

TITLE	Internal aileron and flap bracket inspection and replacement.
CLASSIFICATION	The CAA have classified this bulletin as Mandatory.
COMPLIANCE	Within the next 5 hours.
APPLICABILITY	All CT2K aircraft manufactured and UK Registered prior to 1 May 2004.

Introduction:

A CT2K with 600 hours and 3 years of use in the training role was put into a left hand steep bank, probably above the V_a speed. When full right aileron control was applied to roll out, the right outer aileron bracket (part No. KA2010401) rear bolt tore out of the wing, leaving the external bracket (part No. KA2010040R) still attached to the wing at the front hole. The aircraft was still controllable and landed safely.

Analysis

Close examination of the failed internal bracket KA2010401 revealed that a fatigue crack had started adjacent to the edge of the welded nut on the rear attachment bolt area and had propagated to the edge of the plate. When a large load was applied, the remaining part of the internal bracket failed allowing the detached part to tear through the wing skin.

The failed internal bracket had a flaw adjacent to the welded nut, also the bolt tails were fouling with the rib, causing increased bending moment on the bracket. The bracket is impossible to inspect externally and the possibility of similarly cracked brackets cannot be ruled out. Although the pull-out load is greatest on the outboard aileron brackets, failure of the other aileron and mid flap brackets cannot be ruled out because they are identical parts. There are no internal brackets at the wing root flap location.

The brackets have been changed from 1mm ST37 steel to 1.5mm X5CrNi1810 stainless steel from serial number 04-05-04 onwards, new part number KA2010401ASSY Rev.2.

Action:

Within the next 5 hours, on both wings, an inspection hole must be made at the mid-flap bracket and outboard aileron bracket locations as detailed in fig 1 below. For the combined outer flap/inner aileron bracket, the aileron pushrod hole enables inspection. Using a mirror and torch, the internal bracket feet can be inspected.

Creation of Inspection Holes

- 1) Remove ailerons and flaps by detaching the hinge bolts and aileron pushrod. It is generally easiest to remove the aileron pushrod at the wing bellcrank.
- 2) At the outer aileron bracket and mid flap bracket locations on both wings, Using a fine toothed holesaw, drill an inspection hole $\text{Ø}30 - 38\text{mm}$, at the sloping face of the wing trailing edge, 30mm $\pm 5\text{mm}$ inboard from the bracket holes and 60mm $\pm 5\text{mm}$ along the surface from the bottom of the bracket (fig.1).

