

Zero Instructions

Thank you for purchasing the Zero 2548 combat model. This plane can be built very quickly. It is tough, durable, and will survive a lot of combat. It is intended for 2548 Scale combat but also makes a great sport flyer.

Manufacturer makes no warranty, implied or stated, as to the suitability of the model or materials for any purpose. The user accepts all responsibility for the safe use and operation of the model.

Items needed:

1. 2 inch wide Strapping tape or bi-directional strapping tape.
2. A little CA or epoxy glue.
3. Pro-Bond Polyurethane glue also sold as Gorilla glue.
4. Spinner 1.75" for the Zero.
5. Radio, 3-4 servo's (any size) Mini-servo's and small battery preferred.
6. 3 control horns
7. Pushrods, miscellaneous connectors
8. 6 ounce Sullivan (426) rectangle fuel tank is required.
9. .25 size motor

Wing assembly:

Lightly sand the wings smooth. Sand down the trailing edge if needed to fit the trailing edge balsa. Glue the 2 halves together using foam safe CA or epoxy. Make sure they are straight and you have the dihedral angle you want! (Dihedral is pre-cut) Now apply Probond to the spar slot. To spread the glue into the slot a piece of 2-56 pushrod wire bent into a 90 degree angle works well. Mist the slot with a water spray bottle to activate the glue and get it to foam up more so it will fill the spar slot. Then push the rod into the slot with a screwdriver or appropriate tool. Wipe off any excess glue that squirts out. Be sure you have a light even coat of glue on top of the rod so the slot gets completely filled with glue after it foams up. If you keep an eye on it while it dries you can redistribute the glue from areas where you have too much to areas where you don't have enough. Let everything dry overnight. Pin the rods down so the Pro-Bond doesn't push them out of the grooves as it foams up.

Repeat the process with the leading edge rod. You can make the leading edge slot deeper with a dremel tool and sink the rod deeper into the foam. This will protect the rod in a mid-air bit. Sand off any excess probond or fill any defects with light weight spackle.

Glue on the trailing edge stick with probond. Put the plastic strapping material underneath the trailing edge sticks. This will prevent the wing from splitting at the TE in a crash. You can do the spars, leading edge and trailing edge in one step and rubber band and pin everything in place while it dries.

Apply the included plastic material to the TE area to strengthen it. It must be flush with the trailing edge of the wing covering the trailing edge stick. Use a heat gun to warm and soften the TE plastic and mold it into place. Don't cut it to make it fit so it can help prevent splits in the wing TE. Trim to fit and glue into place with 3M 77 or probond. Note that unlike the P-51 and 109 there is no trailing edge wood behind the trailing edge stick. The round piece of plastic is to reinforce the leading edge. Heat it with a heat gun and it will become very pliable. Mold it to the shape of the leading edge and glue it on with probond or 3M 77. Alternatively, you can use a pop sickle stick to reinforce the leading edge where the rubber bands will be pulling on it as the foam tends to get crushed after a while. To make things look neater you can sink the Popsicle stick or plastic into the foam.

Use one piece of strapping or unidirectional strapping tape and run it around the wing length wise over the top of the spar rods. The unidirectional is lighter than bi-directional. A light coat of 3-M 77 spray glue makes the tape stick better to the foam. Another light coat on top of the strapping tape allows the covering tape to stick to the tape better. You can also cover the wing first and then attach the ailerons with bi-directional tape. Seal the edges of the tape with water based polyurethane or paint or CA. The new 3m-77 might attack foam if you use too much. Apply a very light coat from some distance so the solvents evaporate before they hit the foam. Test on the wing shucks first!

The ailerons should just clear the fuselage and be free to move. To make strong hinges that are free to move well take 2 1.5 inches of 3/4 inch wide unidirectional strapping tape and stick the two sticky sides together overlapping about 1/4 inch. You will need 6-9 of these per aileron. Spray some 3-M 77 on the aileron where they will attach to the aileron. Apply them alternating between being stuck on the top on the top side of the wing to being stuck to the bottom of the wing in groups of 2 or 3 strips per group. Put them on the wood first and get them bent in the correct direction as

much as possible. Spray the wing with 3M 77 and put the aileron in place. If you apply the aileron quickly before the 3M 77 dries you can reposition the tape pretty easily if you don't get it right the first time!

Wing tip shape is traced on the back side of the instructions or box if needed. Sand to shape.

