British Gliding Association
Aircraft Inspection

Number:	Issue:
042/07/2004	5

Mandatory

Date: 1st November 2015

Subject: **Structural inspections**

Applicability: Schleicher Ka 1, Ka 2, Ka 2B, Ka 3, Rhönlercher II (Ka 4), Ka 6 series, K7, K7 conversions, K8 series, K10, ASK 13 series, ASK 14, ASK 16, ASK 18 series and all variants of each type.
(This inspection is strongly recommended for the motor glider types listed above)

Effective date 1st November 2015

Accomplishment: At the next annual inspection regardless of when the last glue inspection was done. The inspection interval after inspection is provisionally 3 years, that will reassessed the BGA upon the BGA examining the inspection reports. **Note if revision 4 has been carried out then you only need to perform the aileron, rudder and elevator inspection again at the next annual.**

Reason After an in-flight wing failure, inspections were carried out on all BGA registered Schleicher wooden gliders. Kaurit adhesive had been used on all these gliders and had sometimes suffered from failure, apparently due to a combination of age and damp conditions. Glued joint deterioration has been found in sufficient numbers of these gliders to warrant an on going inspection programme.

As of October 2015 we are getting reports of glue failure occasionally being found in Ailerons, Rudders and Elevators that had passed the BGA visual glue inspection. Revision 5 sets a more thorough inspection for the control surfaces that takes into account what we have learned so far about finding glue problems.

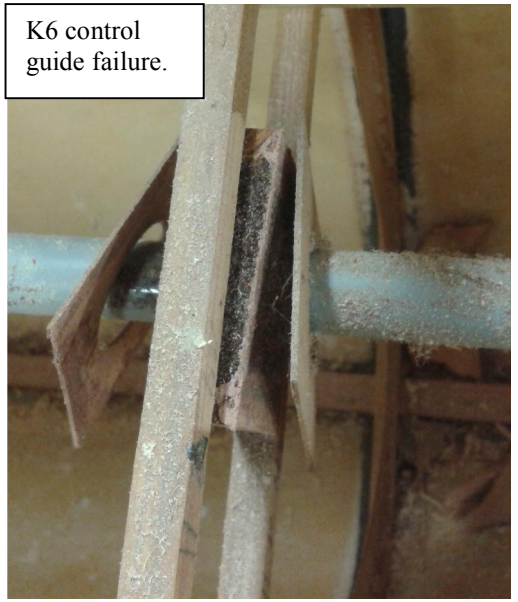
Revisions: Issue 2 clarifies the access methods for single seat aircraft and inspection requirements for Jubi built aircraft.
Issue 2 supersedes issue 1, however full compliance with issue 1 satisfies the requirements of issue 2.
Issue 3 makes this an ongoing 5 yearly inspection, introduces a more rigorous inspection of trailing edges, to be accomplished at the next inspection, as a result of problems found in that area and removes the requirement to inspect inside “D” boxes if the TE structure is found to be undamaged.
Issue 4 revises the wing inspection and adds inspections of elevator, tailplane, rudder and fin. **A report of the inspection is required for BGA records and to validate the life extension in the BGA CAMO.**
Issue 5 applies lessons learned on how to find glue failure in Fabric covered Ailerons, Elevators and the Rudder. This document has been reformatted with examples of glue failure and access to a YouTube video (link below) showing how to find glue failure on elevators.

https://youtu.be/i5AZFrGSe5k

Instructions:

(a) General inspection

Carry out a thorough general external inspection of the entire aircraft. Pay particular attention to creases in the fabric or paint cracks, which may indicate an underlying or internal structural problem. Pay particular attention to the wing lower surfaces if a heavy landing or other ground incident may have occurred. Carefully examine the wing and elevator trailing edges. If the trailing edges have been previously repaired or replaced, then they are not a good indicator of glue condition in the D box and the D Box inspection is to be carried out.


K6 control guide failure.

Try and establish the glue type used. We are most concerned about the longevity of Kaurit glue. It is usually pink in colour (see figure 4) but has been known to be other colours if a filling agent has been used. You might have to remove some paint to determine the glue used in each critical component. On all control guides carefully check the felts are adequately retained. (see pic of K6 control guide for example of failure.

