

9/8/95

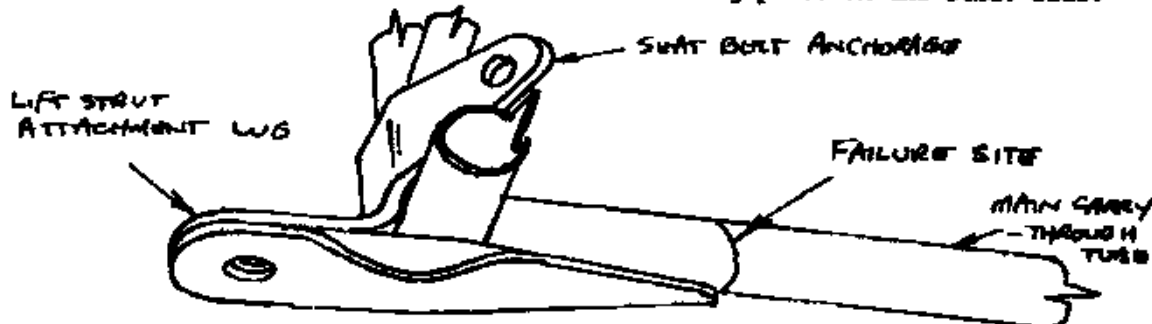
**URGENT — URGENT — URGENT**

**PRELIMINARY REPORT ON INSPECTION OF FAILED MAIN CARRY-THROUGH MEMBER -**

**SKYFOX CA 22 S/n CR22 034 Registration 55-757**

This aircraft was inspected on 9/8/95 at Custom Aero Services, Toowoomba (Phone 076 331 833; Fax 076 331 833).

The main tension carry-through member that connects the lift struts had failed in tension at the inboard end of the lift strut lug plate on the stbd. side.



The failure occurred during flight; the lower longeron and other members at the adjacent cluster had managed to carry the load, thus preventing loss of the wing, although gross deformation occurred. This aircraft had previously been repaired following a landing accident, and the lower longeron from the lift strut cluster forward, had been replaced with 0.058 inch wall material; this had bent plastically, but had not buckled, and was clearly a major factor in preventing loss of the wing.

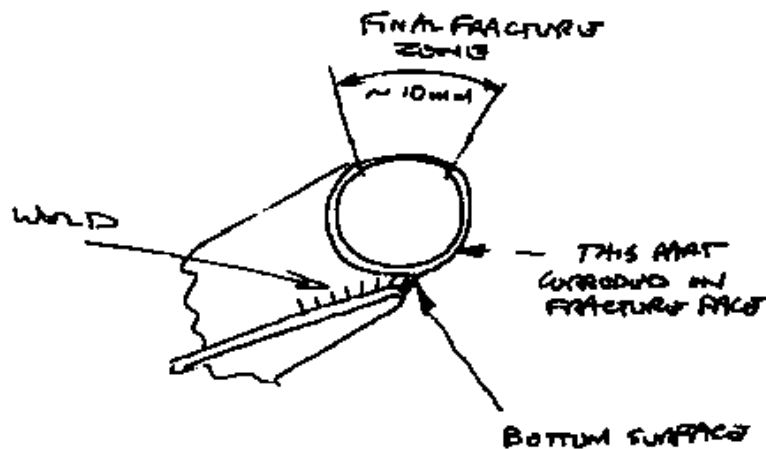
The aircraft was manufactured in July, 1993, and was thus just under two years old. The total flight time was approximately 1400 hours; the aircraft had been used almost exclusively for flying training.

The carry-through tube (which appeared to be 3/4 inch x .035 inch tube) was severely corroded internally. A piece cut from the tube, approximately six inches long, appeared to be fairly uniformly corroded over its full length.