Fuselage:

- A. Join the front and rear halves of the fuselage with foam safe CA or epoxy. Make sure the grooves for the fuselage fiberglass rods line up. The rear section needs to be put on with the correct side up. The top of the fuselage should be closest to straight. In other words the tail end of the fuselage should be above the centerline rather than below the centerline of the fuselage. Try to avoid getting glue into the slots for the fiberglass rods. Place both pieces on a flat surface covered with wax paper to help get them straight. Sand if needed to get them to lay flat on the building surface with no gaps. After dry, Lay the rudder piece on a fuselage half and mark it's position. The bottom of the rudder should be at the bottom of the fuselage. There should be about 1/2 inch of the rudder behind the fuselage. Remove enough foam to make for a tight fit of the rudder into the fuselage after you join the 2 halves. You need to cut the fuselage to make a place for the elevator. Use the slot in the rudder to get an idea where it should be. Mark the spot with a marker and make 2 vertical cuts into the fuselage down to the upper fiberglass fuselage rod. Remove these 2 pieces of foam and save them for reinstallation after the tail group is mounted. It's a lot easier to do these steps before joining than after! You should make sure your elevator slot is square to the firewall. Use 2 levels to make sure it is at least close. You can use some shims if needed later. Glue the fiberglass rods into their slots with probond. A bent over scrap of 2-56 wire works well to spread the glue through the slot. Push the rods into place with a screwdriver.

Mist with water to make the probond foam up and fill the entire slot. The rods must butt up against the firewall. **Do not** notch the firewall for the rods. Pin them in place while the glue dries. Install the 1/8 plywood wing hold down reinforcements at the same time. Wet the wood so the probond will foam up well and fill the voids and bond them to the fiberglass fuselage rods. The front hold downs have the nose airfoil shape precut. The back one should end up flush with the wing saddle area. Use probond to glue the 2 halves together. Do not glue the area behind the tail group at this time! You need it open to get the tail group in place later. Rubber bands work well to hold the halves in position while drying. When dry sand off any excess probond and fill and defects. A great planes power planer works great to chew off the excess glue. Be careful though as it will remove foam very quickly also. Trial fit the canopy and cowl and sand the fuselage as needed and trim the canopy down to the first panel line to get a good fit. Put the wing in place and mark the spots for the wing hold down dowels. Drill the hold down holes through the plywood pieces in the fuselage. Be sure to keep them square to the fuselage and right over the leading and trailing edge of the wing. Best done after the wing is completed!

- B. Prepare the firewall by installing blind nuts for the motor mount. The back side of the firewall is tough to get to after installation so don't forget this step before attaching the firewall! If you strip one out or need to replace a blind nut a 4-40 pushrod works great. Put the pushrod through the hole into the fuselage and screw on the blind nut. Use the rod to pull the blind nut into position. Use a nut to tighten the blind nut into place. Trial fit the firewall and motor assembly before drilling the motor mount holes. You may need to remove a bit of the fuselage and firewall for the muffler to clear and you don't want to have that end up in an area where the structural fiberglass rods are. Usually the motor ends up being tilted with the muffler down about 45 degrees. You can also use a muffler extension to clear the fuselage. When completed put the throttle pushrod into position and then the fuel tank into position. You should also drill holes for the fuel lines and throttle pushrod to come through. Be sure the lines won't get kinked. Use some scrap balsa blocks or dense foam to keep the tank away from the firewall or your fuel lines will get pinched or cut against the firewall. Make sure the muffler will clear the fuselage. It's not a bad idea to put the motor mount screws in place while you attach the firewall so you don't get them full of glue! Attach the firewall with probond. Be sure to put in the fuel tank and throttle pushrod and fuel lines before attaching the firewall! Masking tape can be used to hold it in place while drying. After dry sand off any excess firewall. A belt sander works great here. Test fit the cowl and sand as needed for a good fit. Trim away a little of the back part of the cowl as it is narrower from the molding process. Wrap the fuselage with strapping tape just behind the firewall and just in front of the wing saddle and just behind the wing saddle. This is critical as it keeps the fiberglass rods from being able to bow outward on an impact and exploding your plane!

2. Tail assembly:

- A. Find the rudder and elevator pieces. Sand them with course sandpaper to make a nice curve on the edges. To make the elevator hinge, remove one side of the box of the coroplast; the other side serves as the hinge. Make the initial cut down the center of the box being careful to only cut through one side. **You do not want to cut it off**

completely. After you have the initial cut down the center of the box fold the box open. This will expose the areas that need to be trimmed. Carefully trim off the excess material. After you have it trimmed, flex the elevator up and down with maximum deflection. This will loosen up the hinge a bit. Make an elevator joiner from a piece of scrap 2-56 pushrod about 4" to 6" long. Bend it so there are 2 one inch pieces perpendicular to the remaining 2 inch piece in the center. Position it on the elevator and push the ends into the elevator. You will be going across the flutes of the coroplast. When in position remove it and force a small Phillips head screwdriver into the holes to enlarge them a bit. Squirt some probond into the hole and replace the joiner wire. Place the elevator on a flat surface and put a little weight on it to keep it flat. Use a small scrap of balsa to keep the joiner pushed into the elevator as far as possible. Let dry overnight. If you skip this step and there is tension in the elevator from the joiner wire it will pull the elevator into a bend.

If you plan to paint the elevator and rudder wipe them down with acetone or alcohol to remove any remaining mold release from the plastic. You can also scuff it up with sandpaper or steel wool to help the paint adhere. This is much easier to do before you join the tail group!

B. Find the center of the elevator and mark a line from front to back. This line helps you to position the rudder correctly. Mark the elevator and rudder where they contact each other and the fuselage so you know where to apply probond. Be sure the rudder and elevator are square to each other. Before you attach the tail group to the fuselage permanently it is a good idea to place the wing on the fuselage and verify that the tail group is square to the wing. Make adjustments as needed before gluing in place!