If there is any doubt as to the integrity of any component, remove sufficient fabric to carry out a detailed internal inspection. Wing TE glue failure is a particularly common problem.

(b) Wing Structural Inspection

1, Remove ailerons. Check all hinge areas for oil/grease damage. Check the aileron spar plywood skins for disbonding, both top and bottom using gentle but firm pressure over its entire length.

For fabric covered ailerons. Cut a hole of sufficient size in the lower surface near the aileron horn to access the aileron spar. Gently push the spar shear web away from the spar booms to see if they are bonded together. Using a knife blade or feeler gauge, try and push the blade or gauge between the Spar booms and D box skins.

2, Airbrake box, remove airbrake paddles. Ensure all drain holes are present and not blocked. Apply pressure to all exterior corners, check for rotten wood and delamination of the solid strips of wood around the edge of the cut out. Pay particular attention to any areas where water might sit when the glider is washed, or rained upon. Check the spar face for any delamination of D box skins using the technique described in this video https://youtu.be/i5AZFrGSe5k All internal joints at either end of the brake box require gentle pressure to ensure the glue is still strong.

3, Make 4 access holes in the fabric approximately 2" (50mm) square (2 upper surface and 2 lower surface) at the following locations:
Note. **If you make the access holes in the underneath sufficiently large, you can access the upper spar to skin joints with a feeler gauge without having to cut holes in the upper surface fabric.**
Single seat aircraft: Adjacent to the rear face of the main spar immediately inboard and outboard of the air brake box. See fig 1.
Two seat aircraft: Adjacent to the rear face of the main spar immediately outboard of the air brake box and at the drag spar intersection with the main spar. See fig 1.

