PEGASUS WINGS & QUIK RANGE OF WINGS

WING – General

Rigging Cables

As with all replacement parts, only genuine P&M parts may be used, which are generally available by return of post. Incorrect swages can look OK but have little strength. Be suspicious if the swages are of a different colour to the rest, or have different dimensions or swaging style. Serious accidents have resulted from incorrect cable assemblies.
Pull back the blue plastic protection sleeve where fitted, to inspect cable end terminations. Check for kinks, loose strands, distorted thimbles, corrosion and movement in the paint marks where Talurit type axial roll-swaged ends are used. Cables are particularly vulnerable to kinks at the ends of such connections.

Sail

The sail gives the aircraft it's aerodynamic performance, safety and structure. Polyester yarn is used for sailcloth, tightly woven and then further tightened by application of heat, causing the weave to shrink tighter. A resin finish is applied to fill the weave, make it non-porous and to stabilise it in the 45 degree direction (the bias).

Polyester fabric is degraded by UV light. Aggressive alkaline detergents and mildew can also degrade the fabric. The new rip strength of Toray XT50 or Polyant 210 TNF is approximately 3500 grammes force on a 1.2mm diameter needle. For the XL wing, Flash series and the Blade, the lowest acceptable rip strength is set at 1050gr. The Q, Q2, Quik and GT450 have a 1350gr limit. The QuikR uses a high technology HTP square rip-stop fabric, where the Betts test limit is based on the load to rip the small fabric squares, minimum 400 gr.

From the Q2 wing onwards, aramid unidirectional bands have been used to control the sail stretch and so improve performance. The bands also act as rip-stoppers in the case of debris ejected by the propeller. The Quik was the first flexwing to use the root to tip reinforcement band to achieve high performance and maximum lift coefficient from a small wing. The aramid band is also degraded by UV light although exposure is reduced because it is underneath the sail main body.

Normally the stitches should be tested to the same load as that specified for the sail material, because the Betts test load is a measure of the load transfer capacity at a stitched joint. Over the past few years sails are built with Tenara spun PTFE thread, identified by a sewn on placard at the nose. Tenara is highly resistant to UV.

The strength of the sail not exposed to UV can be found by testing the strength of the material underneath the leading edge mylar. In all cases we have tested, the fabric properties are similar to new material.

To maximise life, the sail should be protected from light when not in use. Mild, Ph neutral detergent should be used for cleaning, with plenty of water.

Fasteners

Fasteners must also be genuine P&M supply or where AN fasteners are specified, supplied with a certificate of conformance. Crack testing of fasteners is not practical and the only course of action is to replace at the recommended service life. They must also be replaced in the case of corrosion or deformation. Nyloc nuts and split pins should only be used once. Beware of incorrect ¼" nuts on M6 bolts!

Replacement of rivets should be carried out only after consultation with the factory. Replacement must be carried out with care not to over-size the hole, care to use the correct type of rivet and to use the correct riveter. Avdel monobolts in particular require a close tolerance hardened riveter head with a sharp edge, which peels over the rivet core, retaining it, before the stem breaks.

Fatigue life

Service bulletin 109 introduced the concept of extending the fatigue life by 1/3 of the prescribed new life by means of a crack test inspection. The life extension may be continued in cycles at 1/3 of the original new life, assuming NO cracks are discovered and that the part is otherwise serviceable (corrosion, deformation). See the SB for full details.

