Mako Construction Guide

Specifications: Original 32” Mako

- Wing span – 32”
- Length – 35”
- Wing area 310 sq. in
- Weight - (without battery) – 13.5 oz.
- Center of gravity is 12 1/2” from tip of floats
- Motor: 2212 – 1900 KV or 2212-2200 KV
- Prop: 6X4E or 6X5E
- Battery: 1800 mah to 2500 mah 11.1 V (2200mah is a good size with a 9min flight time)
- Speed Control: 30 or 40 Amp

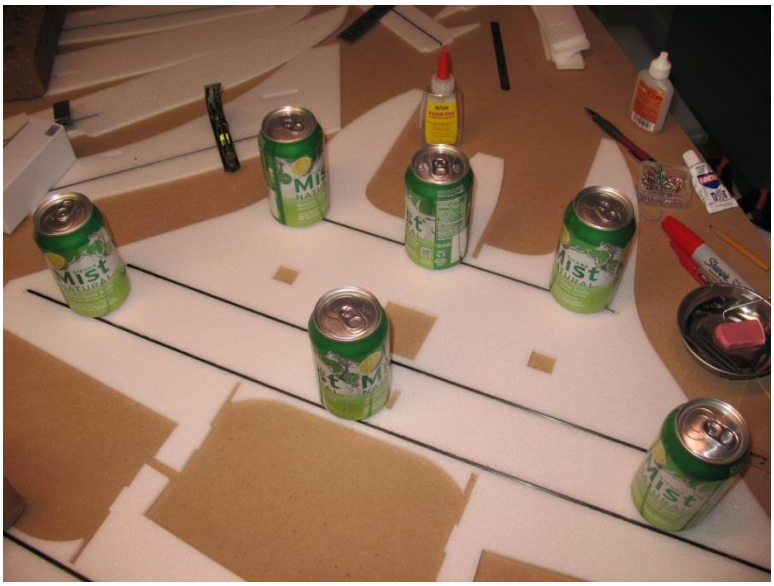
Specifications: 42” Mako XL

- Wing span – 42”
- Length – 46”
- Weight - (without battery) – 26 oz
- Center of gravity is 16 1/2” from tip of floats
- Motor: Suppo A2814/6 - 1400 KV (3s) or A2814/8 - 1100 KV (4s)
- Prop: 8X6E or 9X5E
- Battery: 3300 mah (4s) to 4000 mah (3s) (min of 330g battery weight needed to balance plane)
- Speed Control: 60 Amp
- 9 gram servos for ailerons
- 11 gram Goteck GS-9025MG Micro Metal-Gear Servo (STRONG) for rudder and elevator
- Servo Extensions; Same as original mako. 300mm or 12inches. Longer will work to, but not shorter.

Additional Items needed to complete kit:

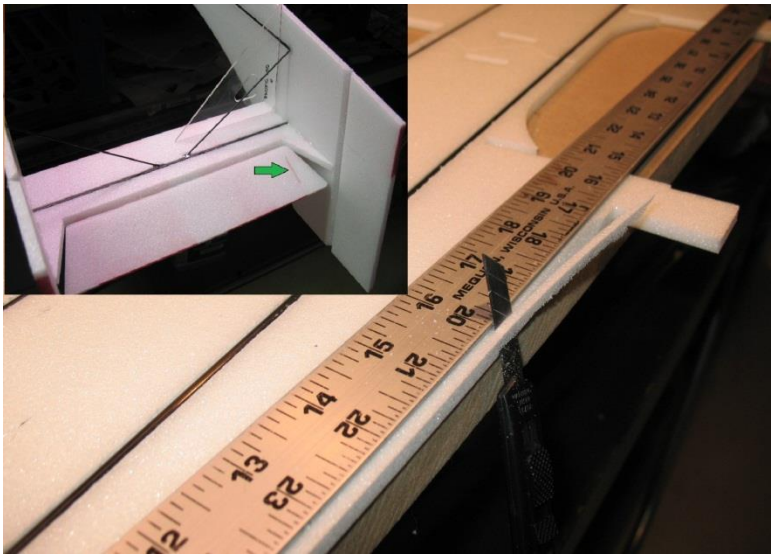
- Glue – Foam-Tac and Gorilla Glue
- (WARNING DO NOT USE WELDERS ADHESIVE, IT WILL MELT DEPRON)
- Velcro
- Servos
- Motor
- electric prop
- ESC
- 4 - servo wire extensions 12” or longer
- Blenderm Tape or fiberglass drywall tape for hinges
- Battery
- Paint or decals
- Screws to mount motor to plywood
- CorrosionX (water proofing for motor, esc, receiver).

We begin the build by assembling the main wing halves, the tail halves, and installing the carbon spars. When installing spars, use only a small amount of glue in the groove, (Foam-tac can melt the foam a little) (WARNING DO NOT USE WELDERS ADHESIVE, IT WILL MELT DEPRON) Press the spar into the groove, remove the spar and let the glue chemicals evaporate for a few seconds, then push the spar back in and add a thin coat of Foam-tac on top of the spar.

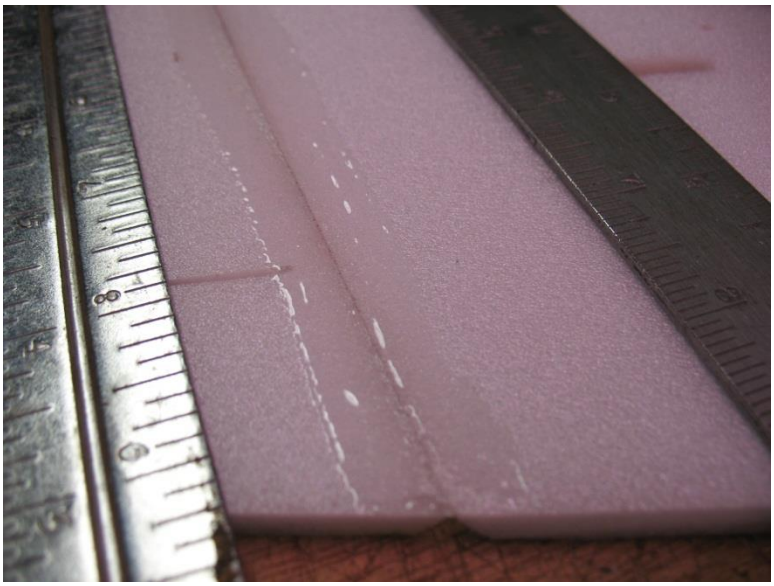


It is recommended that you use a flat smooth surface, wax paper, and some heavy items to keep the wings flat while glue is drying.