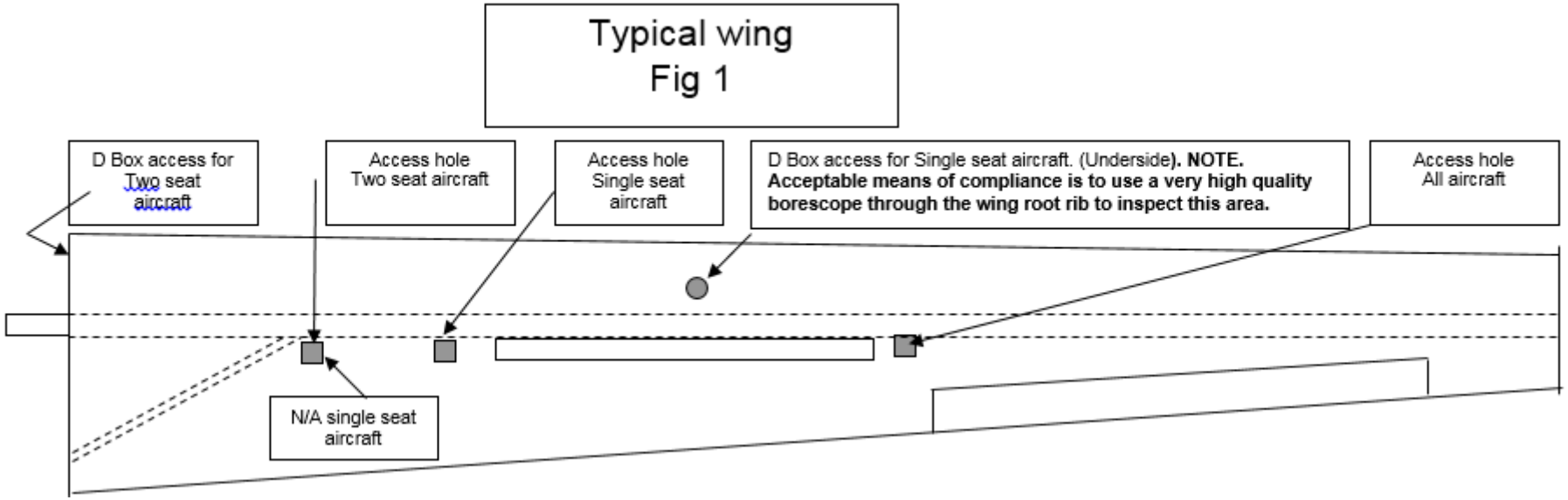
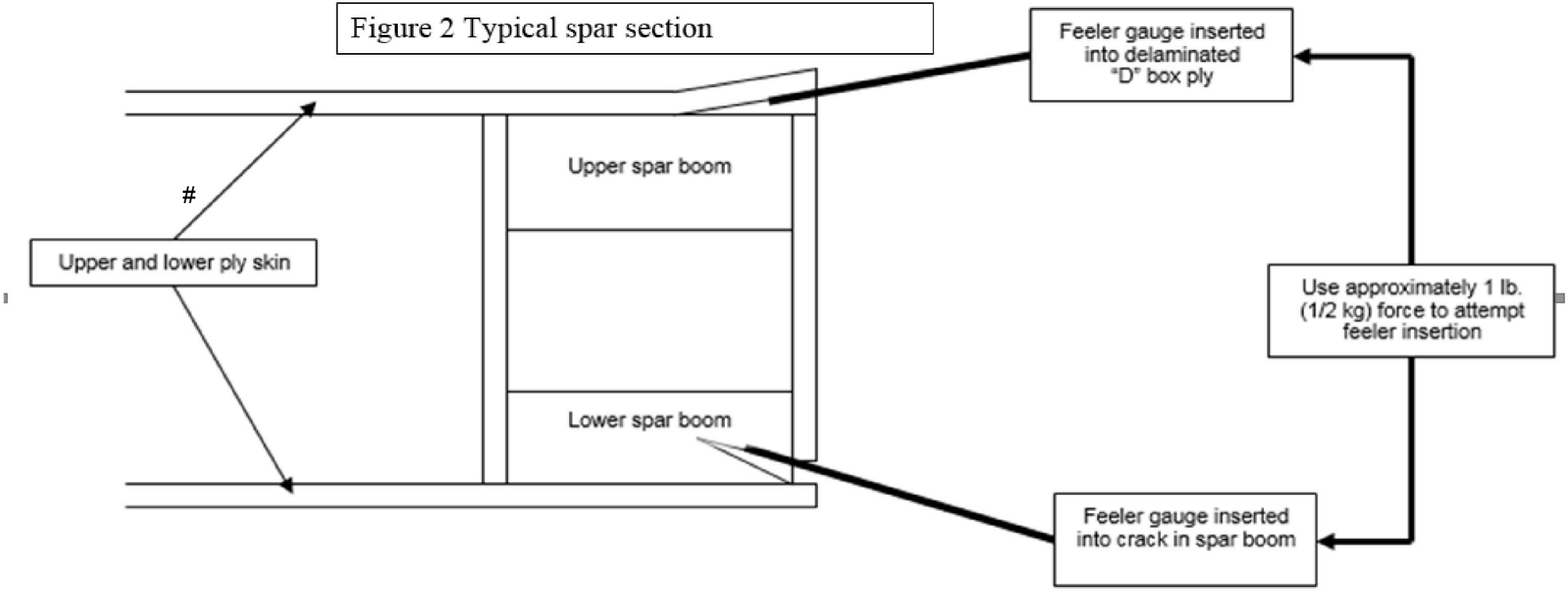


Figure 2 Typical spar section



Through the inspection holes, inspect the internal structure of the wing trailing edge using a torch and mirror or suitable inspection equipment. Pay particular attention to the air brake box and drag spar attachment to the main spar.

Check the integrity of all visible glue joints. Check the adhesion of the D box and other ply skin as accessible, visually and by the following method. Using a 005/010" (0.12/0.25mm) feeler gauge, try to insert into the glue joint parallel to the wing top surface. See fig 2.
Check for cracks running into the spar booms by trying to insert the feeler at 45° to the spar. Apply a force of approximately1 lb. (1/2 Kg) See fig 2.
It may be necessary to locally remove some glue spill to access the joints. On some aircraft (Jubi) it may not be possible to carry out the feeler test due to the extended ply skin. On these aircraft only, a close visual examination will suffice.