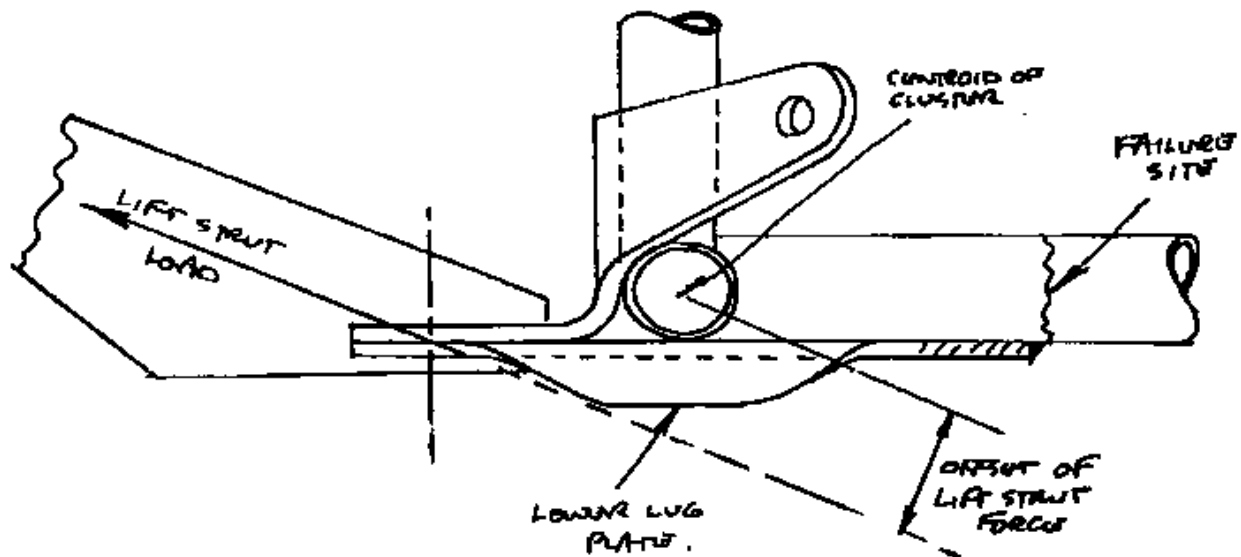
The member had been drilled for the insertion of corrosion inhibitor, and the hole had been closed by a rivet; however it was not possible to determine by visual inspection, whether any inhibiting material was present; the internal corrosion that was evident, did not appear to be concentrated in the weld-heat zones adjacent to joints, but seemed to be fairly uniformly distributed.

The fracture face showed that the final failure took place through about 16% of the circumference, located at the top of the member; the final fracture zone showed characteristic necking and ductile slip faces. The remaining 84% or so of the circumference was quite corroded, showing that it had been cracked for some time. However, it could be seen that the fracture surface was substantially normal to the thickness of the tube, and no local reduction of area was evident. This is consistent with a fatigue failure. The fracture faces were too corroded to detect striations.

DISCUSSION:



The failure had occurred precisely where one would expect a fatigue failure to occur, namely at the end of a weld, where there was a combination of bending and tensile stress:



(Because of the lug geometry used to allow folding of the wings, there is a substantial offset of the lift-strut load, thus generating a large moment about the adjacent cluster. As the carry-through member is the largest size tube at this cluster, it will react a major part of this moment, in addition to the tensile carry-through load. These produce additive tensile loadings at the bottom of the carry-through member, and the local stress is concentrated adjacent to the inner end of the lower lug plate).

Whilst the issue is clouded by the history of a repair that may have burned-out the internal corrosion inhibitor, this site is an obvious candidate for a fatigue failure under the prevailing loads, and the possibility exists that the corrosion was a secondary factor.

The distributed corrosion also lends doubt as to whether this tube may have been missed or not adequately treated, at original manufacture; had the

inhibitor been burned out during the repair, one would expect this to be more evident in the heat-affected zone adjacent to the repair, and to be not evident some six inches away; however, this was not the case.

Only a complete sectioning of the entire carry-through member would clarify this point.

RECOMMENDATIONS:

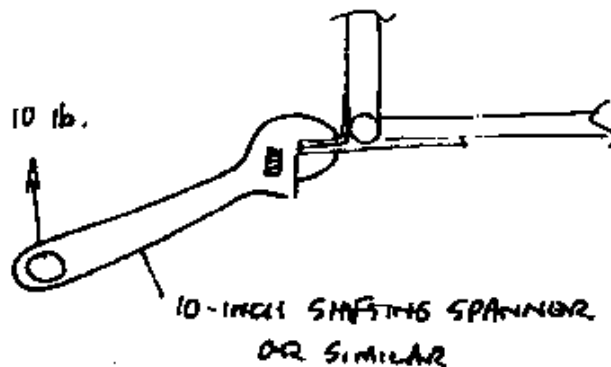
1. All CA 21 and CA 22 aircraft be inspected in this area.

In the case of aircraft more than one year old, or where any weld repair has been carried out in this vicinity, this should be done before further flight.

This can be done by cutting a hole in the fabric, (approx 50 mm diameter would suffice) and removing the paint immediately adjacent to the toe of the weld on the inboard end of the lower lug plate, using a rotary wire brush in a drill.

Since the crack obviously took a considerable time to propagate, cracking should be detectable by visual inspection. It may assist to remove the lift strut, and grasp the lug with an adjustable spanner; by applying an upward load of perhaps ten pounds on the handle of the spanner, the potential crack zone can be flexed. (Care should be taken not to exceed ten pounds or so, and to apply this load only once).

Dye-check should be used if it is available; the flexure technique would assist entry of the penetrant into the crack, if one exists.



*D. J. Llewellyn*  
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