Batten plan and tuning

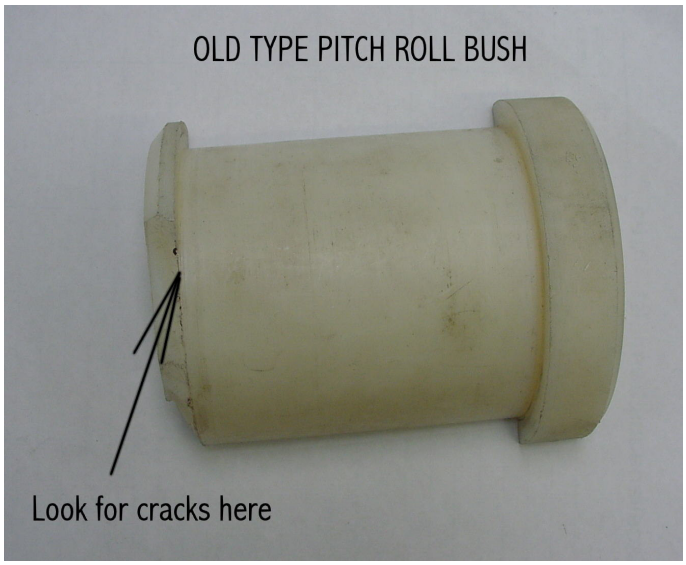
Battens should be checked to conform to the correct batten plan, with tuning adjustments (e.g. reflex) within the tolerances described in the operators manual. The GT450 and QuikR have a flat or more cambered profile for the tips, where for new wings the flat profile is used; camber can be increased up to the higher profile to maintain trim speed if required as the wing ages.
If major parts such as sail or leading edges are replaced, or if the batten profiles differ significantly from the batten plan, it is best to reset all the ribs to the plan and start from scratch, using the tuning guide in the manual, making small adjustments one at a time and keeping notes.

P&M Aviation Ltd.
Crawford Street Rochdale Lancashire OL16 5NU United Kingdom
Tel: +44 (0)1706 655134 Fax: +44 (0)1706 631561 flying@pmaviation.co.uk
www.pmaviation.co.uk

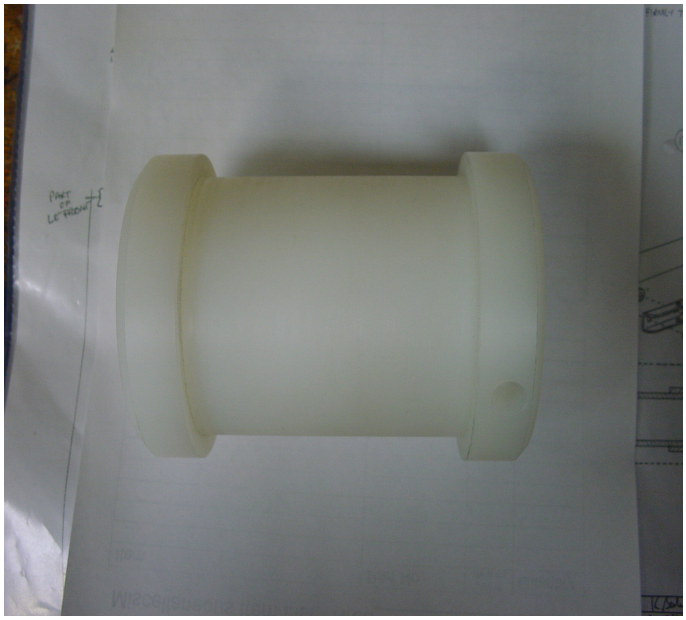
Q1 and Q2 wings

Most of this information is also applicable to the earlier Q1 wing.

1. Roll Bush



The original tolerance in the roll bush was increased to stop roll stiffness if the bush should swell. Following the tolerance change a few roll bush flanges were found to have cracked and/or broken away. The flange length was therefore increased as shown in the photo below. On early wings check carefully for cracking.



Later wings use a new material for the roll bearing, a dark grey material called Vesconite, which is non-hygroscopic and hence non-swelling.

2. **Keel Cracks**

The roll bearing retaining screw must be removed and the bearing slid along the keel. It is necessary to remove the noseplate bolts and slide the plastic protection tube forwards to see it. Check the keel tube material around the hole for cracks. If there is a crack less than 2mm long, the keel can be recovered by drilling out and inserting an aluminium bush according to modification M139.

The noseplate holes in the keel can also wear or crack and a similar bushing modification M140 has been introduced for this.

If the cracks on either hole cannot be removed completely by the bush, the keel must be replaced.