If the feeler gauge (or a very thin sharp knife blade) can be entered more than 3/16" (4mm) or any evidence of glue failure is observed the aircraft must not be flown. All the fabric must be removed and a complete aircraft structural survey carried out. An inspection report must be submitted to the CTO for further instructions.

If the trailing edges have been previously repaired or replaced, then they are not a good indicator of glue condition in the D box and the D Box inspection is to be carried out. Wing trailing edge and all structure aft of the spar, inspect secondary structure as visible. This will include wing ribs, trailing edge structure, reinforcing segments, bracing struts, gussets, and intercostals etc. for signs of glue failure or deterioration. Apply slight pressure to confirm integrity remembering that many of these items are very light structures. Make use of all existing and new access points.

It is recommended that wood or plastic rings (available from Light Aero Spares) are fitted to the inspection apertures prior to cutting the holes so as to facilitate easier access and repair for future inspections. The holes can be covered with exterior grade Fablon plastic as long as they are not too big.

(c) D box Leading Edge inspection - If no faults are found during the inspections listed above (parts a & b) the following inspection need not be carried out. However, if faults have been found or the trailing edges have been previously repaired or replaced then the following inspections are to be carried out. It is recommended that you use a borescope to inspect the entire D box internally through the Root rib where possible.

For aircraft with diagonal drag spar attached to the rear of the main spar (Dual seat aircraft)
Cut approximately 1½" (40mm) diameter hole in the centre of the leading edge root closure rib, taking care not to damage any internal members. Ensure that the inspection holes are free from sharp edges and splinters.

Note: On K7 low wing conversions (K7/13) it will be necessary to cut the inspection hole in the outer and original inner angular closure rib. Only the outer closure rib will require closing after the inspection.

For aircraft with reinforced "D" box inboard section and no drag spar (Single seat aircraft)
Cut a small hole in the lower "D" box ply skin forward of the spar approximately mid span forward of the air brake. If boroscope equipment is available the hole need only be large enough to accept the probe. The pressure on the "biscuits" and "sticks" may be applied with a stiff wire. If the hole is 3/8" or 10mm diameter or less, it may be repaired with tape otherwise a permanent ply repair must be carried out.

Through the inspection holes, inspect the internal structure of the wing leading edge using a torch and mirror or suitable inspection equipment. Look for signs of any degradation of the structure or glued joints.
Using suitable mechanical fingers or lightweight rod, apply gentle pressure to the rib “biscuits” and “sticks”
CAUTION: do not apply too much force, as the “biscuits” are only 1mm ply.
If any evidence of glue failure or degradation is observed, additional access into the D box must be made and a complete aircraft structural survey carried out. An inspection report must be submitted to the CTO for further instructions.

On aircraft with access made in the inboard closure rib. The inspection holes may be closed with ply or fabric as desired to prevent moisture ingress.

D Fin inspection. If performing the inspection during a fuselage recover then the fin is to be removed (except K6s where they are not bolted on) See figure 4 for images of glue failure found previously. Please look at this video for advice on how to find problems,
https://youtu.be/i5AZFrGSe5k

Remove the fin (does not require much fabric work) This must be done on all types apart from K6 and K14 types (Indicate on the form returned to the BGA when the fin was last removed) as checking in situ gives very poor access and finger pressure has to be applied, to ensure that the glue joints still have the required high strength. Inspect base of fin rib and put some pressure on it pulling it away from the fin. Check the entire stern post both sides by applying gentle pressure to the plywood that bonds onto the stern post spar. Apply gentle but firm pressure to shear web plywood away from the spar caps to ensure there is no disbonding over the entire length. You are looking for any sign of disbonding or rotten wood (especially at base of fin). Apply significant pressure to the elevator drive mount to ensure that rib is completely bonded. Note, often the bolts that hold the fin onto the fuselage are rusty and should be replaced.

