

Emergent Repair of Glasair I TD Wing

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Initial Damage

- Due to a blind spot in field of view Glasair TD pilot strikes leading edge of wing into a golf cart at Sun N Fun 2019 while being marshaled.
- Simple steps were taken to restore the damaged wing to full strength.
- This method is applicable to many types of composite damage of non-primary structure.



Close Look at the Damage

Good news is that there is no spar or fuel tank impact.



Repair Steps

- Assess the pedigree of the local laminate
- Identify suitable materials on hand to match the Glasair laminate schedule to include the foam core.
- Develop suitable scarf repair steps permitting vacuum consolidation of repair laminate to achieve glass to resin ratio and consolidation of stiff triax-glass fiber:
 - Take steps necessary to create vacuum integrity of outer mold line, including create a seal of the inner skin.
- Pull a skin off of the wing adjacent to the damage for inside layer.
- Prefab a skin for bonding to the inside surface permitting vacuum integrity.

Repair Steps Cont

- Glasair Laminate Pedigree (inner to outer mold line):
 - 3 Plies 7781 (9 oz areal wt) with Derakane 470 vinyl ester
 - ¼ inch PVC foam
 - 3 Plies 7781 / Derakane 470 (novalac backbone => stiffer structure)
 - Outer mold line coating is gel coat; plane never painted
- Repair Laminate Pedigree (inner to outer mold line):
 - 1 ply 7781 with ProSet 145/226 epoxy
 - ¼ inch PVC foam
 - 3 plies of 7725 with ProSet 145/226

Spot Glaze Putty Applied



Fair in the missing gel coat with lacquer spot glaze putty.

Let cure then wet sand.

Apply Teflon Tape

Apply 4 mil x 4 inch wide Teflon tape as a surface release.

Area covered:
16 x16 inches



Laminate 1 Ply of 7781 & Peel Ply



Tape Edges of Peel Ply Down Tight



Remove Damage



Damage and delamination is removed. Only go as far as needed as the 20:1 scarf taper will clean up a lot of the delaminated laminate.

Preparation of Inside Laminate



Single ply of 'green' 7781 is fitted to the inside, trimmed, inserted and drilled in place for the clecoes.

Trim & Fit 7781 Patch



Trial fit inner patch skin with clecoes.

Bond Inner Skin



Lacking a suitable adhesive bond inner patch skin with epoxy / microfiber putty.

Bond in PVC Foam



Fellow SNF volunteer had a sample box of DIAB PVC foam types that we took advantage of.

Foam on Lower Surface



Bond in foam with epoxy / microfiber mix.

Fabric Comparison

- Style 7781:
 - Weave: 8H Satin
 - Weight: 8.81 oz/yd² (299 gm/m²)
 - Thickness: 8.6 mils (0.22 mm)
- Style 7725:
 - Weave: 2/2 Twill
 - Weight: 8.8 oz/yd² (298 gm/m²)
 - Thickness: 9.3 mils (0.24 mm)

Grinding 20:1 Scarf



3 plies of Style 7781 is approx 30 mils. At 20:1 scarf taper the outer limit would be $\geq .060$ inches.

Scarf Completed & Fair Foam



Scarf taper was much greater than needed to assure the removal of all delaminations.

Dry Micro Foam



Apply dry micro (epoxy/micro-balloon) to fair anomalies and fill in scored core lines.

Two Plies of Triax on L.E.



Lamination of leading edge and repair area completed.

Laminate 3 Plies Style 7725

Following the two plies of triax to the leading edge three plies of 7725 that progressively increase in size make up the scarf repair.



Vacuum Bag Preparations



P3 Film is trimmed and placed to control resin bleed & airweave distributes vacuum over entire surface. Airweave also serves as a visual QC under vacuum.

Vacuum Bag Placement



Control the Vacuum by Resin Bleed



Lower View



Dry Micro Fair



Back to the Flight Line