Place the elevator into place and check the incidence with 2 levels. Put one on the elevator and one on the firewall. Set them both at zero. If needed make adjustments to achieve the required zero incidence. Trim off any excess rudder from the bottom side.

Cover the fuselage with colored packing tape or even fiberglass if you prefer. Just cover over the slots you made for the rudder and cut them open after covering is complete. Be careful with the bi-directional tape as it adds weight very quickly. You can also paint over the packing tape with latex house paint. Scuff the tape well with steel wool and give it a light mist of 3M 77 to help the paint stick better.

When satisfied apply probond to the tail assembly in all the area's it will contact the fuselage and itself. Put the elevator in place and slide the rudder up onto it. Try to keep glue out of the elevator hinge line! Use the levels again to verify the incidence and apply clamps or rubber bands to hold everything in place until the probond dries. **Double check the elevator incidence before the glue dries! Be sure the tail group is square to the wing!** Replace the pieces of foam you removed earlier with probond. You will need to remove the thickness of the coroplast to make them fit. Pin them in place while the glue dries.

Cover the wings with 1.5 or 2 oz fiberglass or colored tape. Lay the glass on the wing and then brush on water based polyurethane varnish. To fill the weave of the glass cloth mix spackolite filler with water until it is paint like consistency and paint it on. When dry sand nearly all of it off. Be careful not to sand holes into the glass! Then paint with Latex house paint. Or you can cover with a low temp film covering or glass with finishing resins if you prefer. The best WBP varnishes will say alcohol resistant on them. I use McCloskeys Crystal Clear. The planes can be covered with low temp iron on film or painted with latex house paints or any other foam safe paints. Test the paint on scraps first if your not sure! Many paints will dissolve foam! You can also use packing tape of the correct color or paint with latex paint and use clear tape. Be careful of the weight gains!

I recommend two small servo's mounted in the wing for the ailerons. You can join them with a Y harness. You can use a single servo with a torque rod setup, or you can install a cable with a single servo mounted flat in the center section. The elevator and throttle servo are mounted inside the fuselage in the wing cutout area. Then you can shift the receiver and battery either in front of or behind the servo's to get the correct CG. Install servo rails across the fuselage of hard balsa sticks. Attach the included fabric to the fuselage with thinned epoxy or foam safe CA where the sticks contact the fuselage to strengthen. Mount the control horn on the elevator. Use a long drill bit to make a hole to the inside of the fuselage following the required path of the pushrod. It is a good idea to use a scrap of foam or balsa to support the pushrod somewhere in the back half of the fuselage or it can bow from side to side or up and down and will not be as effective as it should be! I like to use a cable type of pushrod for the throttle. This decreases the number of stripped gears in the throttle servo!

Attach the cowl to the fuselage with some small screws going through the cowl into the firewall. The cowl will extend over the fuselage for an inch or so. The cowl may be longer than required. Trim as needed. Glue the canopy on with your favorite canopy adhesive. CA will work but you can fog the canopy if your not careful. Put the decals included into place after painting. You must seal the edges of the decals with thin CA or thinned epoxy to keep them in place. You can iron down the decals with a covering iron on low heat to make them stick better. Be careful as they will melt with too much heat.

Balance point is on the spars or up to 1/4 inch behind the spars. The furthest forward CG point is the most nose heavy and is more stable. It will be touchy at the most rearward CG point but will perform the best if you can handle it! Set the control throws at: ailerons .5 inch up and down and elevator at .4 to .5 inch up and down. Adjust later to your liking.

Aileron position can affect the amount of elevator trim required. Set the ailerons neutral or just slightly reflexed (up) If the plane requires a lot of up or down trim to fly level you can adjust the aileron reflex to correct this a bit. If the plane requires a lot of up trim to fly level and - or is pitch sensitive especially to down maneuvers raise both aileron a few turns on the clevis and try it again. I believe the pitch sensitivity comes from the ailerons fighting the elevator to control pitch. The ailerons act as elevators on the short coupled planes. If the plane is overly sensitive to elevator inputs even with reduced throws then make the plane more nose heavy by shifting the battery forward. Another clue can be collected by flying inverted. It should take a little forward movement of the stick to fly level. If the plane climbs or flies level hands off when flying inverted you probably need to raise the ailerons a bit. It should go down somewhat but not radically.

If you use a bladder type tank placed on the CG balance the plane on the nose heavy side as the added weight of the fuel won't be a factor.

Put in a little up trim, have a friend give it a strong underhanded toss into the wind, and have some fun!
I can be contacted by email at Hattrickmwf@gmail.com

Hat Trick Enterprises 920-210-1975 Mike Fredricks
W8530 CTH S
Beaver Dam, WI 53916

I also have Bi-directional strapping tape available. It has filaments running in both directions. It comes on a 50 meter roll and costs 15\$ plus shipping.

Custom CNC foam cutting and CNC routing is available.