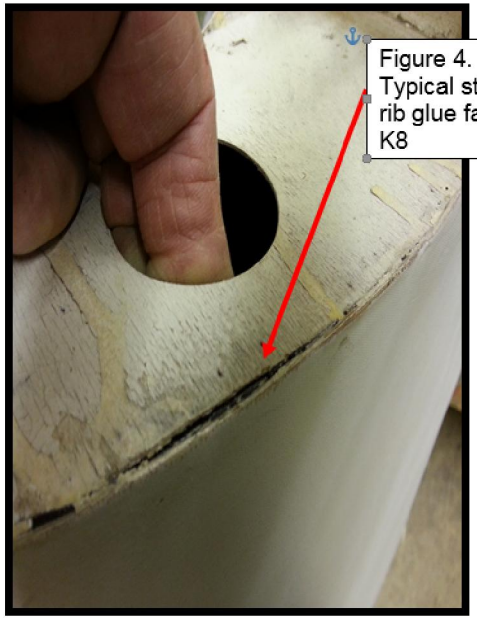
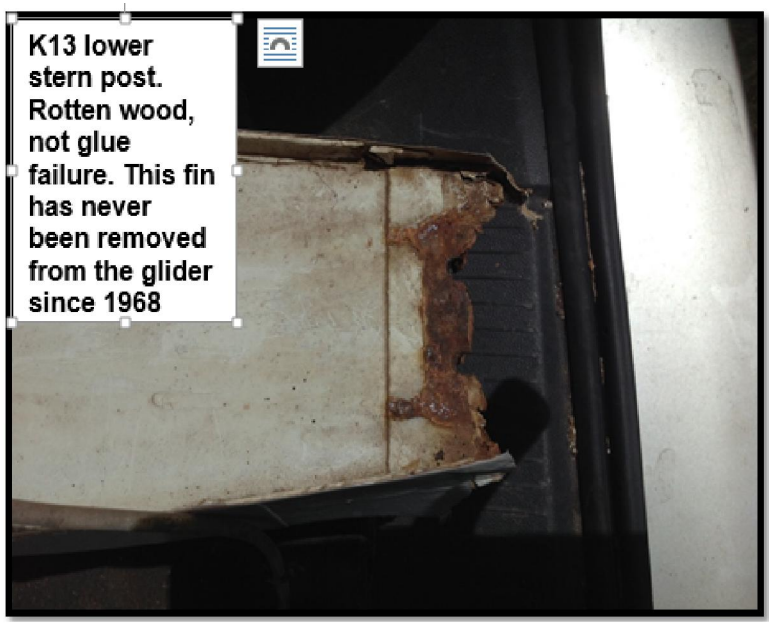


Figure 4.
Typical sternpost and Fin rib glue failure found in a K8



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Rudder inspection. Remove the Rudder.

Check the top hinge for moisture/oil/grease damage. Apply pressure to the D box plywood either side to ensure there is no disbonding. If the trailing edge is bent, this could be an indicator of glue failure, remove all fabric on rudder for a more thorough inspection. .
Check every single rib by gently pushing to ensure there are no disbonded sticks. If any are found, then uncover the rudder and inspect more thoroughly. Be particularly careful to inspect the lower hinge area and lower ribs as these are prone to damage.

Cut a hole of sufficient size in the side of the rudder fabric just above the lower rudder hinge to access the rudder spar. Gently push the spar shear web away from the spar booms to see if they are bonded together. Using a knife blade or feeler gauge, try to push the blade or gauge between the Spar booms and D box skins. This link refers to a short YouTube video that shows a method of looking for glue failure **https://youtu.be/i5AZFrGSe5k**

F Tailplane. Remove the elevators. This gives you good access to the spar for inspection

Apply gentle pressure to the ply wood either side of the spar to check for disbonding or rotten wood (especially on lower surface). Gently apply pressure to the shear web pushing it away from the spar over it entire length.
Apply a feeler gauge (as in figure 2) to the ply skin around the front tailplane mounting bolt and root rib.