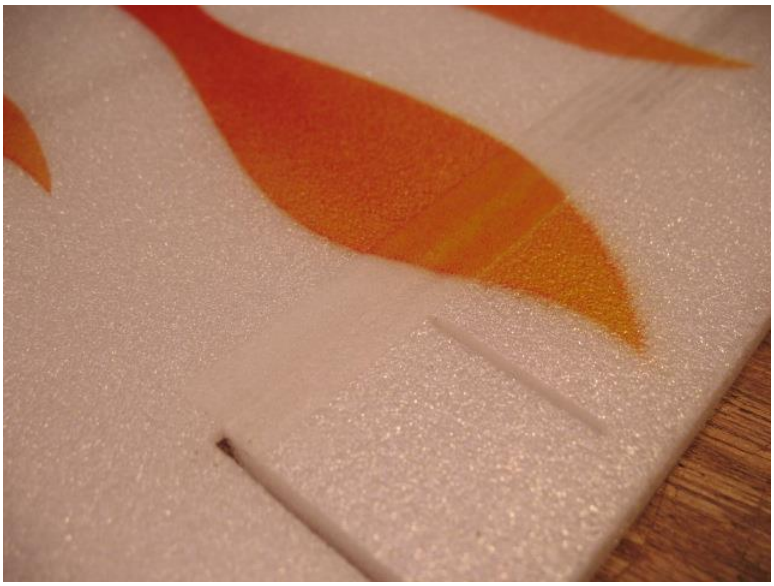
You should now bevel and hinge all control surfaces. Make sure to bevel the correct side. The Photo on the right shows the underside of the control surfaces being cut at an angle. And the elevator slot location with stab upside down.



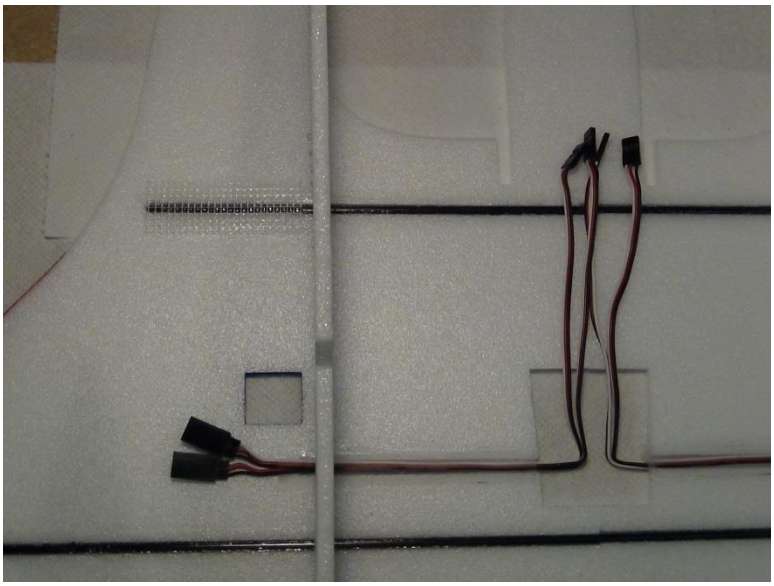
We use a simple tape hinge (Blenderm tape works well). The Photo on the right shows a thin layer of Foam-tac on the depron before tape, it makes the tape stick even better. (For best results, let the glue dry for a 30 seconds before applying the tape).



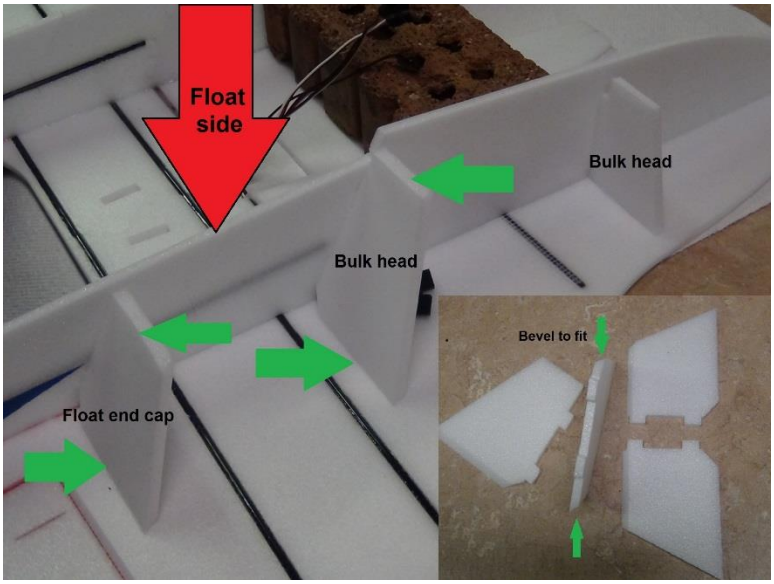
Now is a good time to sand the corners, paint the wing, tail, and fuselage sides. Krylon shortcuts spray paint from Hobbylobby works good and is foam safe. Most spray paints will **melt** depron foam; Test the paint on a scrap of foam before using on the plane.



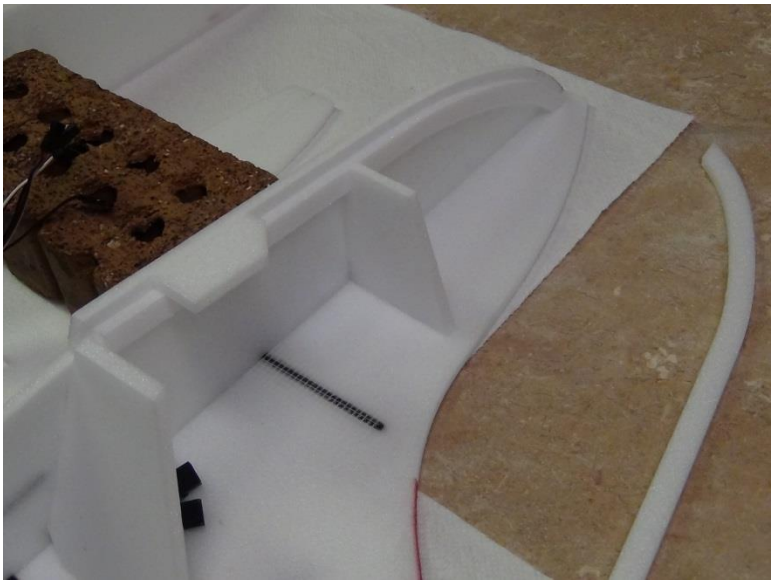
In this photo the servo wire extensions are put into the grooves and covered with Blenderm tape. Note that the wire extensions are kept short near the servo holes, and long at the center to help connect to the receiver.