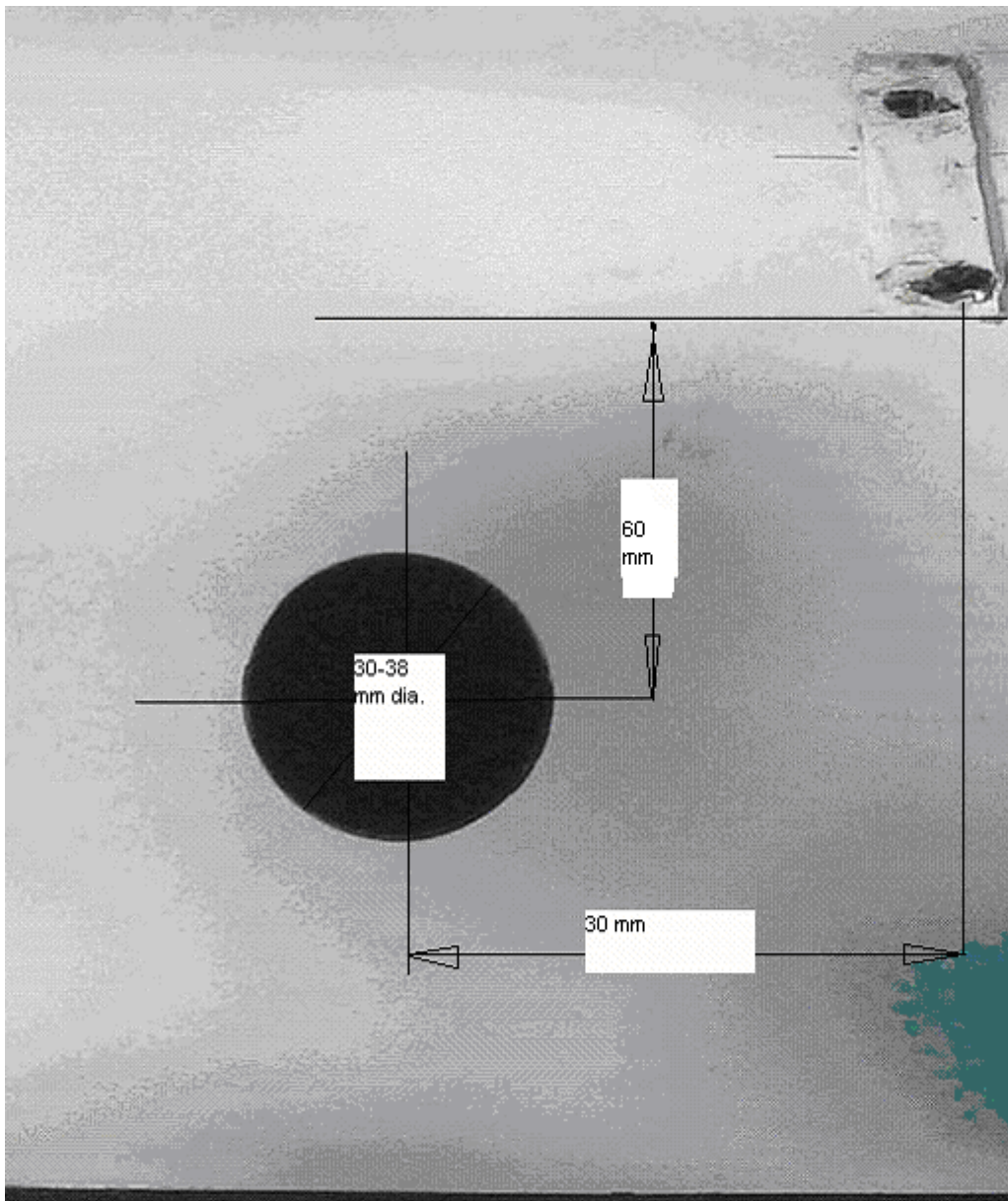


Fig. 1 inspection hole in wing trailing edge, inboard of bracket skin holes. Wing shown upside down.

Inspection Criteria for all aileron and flap brackets, except at the wing roots:

- 1) Apply gentle hand pressure up and down to all external aileron and flap brackets at the hinge area. There must be no sign of movement or skin cracking at the attachment area to the wing.
- 2) The internal bracket bolt tails and welded-on nuts must not be forced against the wing rib, there must be clearance.
- 3) There must be no signs of distortion or cracking of the internal bracket.
- 4) There must be no significant corrosion of the internal bracket.
- 5) The external bracket bolts must be secure (note if they are disturbed, they MUST be degreased, tightened to 10Nm and locked using Loctite 221 or 270).
- 6) There must be no skin cracking or rust on the external skin.

If the inspection is satisfactory, the brackets can be left in position. Repeat the check on all the aileron and flap brackets at the annual permit to fly inspection or at every 100 hours, whichever comes sooner. Each time the inspection is made, it must be recorded in the aircraft technical log. Repeat inspections are necessary until the brackets are replaced with the new 1.5mm material.

If the bracket fails the inspection criteria, it must be replaced before further flight using the following replacement and repair procedure.

Bracket removal, replacement and repair procedure.

This procedure must be carried out by the Factory or a Factory approved composites repair organisation.

Materials required for each replacement bracket:

New aileron bracket part number KA2010401ASSY Rev.2.

Flange, cover and self tapping screws for access hole.

“Bonding mixture” is either SP systems SP125 or SP330 or a mixture of Epoxy resin L285, Hardener 285, with equal parts of Cotton flock and Cabosil M-5 to make a paste like consistency.

Resin and hardener L285 (supplied by MGS or PRF Ltd.), acetone, 80 and 600 grit abrasives.

Carbon fabric, interglas 98131 or PRF Co 442 (160gsm twill)

Epoxy/microballoon filler or lightweight polyester filler

Primer and white paint (colour code no. RAL 9016)

1. Using a holesaw and diamond wheel or fine toothed saw, Cut out an access hole outboard from each affected bracket location in the lower wing skin as shown (fig.2).