3. Sail Centre Section Stitching

Carefully check the stitching in the centre seam of the sail between the king post hole and the trailing edge. For operation at 490kg, the sail MUST have the later type webbing pull-back strap and a triple row of zigzag stitching at the joint.

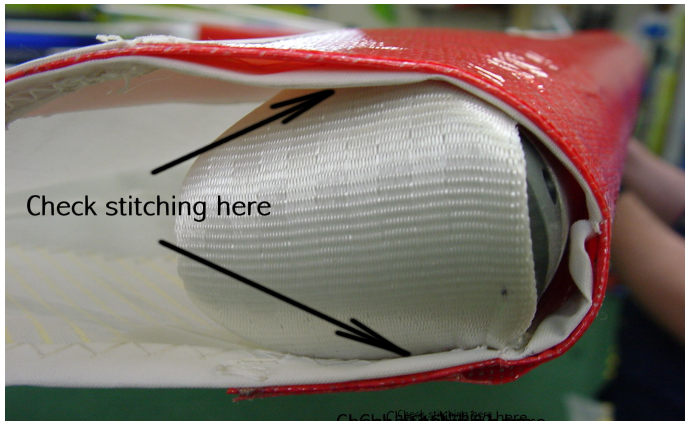
4. **Leading Edge Stitching Abrasion**

Check the stitching in the French seam along the leading edge, if stitch protection tape has not been added in accordance with bulletin 84 then to save further stitching problems it should be fitted.

5. Fin Tube Abrasion of Sail Stitching

If the satin anodising on the fin tube is coarse, the stitching has been known to abrade by the action of the fin tube. Protection tape must be in place in accordance with bulletin 84.

6. Tip webbing and UV cover

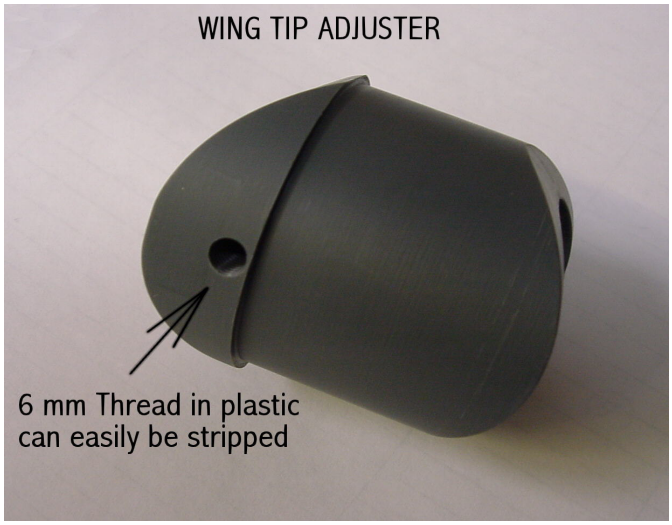


It is vital that all wings have had service bulletin 84 carried out. Where the tip modification has not been carried out the UV/abrasion protection patch must be glued properly in place and no broken stitches holding

the tip webbing in place can be accepted. By now all Q2 wings should have the later type tip webbing stitching done, identifiable by multiple V rows of stitching as opposed to the original style which was a simple rectangle with two diagonal rows of stitching.

7. Trim Cable Attachment to King Post
The attachment should be tightened onto the king post, but not so tight that it will not allow the trim cable to be aligned by hand.

8. Stripped Thread in Tip Adjuster



Owners have been known to over tighten the socket head screw in the tip adjusters, check that the screw is present and tight. Note NO washer should be fitted here, the tip adjustment depends on the socket head screw biting directly into the leading edge.

An optional modification is available to attach tabs to the mylar leading edges, secured by a dome head socket screw to the tip adjuster, which must be tapped M8. (Modification M125). This stops the mylar wrinkling and migrating towards the nose.

9. Roll Bush Retaining Bolt Stripped Thread.

Check socket screw for tightness and stripped threads. Do not over tighten, as the tube will be distorted causing the roll bearing to become stiff.