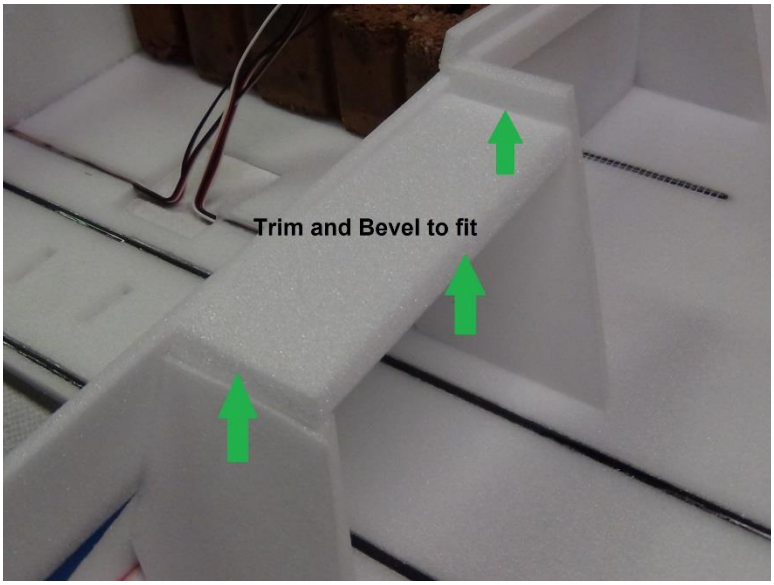
Now the float sides and front bulk head can be glued to the wing, Bevel edges to fit (see green arrows) on the rear bulk head and float end cap before gluing in place. Make sure float side stays straight and square to the wing.



Glue on curved support strips. Use a piece of scrap foam to get the correct spacing. **Let glue cure for a few hours before starting the next step.**

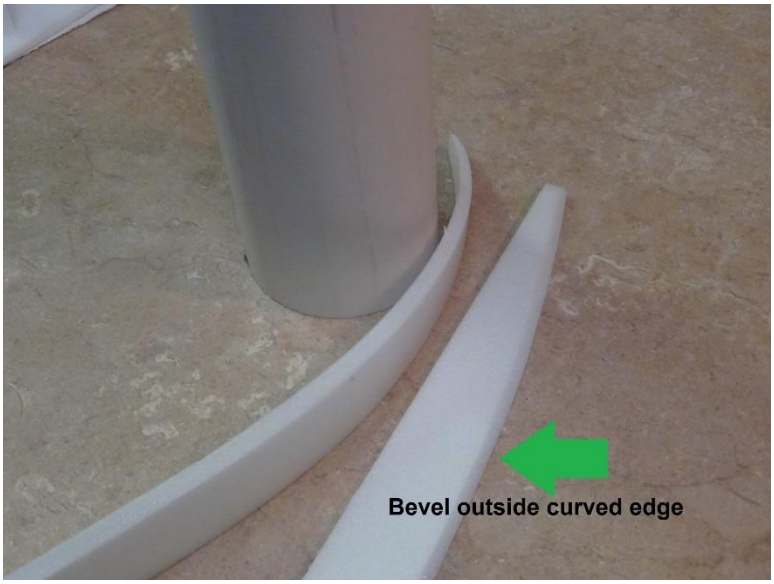


Trim and bevel rear float bottom pieces, and glue in place.



The long front float bottom pieces can now be beveled and trimmed to fit. Gently press and bend the foam on something round like the pipe in the picture.

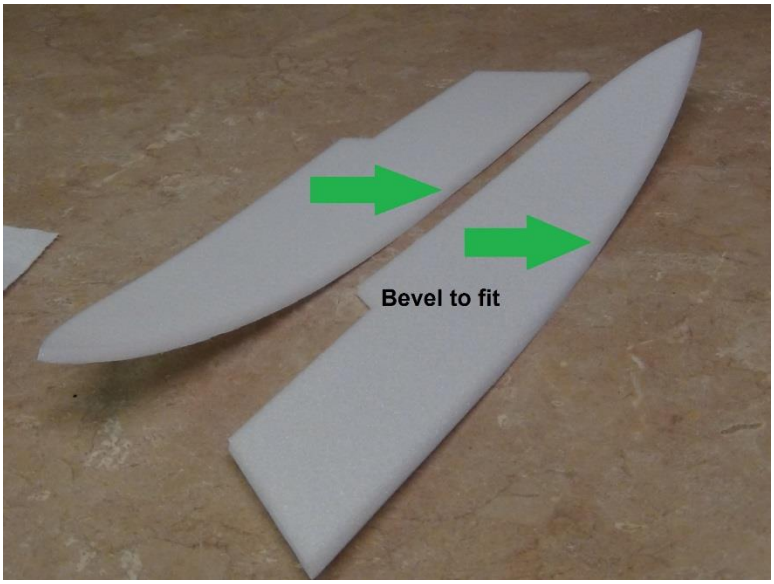
This pre curving of the foam allows for less clamping and holding while the glue dries.



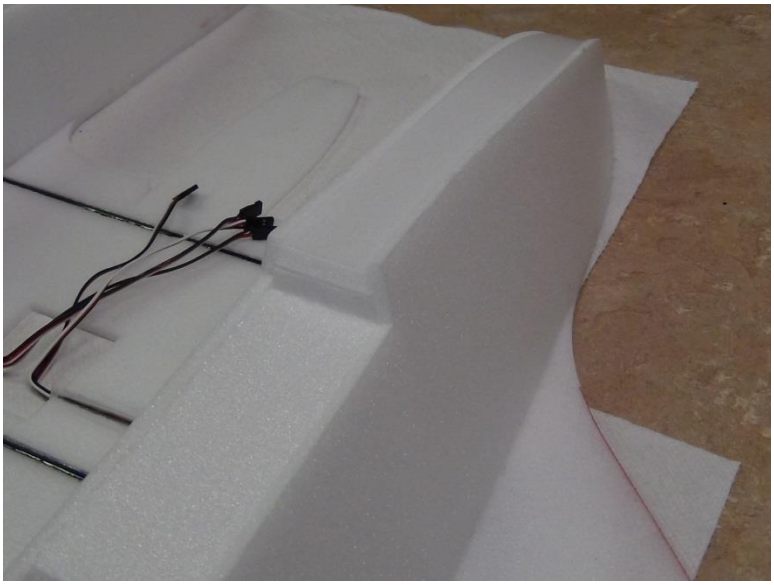
Once float bottoms have been trimmed, beveled, and pre curved. They can be glued in place.

Note:
One of the great things about Foam-tac glue is that it works like a contact adhesive, apply glue to one piece, push the two pieces together and pull them apart, let dry for half a minute and push back together.

Bevel and pre curve the outer float side pieces.