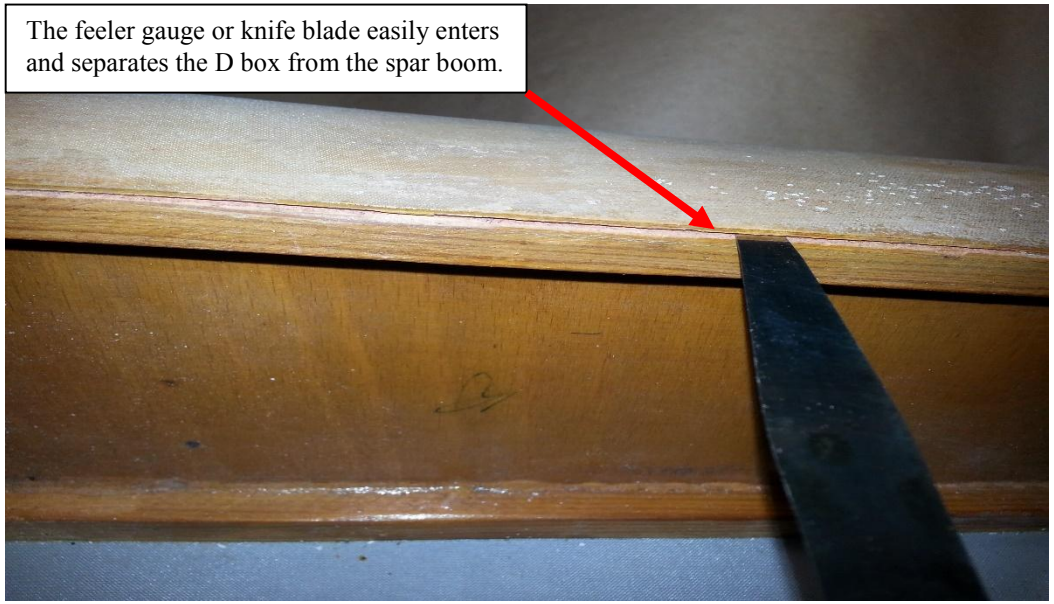
G Elevators. This link refers to a short YouTube video that shows a method of looking for glue failure **https://youtu.be/i5AZFrGSe5k**

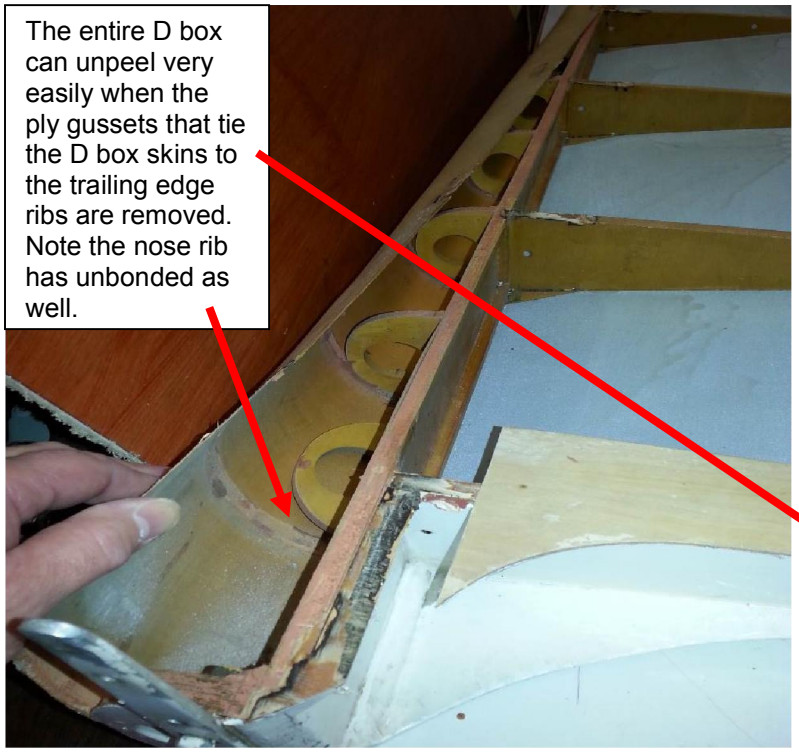
Check the trailing edge is straight and solid. Apply pressure to every rib over the entire length to ensure there are no broken sticks. The root rib requires gentle but significant pressure trying to pull it out of the spar. Using a feeler gauge (as in figure 2) check for any disbonding of the spar to D skins on the root end of the spar where you have access (including inside the D box tunnel).