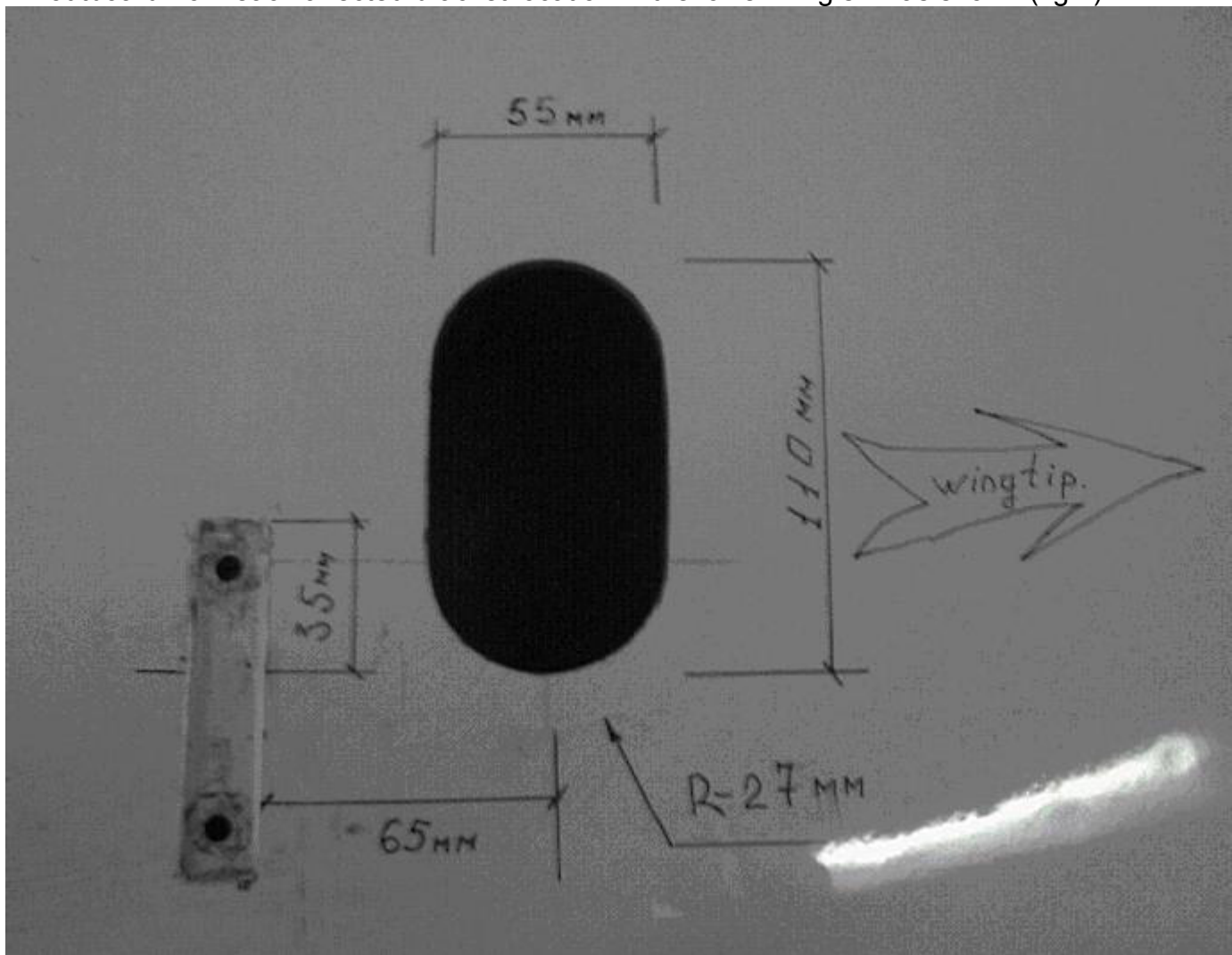


Fig. 2 access hole in wing lower surface, outboard of bracket skin holes

2. Mark the positions of the bracket attachment holes on the skin using a mylar or similar translucent template.
3. Cut away the skin at the edges of the bracket foot recess, fig 3.
4. By access from the access hole and inspection hole, unscrew the nuts and bolts attaching the bracket to the rib and remove the bracket. Remove the nuts and washers from the rib.
5. Send the bracket to Mainair Sports Ltd for analysis, together with a note stating which location it came from in the wing, the registration mark, serial number, age and hours flown.