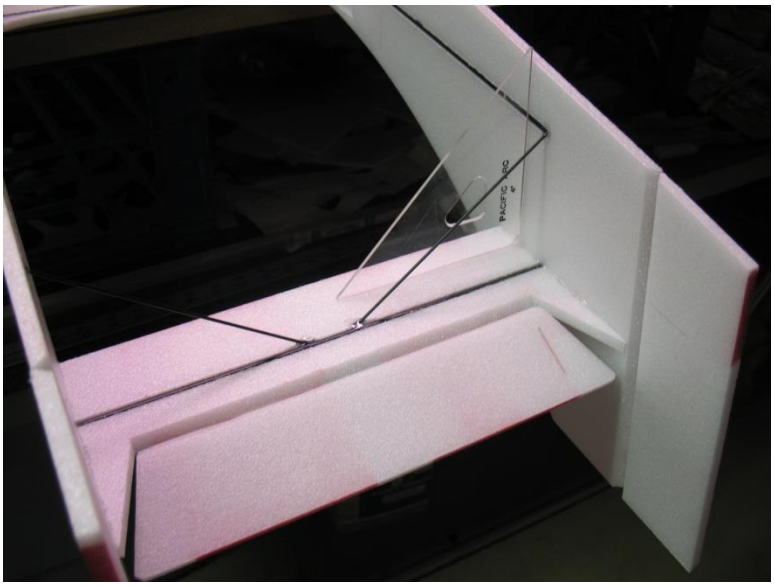


Glue and clamp outer float sides in place. Once they are dried the floats can be trimmed and sanded flat.



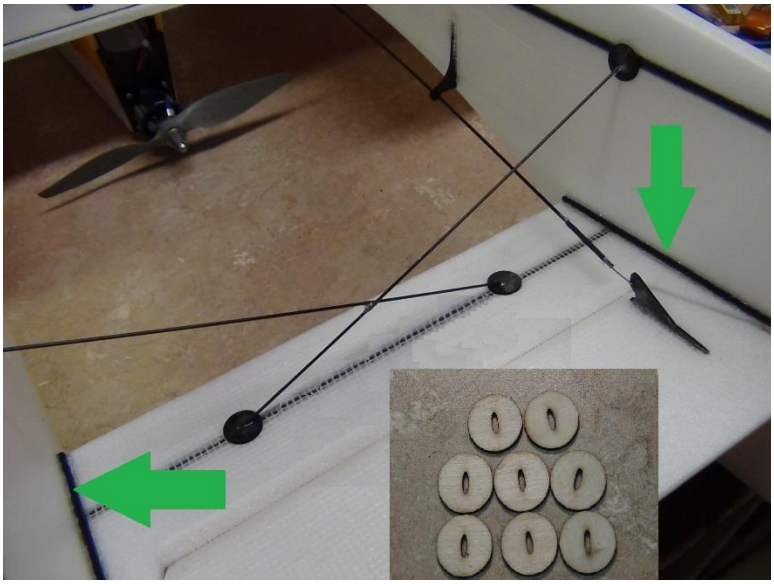
The fiber glass wear strips can now be <u>trimmed to fit</u>, and glued to the float bottom, first spread a layer of Foam-tac glue on the bottom of floats and let dry for a few minutes, then remove protective backing from fiber glass strips and apply to floats.

The horizontal stab and carbon trussing can now be glued in place. Make sure sides are straight and square.

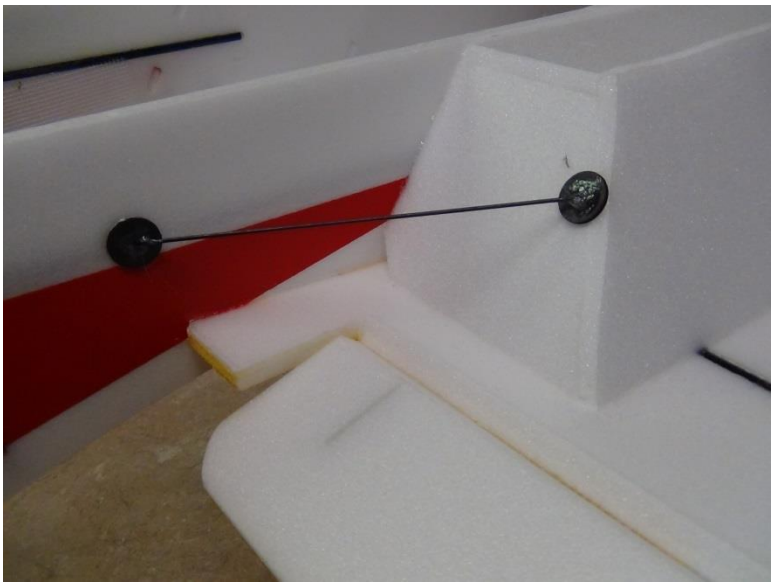


Up till now the build process has been the same for both size Makos. If you are building the 32” Mako, skip down to page 9.

As you can see in the pictures, I paint my plywood pieces black. It is easy to do while they are still connected together and gives the plane a more professional look.
With the XL version we added plywood anchors’ to the trussing on the tail and 3mm carbon tube to reinforce the horizontal stab corners (green arrows). Glue as shown in picture.

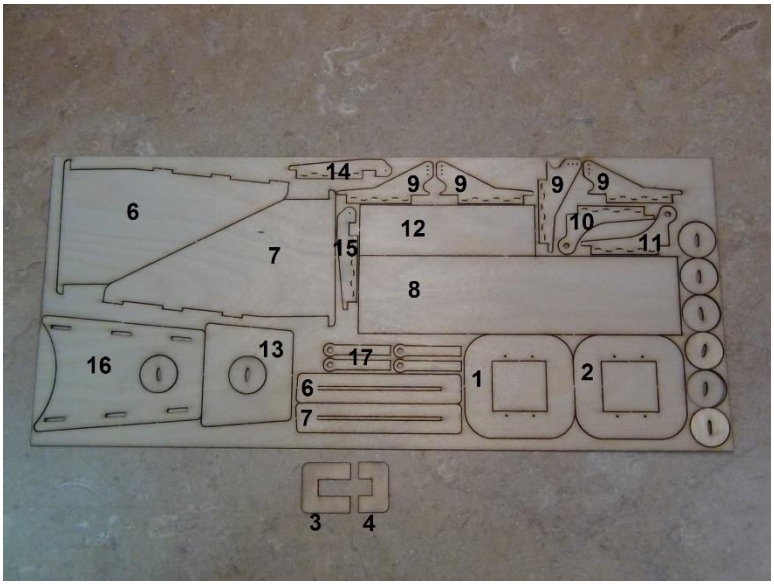


On the XL version we also added trussing and plywood anchors from the spar in the tail to the back of the float.



