TITLE	COMPONENT LIFE EXTENSION BY INSPECTION PROCEDURES
CLASSIFICATION	ADVISORY
COMPLIANCE	ACCORDING TO COMPONENT LIFE SCHEDULE IN OPERATORS MANUAL
APPLICABILITY	ALL P&M (INCLUDING PEGASUS AND MAINAIR) FLEXWINGS

INTRODUCTION

The operator's manuals detail lifed replacement of critical items in the airframe. With extensive service experience over many years, some parts have proven to be less critical than first thought, whereas other areas have produced problems. Mandatory replacement of components at the required life was the initial approach. However, with service experience and detailed inspection, some extension of service life of some components is now possible on condition, as follows.

ACTION:

This service bulletin must be added to the section of the Operator's manual concerning replacement of lifed items.

Airframe Component Fatigue Life:

At each scheduled component life, it may be possible to extend the life of the part by means of inspection procedures as follows. Any life extension given by such 'on condition' inspections must be entered in the aircraft technical log. On reassembly, fasteners must be inspected and new nyloc nuts used where applicable. Rivets used to locate tube assemblies must be replaced with the correct type.

Main airframe aluminium alloy tubular components:

At the required life period, all the items must be stripped out, cleaned, degreased and crack tested at holes, notches, changes of section etc. by a qualified inspector. Dye penetrant or close visual inspection using a good quality X 5 or greater magnifying glass in good light are acceptable. Any reports of fatigue cracking must be referred to P&M Aviation. Following detailed inspection disclosing no cracks, life can be extended by 1/3 of the operators handbook new life till the next crack inspection, which must be entered in the aircraft technical log. Obviously, the part may also be rejected because of damage,distortion, corrosion or wear.

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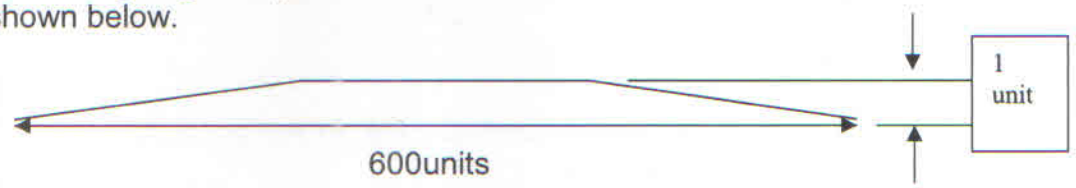
Tolerance on Straightness:
The tolerance on overall straightness of primary airframe tubes in service, *except for leading edges or parts with a defined manufactured bend*, is L/600 measured as shown below.



The best way to measure the bend is to rotate the tube on a flat surface to find the axis of the bend, which should be marked. Then, using a taut light string held tight to the marked ends of the tube, measure the maximum gap between the string and the bend.

For example, considering a tube 2500mm long, if the gap is 3mm, the bend is 2500/3 = 833 i.e. bigger than 600 so within limits. The maximum allowable is 2500/600 = 4.16mm

Specific Parts:

Leading Edges:

The leading edges are preloaded into a bow to match the sail curve, to achieve the necessary spanwise tension at thewingtips.

Aluminium alloys under a continuous bending stress can creep, i.e. develop a permanent bend if the wing is kept rigged for long periods. The effect is to reduce the spanwise tension and so reduce the crossboom compression, i.e. thepermanent leading edge bend relieves the load in the structure.

The aerodynamic effect is to allow more washout (twist) in the wing under load, which results in a reduction in hands-off trim speed and increased pitch control forces in manoeuvres. The reduced tension can also result in lighter roll handling. The aerodynamic performance (glide ratio) will degrade.

Because of the creep, the fact that the leading edges are primarily loaded in bending and that the effect of moderate permanent deformation is benign, the bend limits for leading edges *only* have been relaxed. There is further relaxation for the complete leading edge assembly, to account for play in the sleeved joints. The bend limits are now as follows:

PART	LIMIT	MAX DIFFERENCE L TO R
LEADING EDGE FRONT	L/400	L/600
LEADING EDGE REAR	L/400	L/600
COMPLETE L.E. ASSEMBLY	L/350	L/500

If the bend is outside the limit, the affected leading edge sections must be replaced preferably in pairs and the wing check flown after replacement. A bent leading edge must NEVER be straightened or turned round.

Trike Pylons, Base tubes, Seatframes, front struts, undercarriage struts, control frame tubes, lift struts, wing keels, crossbooms, kingposts,:

All these parts must be checked for straightness to the L/600 limit except where there is a defined manufactured bend.

Pegasus and Mainair round tubular pylons and basetubes must be stripped of all fittings and be inspected for cracks and deformation at all holes and changes of section. Mainair trike basetubes are known to bend in heavy landings.
The XL and Q pylon has been known to crack at the engine mount holes and the pylon top bush hole. The seat frame connections on the XL and Q trike are known to crack or become distorted after heavy landings, however these are readily inspectable once the fittings are disconnected.