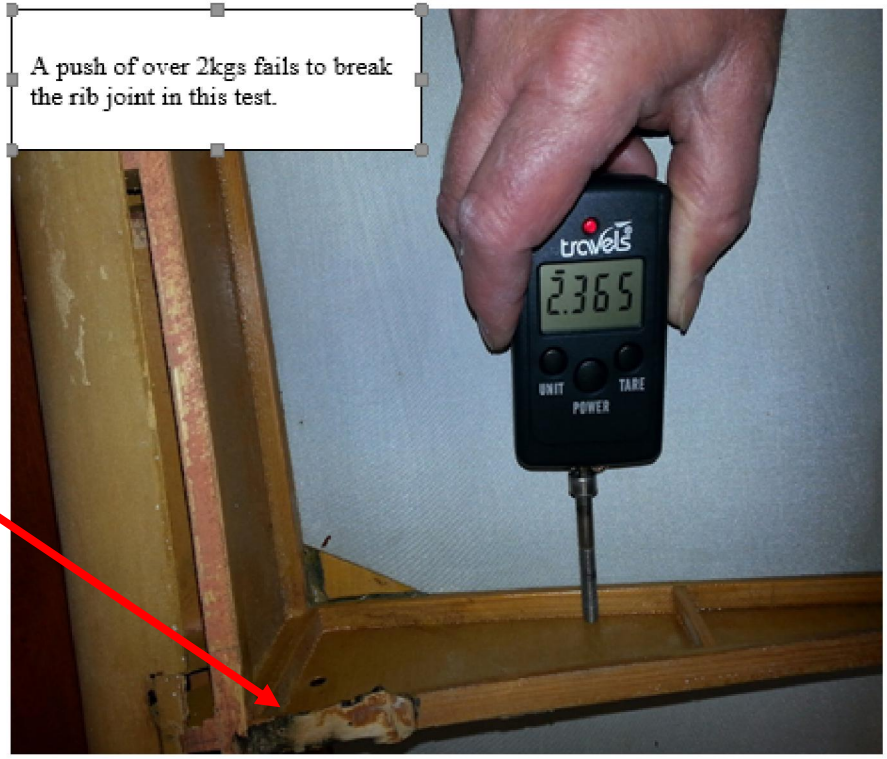
Cut a hole of sufficient size in the lower surface of the fabric in the root end of the elevator to access the elevator spar.

Gently push the spar shear web away from the spar booms to see if they are bonded together.

Using a knife blade or feeler gauge, try and push the blade or gauge between the Spar booms and D box skins..







Record compliance and findings in the glider log book, fill out inspection report form on page 8 and send it to BGA.
Feedback

You must use the form at the back of this document. If any defects are found then add an additional page (photographs). You can email or post to the BGA. These forms will be used to assess the next inspection interval (provisionally 3 years) and what is required at the next glue inspection.

Approved By
Gordon MacDonald, Chief Technical Officer

Glider Type: _____ **Year Built:** _____ **Registration:G-** _____ **BGA Number:** _____ **Ser No :** _____

Hours: _____ **Launches:** _____ **Last Recover Date:** _____ **Last fin off date** _____

Dated any of the components that have been recovered

Critical Component:	**Mark 'S' Serviceable or 'D' Defective**	**Select Glue Type found in that Component:** (Please tick the appropriate box).			
		Kaurit	**Aerodux**	**Other**	**Unable to determine**
Spar bonding to D box glue type					
Spar to Ribs bonding glue type					
D Box bonding to ribs Glue type					
Wing root rib sticks glue type					
Wing root rib to D box and rear rib(drag spar) glue type					
Sternpost glue type					
Sternpost Bonding to D box plywood glue type					
Fin root rib glue type					
Fin root rib to D box plywood glue type.					
Tailplane spar glue type					
Tailplane box to D bonding glue type					
Elevator root rib glue type					
Elevator spar glue type					
All battery boxes and parcel shelves glue type					
K6/K2/K14 frames forward of mainframe glue type					
K6/K2/K14 Entire internal fuselage glue type					
K6/K2/K14 Bonding of frames, longerons to exterior plywood skin glue type.					

For any components above that have been marked as defective please complete a report on a separate page describing the defect in more depth and if possible please add some photographs. On completion of this report please mail or email it to the BGA. (office@gliding.co.uk).