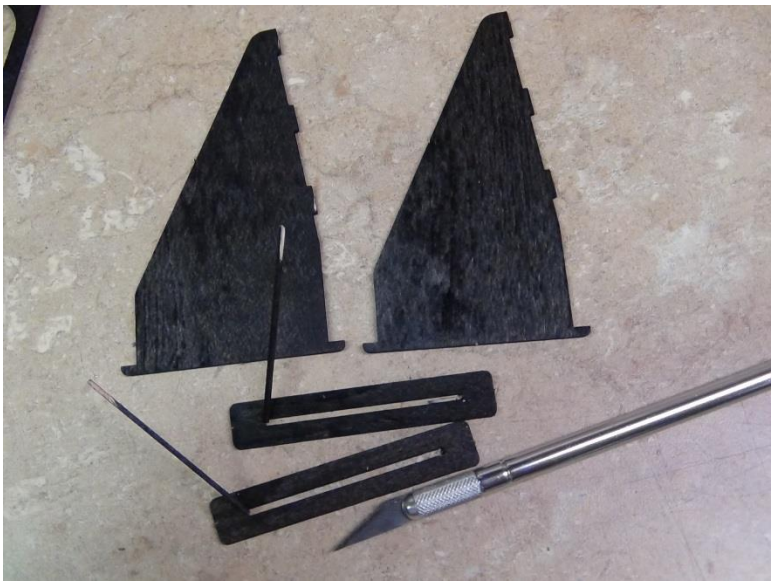
Plywood accessory pieces for Mako XL

- 1 & 2 - Servo bracket
- 3 & 4 – Hatch latch brackets
- 6 & 7 – Motor mount frame
- 8 - Battery tray
- 9 – control surface horns
- 10 & 11 – control rod supports
- 12 – Hatch tab
- 13 – Motor mount
- 14 – Right rudder horn
- 15 – Left rudder horn
- 16 – Motor mount backer
- 17 – control rod supports

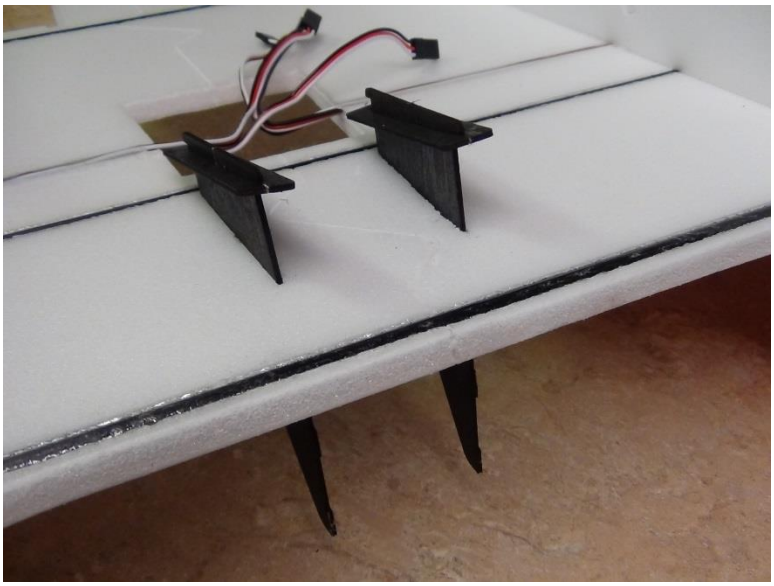


The XL has a stronger plywood frame to handle the larger motor and not crack the foam.

Remove the plywood sticks from the slotted brackets and test fit pieces 6, 7, 13, and 16 before gluing.

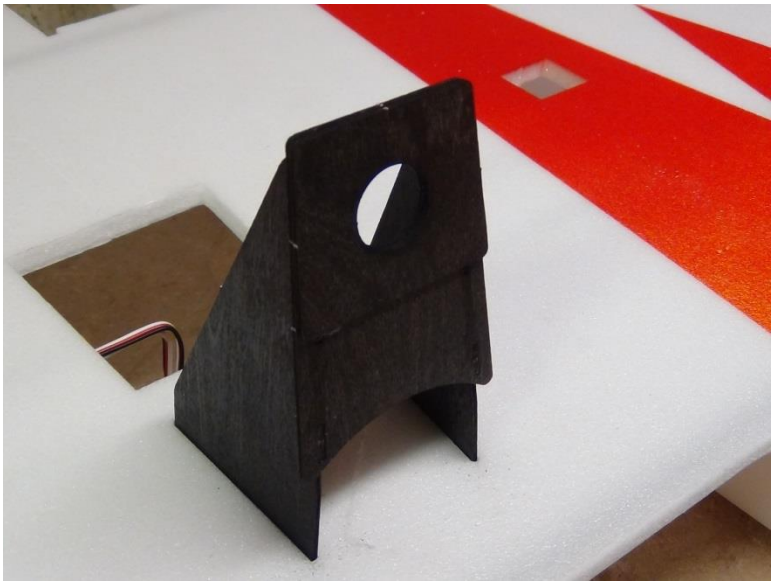


Slide motor mount sides through slotted brackets and into slots in the wing. Note that these are inserted from <u>underneath</u> the wing.



Glue motor mount sides and slotted brackets to wing with Foam-tac.

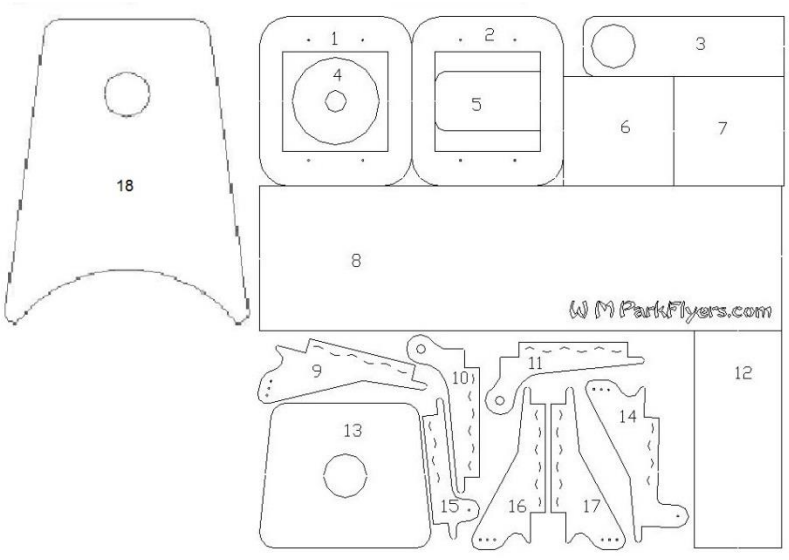
Use CA glue or epoxy to attach motor mount 13 to motor mount backer 16 and the motor mount backer to the motor mount sides.