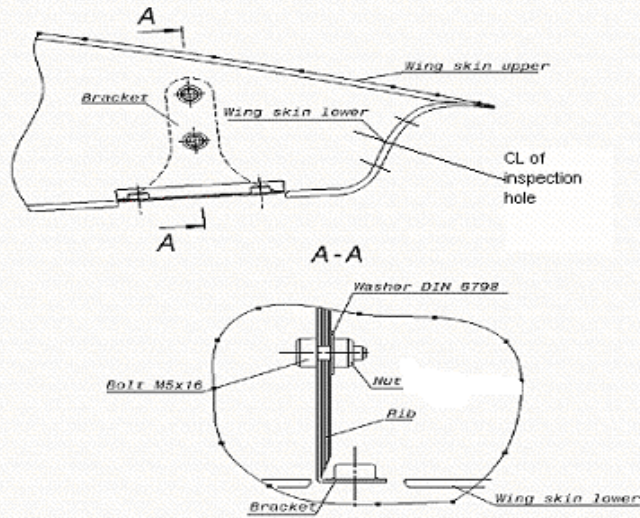


Fig. 3

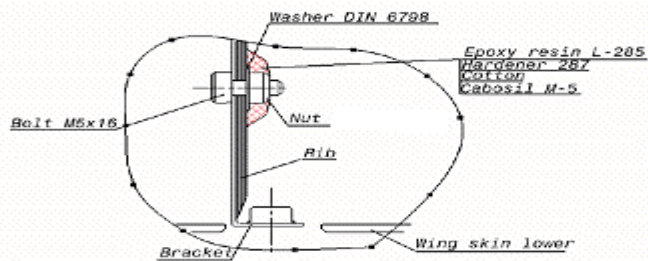


Fig. 4

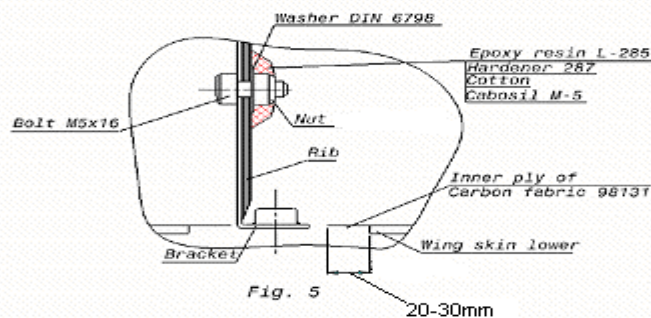


Fig. 5

Fig 6

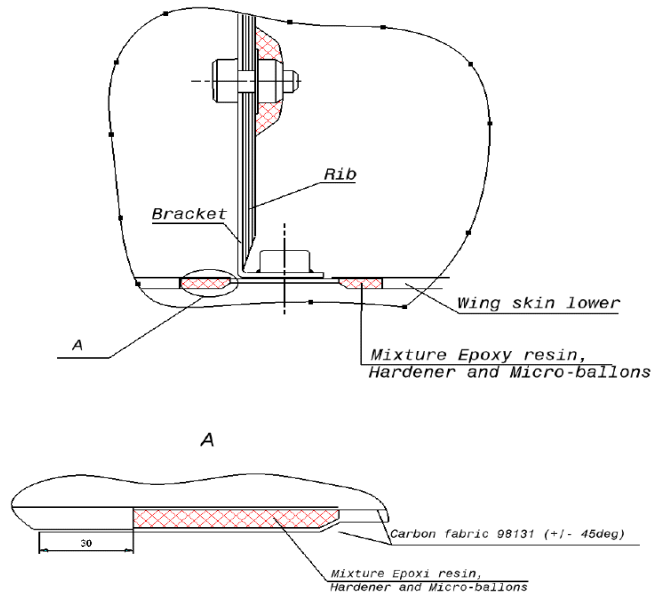


Fig. 7

6. Fit up the new bracket, removing old hardened adhesive as necessary. Using the template prepared earlier, shim the bracket away from the rib to achieve the correct position for the bolt holes in the skin. A glass/epoxy, carbon or birch ply shim should be used. Grind away the rib to the minimum necessary to achieve bolt tail and nut block clearance.
7. Degrease the side surface of the rib, the shim and the lower surface of the new bracket with acetone and apply bonding mixture onto them. Mount the bracket and attach it to the rib with the bolts, washers and nuts.
8. Degrease the area around the nuts with acetone. Apply bonding mixture onto the both nuts (fig 4).
9. Remove the outer skin and foam till the inner skin is exposed for 20-30mm around the bracket foot hole (fig 5). Degrease skin and aileron bracket foot.
10. Lay up 1 ply of carbon fabric at +/- 45 degrees to the wing spar onto the inner skin and bracket foot (fig 6.)
11. Add filler and form the recessed profile at the bracket foot (fig 6).
12. Abrade skin 20-30mm around the foam area, degrease and lay 1 ply of carbon fabric at +/- 45 degrees onto the outer skin (fig7). Use local tooling to maintain the recessed profile at the bracket foot.
13. Bond in the flange into the access hole made under operation No.2 (fig.8), using the bonding mixture.



Fig. 8

14. locally postcure the repaired areas at 55 C for 15 hours.
15. Finish, fair and paint the repaired areas of the wing when cooled off.
16. Reattach the external aileron/flap brackets being sure to degrease and **then apply Loctite 221 or 270 to the aileron bracket attachment bolts**, tighten to 10 Nm.
17. Lubricate the aileron hinge and pushrod self-aligning bushes using light machine oil, ensure they are free.
18. Re-fit the ailerons and flaps, check for full and free movement and uniform gap (3-10mm) between aileron top surface and wing skin.
19. Re-rig as described in the CT operator's manual
20. Check for full and free movement of the flaps and ailerons and control deflections of the ailerons (50mm down +-5, 110mm up, +-10mm measured at trailing edge, flaps up)
21. Attach the access panel (fig 9) using 6 self tapping screws.

