Exxtacy

Repair and Tuning Manual

Exxtacy Construction Basics

The Exxtacy is built with carbon fiber and Kevlar/Aramide honeycomb. The Exxtacy's main load bearing structure is based on a D cell, aptly named because of its cross sectional shape.

The honeycomb layer is surrounded with carbon fiber, and the front, curved portion, of the D cell has fiberglass covering on the outside. The fiberglass covering provides a means of visually checking for damage, as any area that has been affected will be readily identified by white streaks.

The spar is the vertical portion of the D-cell and is protected by the curved surface to the front.

The ribs attach to the D-spar, and swing out into position, to hold the rear portion of the sail. The sail itself fits completely around the front of the D cell, and is held together, in the back, with Velcro, and strings to the end of the ribs for tension.

Along the back of the D cell, at the top and the bottom of the spar are long layers of carbon fiber belts that run the entire length of the spar. There are several layers of belts, near the nose, with decreasing layers toward the tips. These belts provide the main load bearing strength in tension and compression, with the front or curved portion of the D cell providing torsion stability.

The belts are looped around steel connectors, at the top and bottom of the D cell, at the nose. This is where the two spars attach to the aluminum keel.

The controlbar is very much of the standard hang glider variety, except with significantly shorter downtubes. The front and rear is held by regular wire supports to the nose and the rear of the keel. Control cables are hooked to the corners of the basebar that run through a fiber pulley out to the actuator that raises the spoilerons.

Back to Top

D Cell Repair

The most common damage likely to occur to the D cell is a dent, or a puncture. The surface of the D cell is covered with a fiberglass layer that allows for ease of visual inspection. You can sight along the length of the D-tube with the sail removed to catch any damage.

Check for any irregularities in the smooth exterior. You can also press with your thumb to feel for soft spots to determine the extent of any damage, beyond any obvious surface blemish.

Begin a repair by drawing a line with a felt pen approximately 1/2 inch outside the perimeter of the damaged area (as determined by sight and by pressing your thumb).

 

Then, using 60 to 80 grit sandpaper, sand through the outer layer of fiberglass, and the exterior layer of carbon fiber. Sanding should be at a 45-degree angle to the outside surface of the damaged area, so as to allow even load distribution of the repaired area with the surrounding structure.

Below the sanded area you'll find the Kevlar/Aramide honeycomb. If the honeycomb is crushed, then it will need to be removed. This can be done with a knife, making sure that the outside edge is cut away at a 45-degree angle to the outside surface.

Once you have removed the honeycomb, inspect the interior layer of carbon fiber for any damage, to determine whether it will need patching. If the honeycomb isn't damaged, you can check the interior carbon fiber surface, by poking through the honeycomb with a pair of tweezers. If the interior layer has been punctured, or deformed, draw another line with the felt tip pen 1/2 inch outside the previously sanded area (this previously sanded area encloses the extent of the damage plus a 1/2 inch on each side) on the outer surface of the cell tube.

Sand this newly marked area down to the honeycomb, and scrap away the honeycomb down to the lower level of carbon fiber, keeping the sanding and the scrapping at a 45-degree angle to the surface. If you have to go down this far, you have now exposed the interior carbon fiber layer to an extent of inch on all sides outside the original damage to the exterior carbon fiber layer. You can remove any of the exterior carbon fiber layer that has been damaged.

 

Lay a sheet of very thin clear plastic (like from a plastic bag) over the newly sanded, damaged area, and using a felt pen, draw a circle equal to the size of the most interior clear area on the interior carbon fiber layer.

You are going to outline the size of additional patches in a similar manner on additional pieces of thin plastic. The difference between these patches, and the one that you will place on the interior carbon fiber, if you go down this deep, is that they will be 1/2 inch wider on each side then the hole that they are covering.

The patches will be marked in three ways. First they must be marked for the size of the patch, itself. Second they must indicate the orientation of the patch, typically by an arrow pointing to the nose end of the spar. And third, they must be marked with a crosshatch to indicate the direction of the carbon fibers that the patch will be repairing. A circle, an arrow, and a crosshatch.

After the first patch that fits onto the interior carbon fiber layer (if you find damage to the interior layer and have to go down this far), each patch is sized approximately 1/2 inch larger than the area being patched. The third patch is 1/2 inch wider on each side than the second patch and the fiberglass patch in another 1/2 inch wider on each side.

Cut the new pieces of carbon fiber, using sharp scissors, into squares that are roughly somewhat larger than the size of each of the patch marked on the plastic sheets.

Place the newly cut carbon fiber sheets over the face down clear plastic pieces (that is flip the thin sheets of plastic over), such that the direction of the carbon fibers match the cross hatch directions indicted by the markings made earlier.

Measure out epoxy resin and 1/2 as much hardener, and mix each together thoroughly using a disposable stick.

Using a stiff brush, carefully apply the resin to the patches laid on top of each of the clear marked plastic sheets. Stipple the resin up to the indicated patch size on the plastic. Do not use a brushing motion, as this has the effect of pulling the carbon fiber weave apart. Also, use only enough epoxy resin to cover the cloth, cause it to adhere to the clear plastic, and to penetrate the cloth completely.

When you are ready to apply a patch, carefully cut along the line of the patch as marked on the clear plastic using sharp scissors.

Apply the first patch making sure to orient the arrow on the outside of the clear plastic in the correct direction (say with the arrow pointed towards the nose), and positioning the material directly over the affected area oriented along the carbon fiber strands on the interior surface of the D-cell. Once in position, and pressed into place, carefully remove the outer clear plastic template.