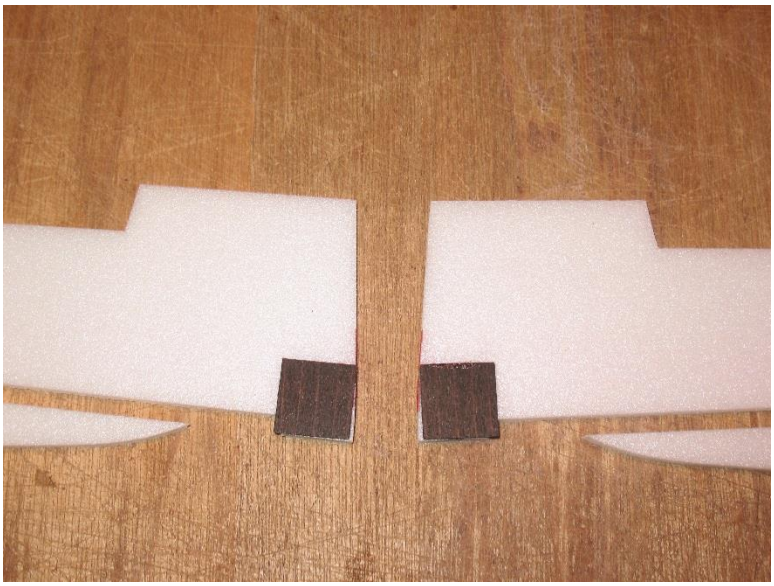
Fuselage sides can now be glued and clamped in place. These also can be pre curved for easier installation.

Plywood accessory pieces for 32” Mako.

- 1 & 2 - Servo bracket
- 3 - Magnet tab
- 4 - Hatch screw washer
- 5 - Magnet tab backer
- 6 & 7 - Fuselage support square
- 8 - Battery tray
- 9 – Elevator horn
- 10 & 11 – control rod support
- 12 – Hatch tab
- 13 – Motor mount
- 14 – Right rudder horn
- 15 – Left rudder horn
- 16 & 17 – Aileron horns
- 18 – Motor mount backer



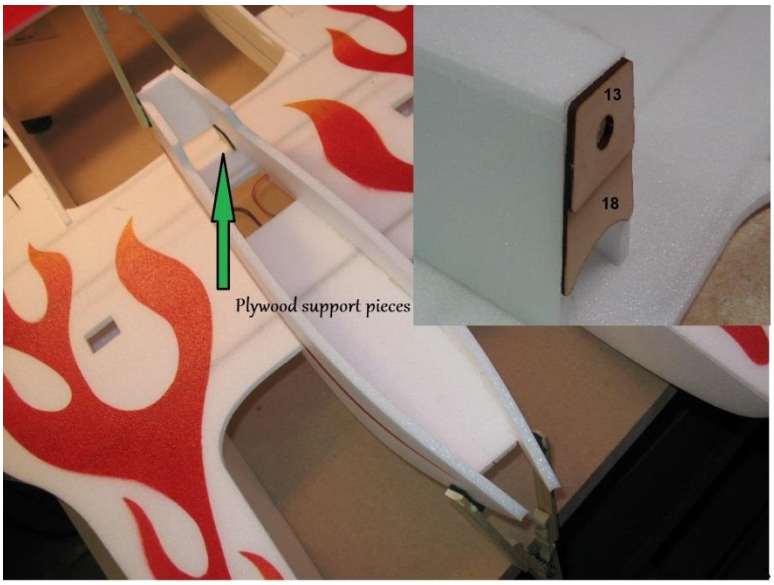
Back to the 32” Mako
Glue the plywood support squares to the sides of the fuselage.



Glue the fuselage sides and plywood support squares to the wing and clamp in place.

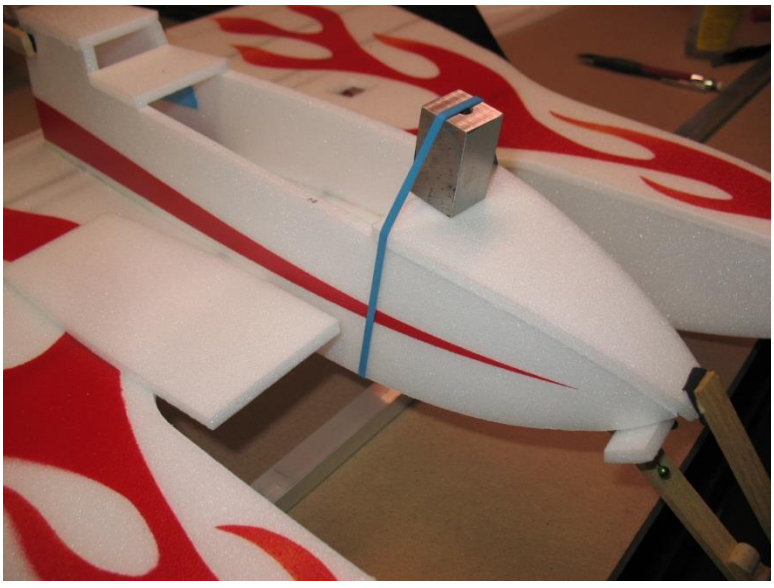
Then glue the foam fuselage back wall (this is what the plywood is glued to) and foam motor mount top in place.

The plywood motor mount (13) should be glued to the plywood motor mount backer (18) with CA glue or epoxy. And the motor mount backer is then glued to the back of the fuselage with epoxy or polyurethane glue (gorilla glue), Don’t use Foam-Tac glue, it can loosen up from the heat of the motor.

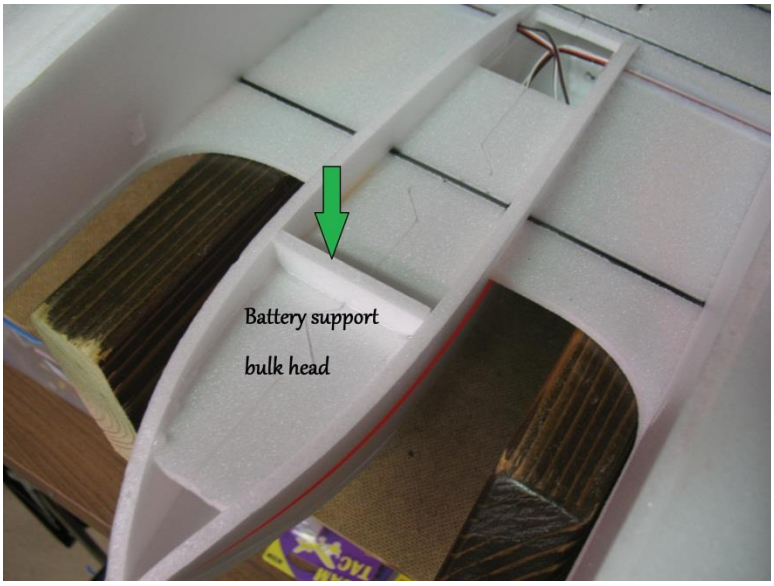


Cut hatch to size and glue top of fuselage in place. **Let glue cure for a few hours before starting the next step.**

This can also be pre curved for easier installation.



