# Flap Hinge-Spar Repair

**Note**: You must have the approval of a certified aircraft mechanic (A&P) to perform this procedure. This procedure requires riveting and a logbook entry by your mechanic.

**Description:**

After removing the flap hinge hardware for wing painting, two small cracks were evident just ahead of the hinge bolt nuts on the outer flap hinge. They would be almost impossible to see without the hardware (hinge nuts and bolts) removed. The cracks are on the bend at the trailing edge spar. How they happened is hard to say but I suspect the flaps were subjected to overspeed at one time or another or perhaps there was some harmonic vibration in that hinge area. Who knows? Anyway, the crack must be addressed but how? The cracks were right where the bend is on the aft spar and is impossible to stop-drill. Fortunately the rear spar above the outboard hinge had plenty of area to form a patch, as shown below.

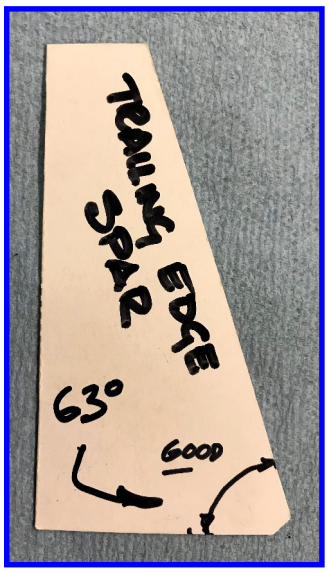

View of center flap hinge. Cracks were found on the outer flap hinge.

**Procedure:**

Removing the flap is the most convenient way to begin. It will give you plenty of room to work and you can see the cracks in the aft spar much easier. Make sure you reinstall the hinge and flap pushrod hardware when completed and safety all hinges and flap pushrod attachments.

You will need access to a bending brake to make the patch as it must fit down the spar and lay on top of the spar flange. Use .062" 2024 aluminum sheet and cut a patch to fit the aft spar. Make sure the rivet pattern conforms to the guidance given in AC 43.13. The rivets are AN470-4-5's and the bend angle is 63°, as shown below, which will fit nicely against the spar. Keep in mind that the bend radius of the patch must be slightly smaller than the bend radius in the spar. If your brake has sharp points on the brake "panels" you will have to put a spacer between the aluminum and the panel to get the right radius. Use some scrap aluminum to test the radius.

Use thin cardboard to make a pattern for the patch and mark the correct rivet spacing on the pattern. You can then transfer this to the aluminum sheet and cut it out using a shear or aviation tin snips. Be sure to de-bur all holes and smooth out the edges of the patch before installing. When the tested bend radius is satisfactory, bend the patch to the 63° angle. All drilling will be done with the patch clamped in place.




Cardboard pattern of trailing edge angle for the patch.

**Note:** Make sure there are no cracks in the bend of the patch as the radius is quite small. If it's cracked, throw it away and start over.

Use Cleco clamps or "C" clamps to hold the patch in place and be sure the patch fits tightly against the spar and spar flange. Using a #30 drill bit, drill the rivet holes through the patch and spar as shown below. Two rivets are installed through the spar flange and, along with the hinge mounting bolts, will hold the hinge and patch flange in place. Remove the patch and de-bur the holes in the spar and patch on both sides. Cleco the patch in place and start riveting. A rivet squeezer can fit into the trailing edge lightening holes and can be used for most of the rivets, however, a rivet gun and bucking bar will need to be used on a few of the rivets.

After the patch is riveted in place, prime and paint it as required. Check your other hinges for cracks and repair as necessary. Some Seabees have a small rectangular doubler on top of the spar flange, which indicates a problem must have existed previously. It is well worth removing the hinge hardware and inspecting for cracks on all the flap hinges. The aileron hinge area doesn't seem to have this problem, at least not so far.

Completed patch with hinge hardware installed.