be perpendicular to the hinge line. Other people have had great success having the Z-rod aligned with the center chord line and airstream of the airplane. If you notice binding, upgrading to a ball link on the control horn should help.

Be sure when figure out your placement of servos that they have enough foam to sit recessed inside the pocket, there will be no binding on the Z-rod, and be aware if you need servo extensions. We also recommend, if possible, to place the servos behind the CG, especially if you will be racing and have more equipment on the front of the plane.

Install the linkage stoppers on the servo arm. Once you found the correct hole on the arm, be sure to use thread locker on the small nut that holds the linkage stopper on the arm. Do not over tighten the nut. If you are using Dubro, be sure to use the metal washer. The linkage stopper needs to be able to rotate on the servo arm.

Using the Z-rod, figure out where the control horn should be placed on the balsa elevon. The holes for the Z-rod on the horn should be directly above the hinge line. Use a marker to mark where to drill. Use an appropriate drill bit slightly larger than the control horn screws. Install the Z-rod on the control horn, then screw the control horn down to the balsa elevon with the plastic square horn plate under the elevon. Do not over tighten or crush the balsa. The horn should be snug and not move around.

Install winglets

Use hot glue to tack on the winglets. Put a good dab on the front, top, bottom, and back of the winglet. Be sure the winglet's leading edge is BEHIND the leading edge of the wing. Use the top and bottom

lines on the winglet to center it on the plane's wing tips.

If the winglets fall off in the field while flying, you can use hot glue to put them back on.

TIP: Hot glue releases with denatured or isopropyl alcohol.

Install Battery, other electronics, and find CG.

The placement of the battery and motor should be left to almost last due to the weight. Find the placement for your various electronics. It is okay to remove foam in the middle of the airplane as needed. Only remove foam that is in the way. Try to maintain the integrity of the plane the best you can.

Install the motor on to the motor mount and install the prop, however do not connect the wires. The standard 3D printed motor mount will have supports in the center hole. It is okay to knock these out with pliers or a screw driver.

Standard Motor Mount:

When installing the motor, do not use over sized screws or you might crack the plastic. It is okay to use a drill bit slightly smaller than your screws to tap the area the screws will be placed. You can also use the screws to cut threads by driving them in a bit, then unscrew them a bit, then drive them in a little bit more. Do not over tighten or force the screws.

Upgraded Motor Mount: (currently being tested)

Using the four M3 – 8mm screws, mount the motor to the motor mount. Cobra motors will require the wires to be routed through the holes behind the motor. T-motor will require the wires to be routed around the side wall and then inside the mount.

Install the motor mount on to the 3mm rods. It will “ratchet” into place. The motor mount was designed to be adjustable during the build process to find the proper balance on the CG. Adjust the motor and battery as needed to find the correct CG. Be sure the motor mount is square and secured with enough plastic over lapping the 3mm CF rods and foam.

Center of Gravity is 6.75” - 7” from the nose.

After everything is installed and you are triple sure the CG is correct, lay a bead of hot glue along the left and right side of the top and the bottom of the motor mount to secure it in place. We suggest hot glue because it can be removed with alcohol at a later time if the motor mount needs to be removed or replaced.