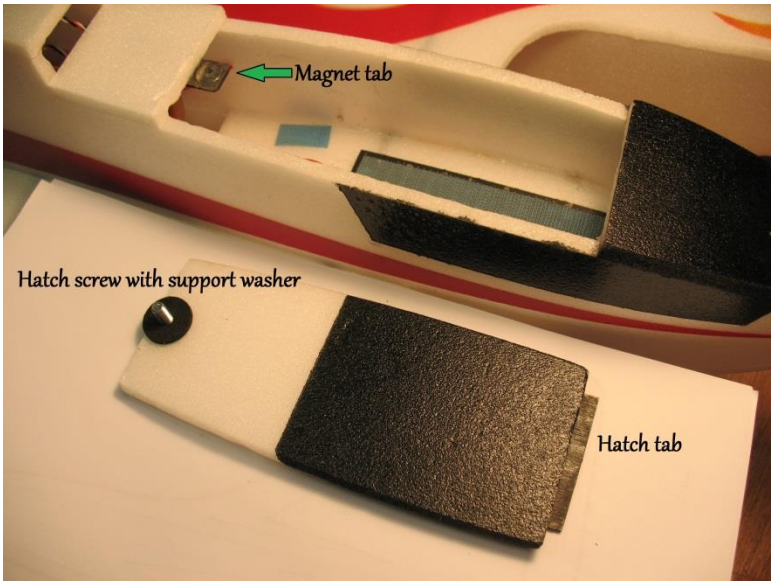
Glue battery support bulk head, and fuselage sides to bottom of wing.



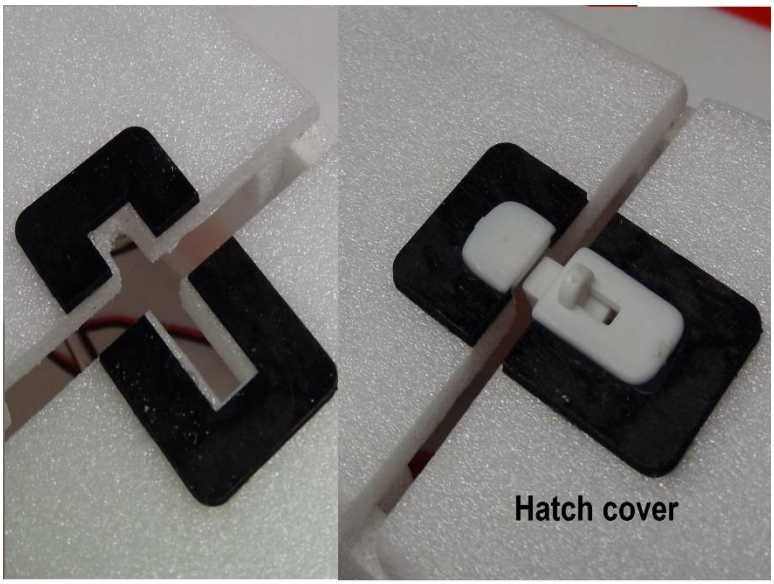
Cut the bottom of the fuselage to size and glue in place. **Let glue cure for a few hours before unclamping.**
This also can be pre curved for easier installation.

Trim off any extra foam and sand flush with a coarse sanding block.

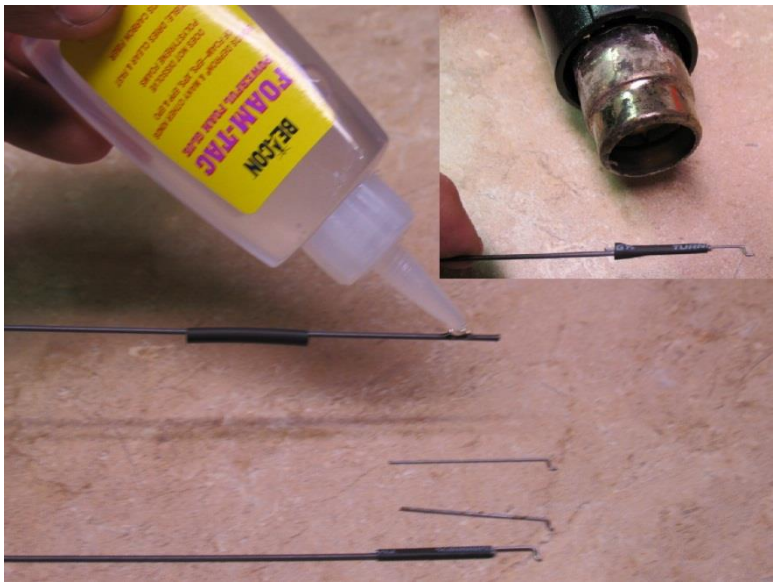
This photo shows how the hatch can be held shut with a magnet, a screw, and the supplied plywood tabs.
Apply velcro to battery tray (8) and glue tray to inside of fusalage with Gorilla glue.



The hatch can also be held shut with a DU-BRO hatch latch and #3 & #4 plywood brackets. Glue brackets to foam with Foam-tac, and glue hatch latch to brackets with CA glue.

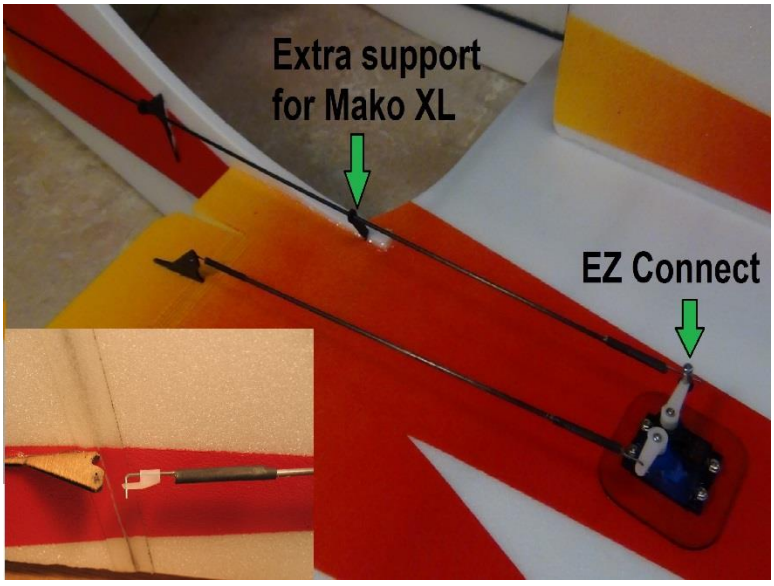


The wire control pieces can be easily attached to the carbon rods with Foam-tac glue and shrink wrap. The glue is flammable, so use a heat gun or hair dryer on the shrink wrap. The glue and shrink wrap can also be reheated to move and adjust the wire.