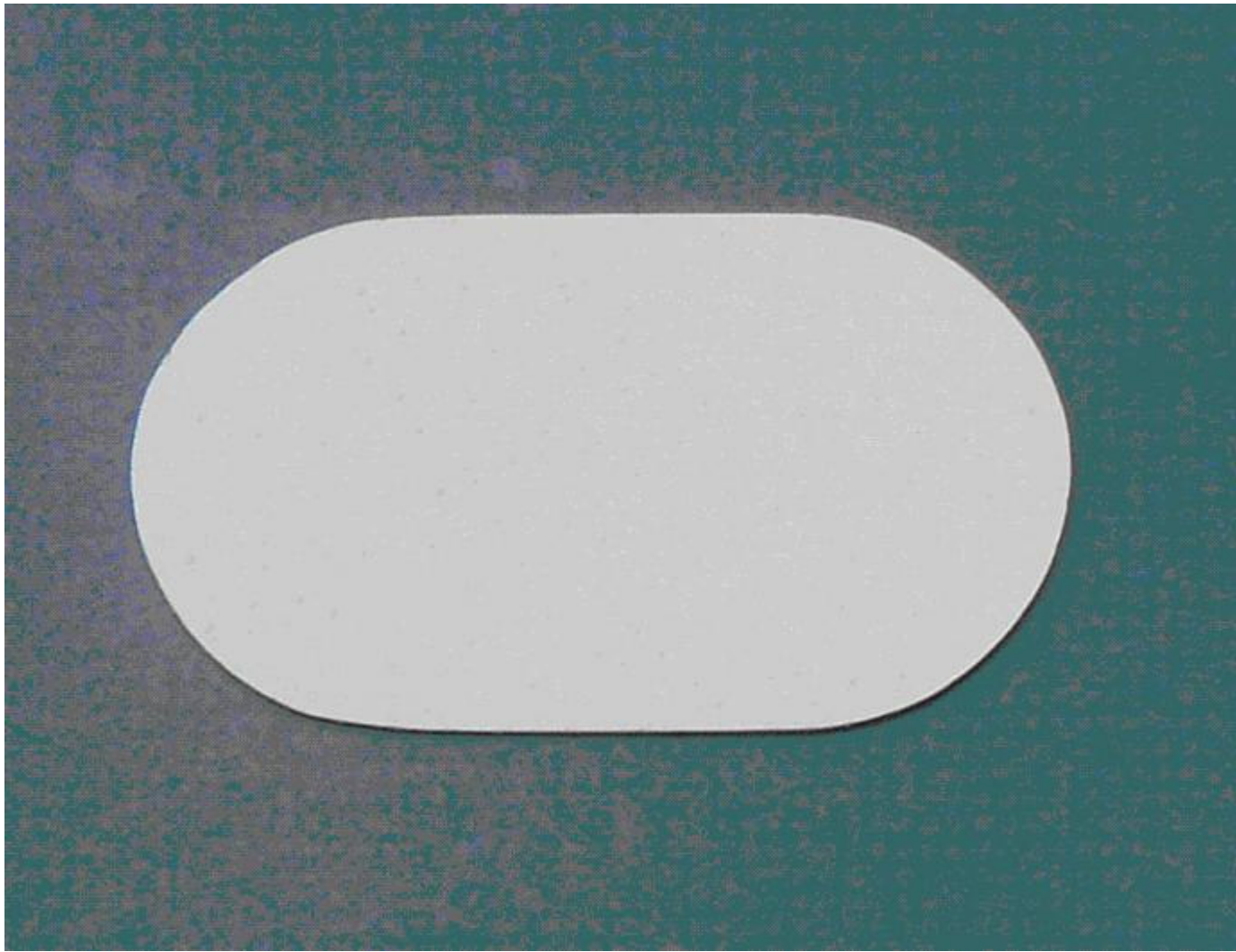


Fig. 9

Documentation:

Inspections and repairs must be signed by a BMAA inspector in the technical log. Duplicate inspection is required for the reassembly of the ailerons and flaps, especially regarding fastener security, alignment, movement and clearances. One of these duplicate inspections may be made by the owner.

ISSUED BY: Chief Engineer W.G.Brooks

DATE 3/08/04

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