On the box section pylons, the critical areas are the connection to the wing and the trike. The wing attachment area must be inspected for cracks and loosening of the bush, especially on the top connection. Twisting of the trike relative to the wing (e.g. in a roll-over) can distort the cross section and has been known to cause cracking at the corners of the box section.
The basetube seat frame attachment bracket holes and the rear steering hole must also be checked for cracks at the time required in the manual.

Leading edge to crossboom bolts:
Except for the Mainair wings, 8mm bolts must be removed at the required life and replaced, or replaced with the 10mm diameter bolt modification PG123 (XL) and PG124 (Q and Q2). For the Q and Q2, the design can be further uprated to fit the 17mm spherical bush as used in the QuikR (M197).
Following this modification, replacement is only necessary in the case of wear, corrosion or distortion.

Hang Bolt:
Bolts generally are not amenable to fatigue crack inspection so replacement is the only course. Obvious grooves more than 0.02 mm deep, or corrosion pitting, warrants replacement. A small amount of lubricant, e.g. Vaseline, can be used.

Propeller Bolts:
If these are maintained at the correct torque, no relative movement will occur and they can continue in service as long as they are free from corrosion. Especially with wooden propellers, If the propeller bolt torque has been allowed to slacken and there are signs of fretting/relative movement in the assembly, all the bolts must be replaced. Early Pegasus XL 462 trikes with ¼" propeller bolts threaded into the driver, should have had modifications 019 (8mm bolts) and 029 (10 ft/lb bolt torque) carried out.

Hang channel
This must be inspected for wear and fatigue cracks at the required time. If wear is within limits (maximum 10.5mm diameter hole on 10mm hang point bolt), there is no distortion and no cracks exist, extend life by 1/3 as per tubular parts.

Rigging Cables:
In order to extend the life, cable assemblies must be closely inspected paying particular attention to the swaged areas for corrosion, broken strands and slippage. The thimbles must not be kinked and there must be no abrasion, loose strands or kinking over the cable run. Cables sometimes break strands in the inner core of 7 strands, which is not visible till the cable lay is unwound. Following a satisfactory inspection, extension of life by 1/3 of the new value to the next detailed inspection is allowable.
Note - Axial roll swaged terminals are subject to a fixed life, see service bulletin SB143.

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Undercarriage pickup bolts and channels:
These areas have not proven to cause problems and so inspection at the lifed period is all that is necessary.

Engine mounting bolts:
¼" diameter bolts used on Lord engine mounts have been known to fail occasionally. These must be replaced at the required life of 500 hours. 10mm diameter bolts used on the HKS & Rotax 912 engines are not subject to this. Obviously the rubber engine mounts themselves can degrade and must be replaced if cracked/disbonded.

Other engine parts:
Exhaust systems and mounts are subject to thermal cycles as well as millions of fatigue cycles. In general, exhaust systems are mounted with some fail-safe features so that if one part of the mounting or exhaust cracks, the system will stay in place. Regular inspection is vital. Periodic removal of the exhaust system is advisable to check for worn springs, ball joints and loose baffles. Re-welding of exhausts by a competent aircraft welder is allowable but eventually cracks will recurr and it will be more effective to replace the assembly.

Sail:
The sail is subjected to degradation by UV light, biological attack, fatigue and abrasion. See service bulletins SB132 and 133.

Fatigue:
Sail trailing edge vibration can develop after many hours.
On the XL wing, if a trailing edge panel is very slack, it will 'buzz' in flight. This will eventually cause fatigue failure along the trailing edge seam. If increased bungee tension does not stop it, the trailing edge can be tightened by increasing the trailing edge scallop, in our sail loft.

Abrasion:
Abrasion of the Q & Q2 wing sail can occur at the contact with the leading edges, fin tube and battens.
Abrasion at the leading edge French seam can be prevented by taping over it. This is now done in production. A taping kit is available. Up to 100mm of unravelled stitching at the leading edge seam is acceptable provided it is taped over between the leading edge and the seam. Abrasion is possible between the fin tube and the sail trailing edge. Any damaged stitches here are potentially hazardous. Abrasion of the sail undersurface batten pockets and the crossboom is not critical to the sail, but allows wear of the battens and crossboom. This contact point must be protected with a neoprene diving suit material patch. Wear of the kingpost hole reinforcing webbing sufficient to cut through the webbing must be repaired by sewing on a new webbing patch.

Abrasion of the tip webbing attachment is unacceptable and must be referred to P&M. The tip webbing attachment on the Q2 wing must be modified and protected according to mandatory modification PG207 & service bulletin SB97.

ISSUED BY W.G. Brooks **DATE 18/03/19**

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