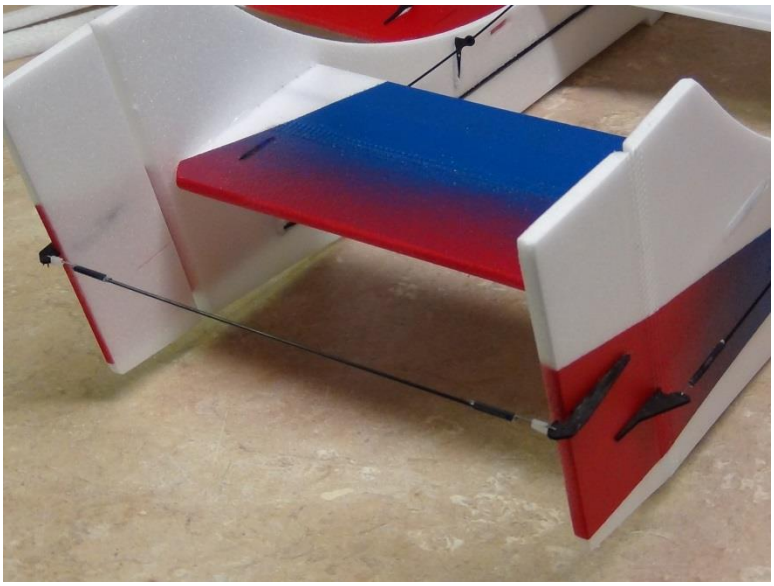


Recommended hole location on horns:
Aileron servos; Second or Third hole from the end.
Elevator and Rudder servos; End hole.
Aileron and Rudder plywood horns; Center hole.
Elevator plywood horn; Bottom hole. (Hole closes to foam).

Glue plywood horns and control rod supports into provided slots with Gorilla Glue. (Note: the Mako XL has an extra control rod support on both the rudder and elevator. You will need to make holes for these) Glue #1 and #2 servo brackets to wing, and install servos.
For easy setup and adjustments, use the 90 deg EZ links on the rudder and elevator horns, the EZ connects on the rudder and elevator servos, and the wire Z bends on the ailerons.

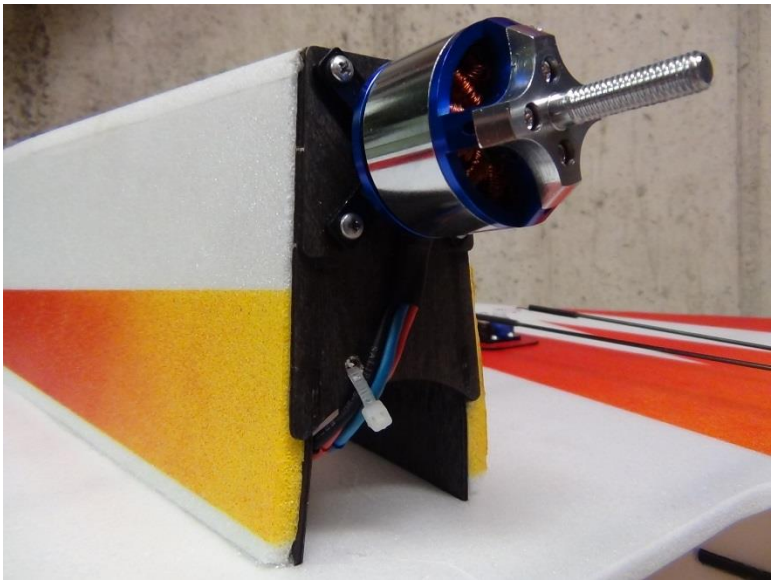


Connect rudders together using a Z bend on one end and a 90 degree bent wire and an EZ link on the other end.

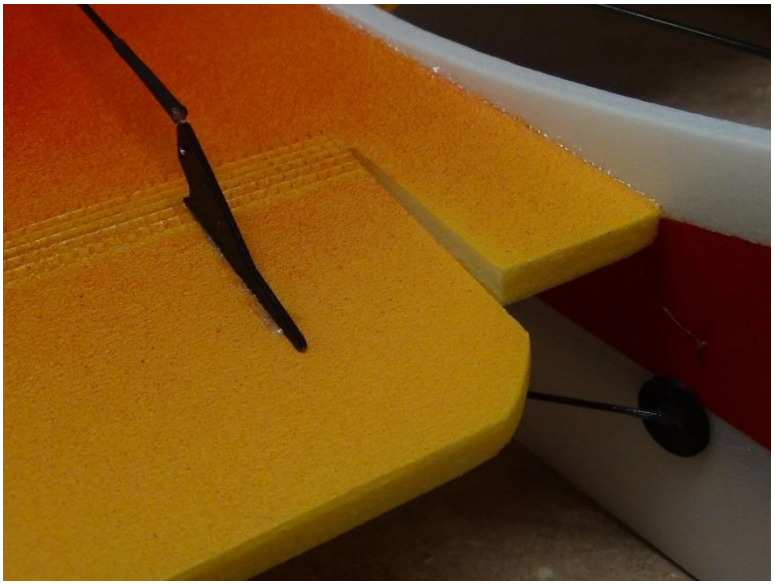


We strongly recommend using CorrosionX To waterproof your motor, ESC, and reciever.

Use a zip tie to secure motor wires to plywood motor mount. This will prevent the wires and ESC from sliding out and being cut by the prop. You can also secure the ESC and receiver to inside walls of fusalage with velcro.



For less flaring when slowing down, and more level flight when increasing speed, we recommend triming the ailerons down about 2 or 3 mm. This counters the lift that the float bottoms are giving the nose during flight.



A hole can be cut in the nose for added ventilation.

Suggested throws and Expo,
Elevator low rate, 40% Expo and 1/2" throw each way.
Elevator high rate, 60% Expo and 1-1/4" throw each way (this is needed for a hand stand)
Aileron low rate, 30% Expo and 3/8" throw each way.
Aileron high rate, 50% Expo and 3/4" throw each way.
Rudder, 60% Expo and 1-1/4" throw each way.

Congratulations! You have completed the construction of the Mako. Recommended CG is 12-1/2” from tip of the floats on the 32” Mako, and 16-1/2” on the 42” Mako XL.

If using Spektrum 2.4 Ghz, a two piece receiver with a remote reciver is recommended for flying off of water, water can interfere with the signal.