If you have removed honeycomb be aware that it is impractical to replace the honeycomb layer with new honeycomb. It is therefore necessary to fill in the area that was occupied with honeycomb with resin mixed with filler. The filler can consist of micro balloons, but other materials may be substituted, such as talcum powder, sawdust, or in drastic cases, dirt (clean fill only ☺).

 

Once filled, level the area using a straight edged stick. Fill back to the level of the surrounding surface of the D-cell, with no excess, and no lack of filler.

Now that you've placed and interior surface patch, and fill above it, you can add the next two patches of carbon fiber. Be sure to peel away the clear plastic decal that indicates the direction of the patch, and the alignment of the fibers.

 

Apply the outermost covering of fiberglass, in the same fashion.

Use heavy duty Mylar to hold the patches in place and to smooth the epoxy resin to conform to the outer surface. Tape the Mylar tightly against the outer surface of the spar with duct tape.

 

Next, place Ethafoam tightly over the Mylar, and hold it on with packing tape or duct tape wrapped around the entire spar.

 

Afterwards, support the spar with the patched area down. This allows gravity to keep the interior portion of the patch from sagging inward.

The spar is left to cure for at least five hours in a heated environment, but preferably overnight. Afterwards the tape and foam and Mylar are removed to leave a finished surface that requires no further sanding.

Back to Top

Rib Repair

The ribs attached to the back of the D cell on the Exxtacy are constructed of carbon fiber tubes surrounding a foam square. Any cracks or breaks are repaired by first lightly sanding the carbon fiber layer on either side, to allow for adhesion of the epoxy resin. A tube of carbon fiber is slid over the area, extending a few inches beyond the break, or crack.

If the rib is broken clean through, apply epoxy resin to both ends and then secure then together with tape. After the break is cured, you can slide a tube of carbon fiber over the break.

Resin is then applied over the fiber, using a copious amount, such that the cloth is penetrated thoroughly to the lower layer.

Plastic vinyl tape is then wrapped tightly over, and beyond the resined area. The epoxy resin will not adhere to the tape, and any excess resin will be squeezed out, and may be blotted away.

➡ [Back to Top](#)

Tuning

You can tune the Exxtacy. To remove a turn, or tighten or loosen the sail, or to adjust the bar pressure. You may need to set the sweep within the appropriate parameters. Also, you can adjust the slackness in the control cables that attach to the corner of the controlbar.

Turning Adjustment

If the glider exhibits a turn in either direction when flown straight and level, in calm winds, you can correct this by installing a washer to cant rib number seven up or down. You place the washers at the spar end of the rib between the carbon tube and the white plastic tip.

Before conducting this fix make sure that the sail is seated properly from side to side. Check to see that the Velcro straps that attach the sail at the nose are holding each side of the sail an equal distance from the end of the spar. Sight down the zipper when the sail is tensioned to make sure it is straight and inline with the keel. If it appears to be angled to one side, adjust it using the black straps that hold the trailing edge of the sail to the keel. Also, confirm that there is sufficient slackness in the control cables on both sides, such that one side is not partially deploying a spoiler, and causing a turn.

Remove the Delrin block at the end of rib seven at the spar end. Slide a washer over the Delrin block. Push the Delrin block back into the end of the rib.

The washer may be made from any material suitably sized. You can cut any width piece that you like. Add a thin washer and test before adding a thicker one.

Adding a washer at the bottom of the rib, will increase the washout, and at the top, decrease. For instance, if the glider has a right turn, then place a washer on the bottom of the seventh rib, on the left side, or a washer at the top of the rib on the right side.

Initially increase the washout of the seventh rib on the other wing opposite the turn (by placing a washer on the bottom of the rib). This is better, then decreasing the washout of the wing with the turn.

Sail Tension

You tension the sail by tightening the turnbuckle, at the nose of the glider. If you find it hard to turn the turnbuckle, then the sail is too tight and must be loosened at the trailing edge.

If the sail is loose shorten the black straps that attach the trailing edge of the sail to the keel. After making this adjustment, you can adjust the sail by repositioning the Velcro where the two sails zipper together in the middle. Do not just loosen or tighten the turnbuckle to tighten the sail. The correct turnbuckle adjustment determines the sweep angle of the wing. This is discussed below.

Pitch Pressure

Flex wing pilots new to the Exxtacy will notice a dramatic decrease in pitch forces. Pitch pressure is a function of many factors, but mainly it comes from the twist of the wing. The twist in an Exxtacy is determined by the construction of the outer four ribs and, for all but the seventh rib, is fixed at the factory. Rib seven can be adjusted using washers, and generally needs to be a few millimeters higher than rib six, when sighting along the trailing edge.

The second factor that determines pitch pressure is the wing sweep. This is adjusted by the setting the black straps at the trailing edge of the sail. The sweep must be measured to conform within the allowed specifications determined when the wing was certified by DHV.

You measure the wing sweep by placing a set of marks on the rear of the keel. Measure from the back of the bottom keel attachment plate, at the nose. Place a mark 2525 mm back on the keel. Place two more lines 15 mm, forward, and backwards of this line.

Stretch a long string, at the end of each wingtip, at the trailing edge of the sail, and pull it taught..

Hold the glider with the keel parallel with the ground, and the wings level side to side.

Using an object that is at 90 degrees to the keel, against the string, check to make sure that this perpendicular falls within the sweep marks made earlier. Typically when the glider has more sweep, the pitch forces will be higher. Increasing the nose angle, will lower the pitch forces. Don't increase the nose angle to the point that the line across the keel does not fall forward of the inner mark. Doing so may create a negative pitching moment that could compromise safe flying in turbulent conditions.

Back to Top