There is a modification recommended for this area introduced on the GT450, to use a longer bolt where the shear loaded part of the bolt is on the plain shank and where the roll bearing is recessed to accept a nyloc nut.

10. Hang Bracket
The hang bracket roll bearing on the keel never wears out because of the huge bearing area. On the Q2 wing onwards, the hang bolt is intended to be done up tight, it is NOT intended to rotate in the hang bracket. The bearing should be in the top hat nylon bearings onto the pylon sleeve, not the bolt. The bolt hole does wear and the maximum tolerance is 10.5mm. The hole should be inspected for cracks, though these are so far unknown in this area.

A heavy crosswind landing or roll-over incident often results in a twisted hang bracket – check it for alignment.

Sometimes the twisting action of the trike on the wing causes the four M6 countersunk socket screws to loosen. They must be installed with Loctite 648. On removal, some heat on the block (hot air gun only, not a flame) may be necessary to free them off, using a good quality, sharp allen key.

New hang brackets can be provided with a spacer which controls the gap in the hang bracket, simplifying attachment of the trike pylon. The spacer must be fitted by springing the hang bracket apart before fitting the four countersunk screws.

11. Leading Edges
Leading edges can develop a set, particularly on the Q2 where the internal sleeve ends outboard of the leading edge front section. Often purely the outboard section is out of tolerance.

Remove the LE channel bolts and check closely for cracks at the hole edges.

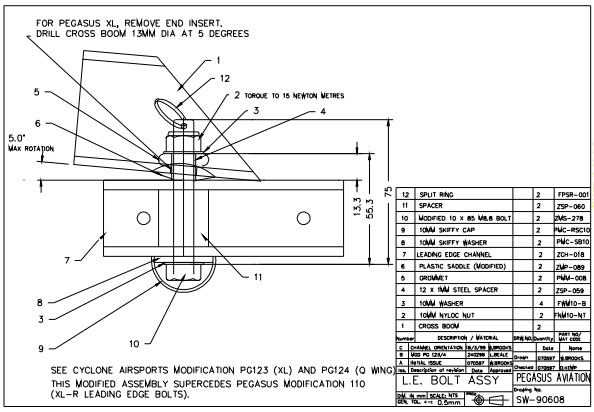
The tolerance on straightness is L/600, measured like the distance from a bowstring to a bow. Over the whole leading edge, the allowable bend is around 10mm. Leading edges should normally be replaced in pairs, otherwise undesirable turns may be apparent.

On reassembly, ensure the LH and RH leading edges are in the correct sides and ensure the leading edge outer slot on the top is plugged into the leading edge inner section pin. It is good practice to assemble the leading edge with a felt pen line at the joint, indicating correct engagement.

Leading edge bolt holes can become worn at the nose, these can be bushed according to modification M142.

12. Leading Edge and Crossboom Abrasion
The leading edge can become abraded by the wing ribs. A bad case has been seen in the factory recently where the sail had got sand in it – large areas of abrasion through the anodising were apparent causing loss of strength and inviting corrosion. Crossbooms can get abraded by the battens, if the abrasion is more than 0.5mm deep, the boom must be replaced. Cases have been seen of battens wearing holes in cross booms! More recent wings have combined neoprene/mylar anti-abrasion patches sewn onto the sail, which can be applied to the Q2 if desired.

13. Crossboom To Leading Edge Channel Bolt and Bush.
The main bolt connecting the end of the crossboom to the leading edge channel was originally 5/16". Modification PG124, necessary for operation at 409kg AUW, was introduced in 1997 to increase the size to 10mm diameter, M8.8 material. It is provided with a bush, rocking saddle and rubber grommet allowing the crossboom to float up and down at the keel, without bending the 10mm bolt. The 10mm bolt should be torqued to 15NM and a safety ring installed above the nyloc nut.



14. Cross Boom Centre Section Ball And Socket.
The ball and socket rarely gives any trouble. The vertical pivot bolt in the restraint cable brackets should be loose, safetied by castle nut and split pin. It is intended to move in an oversize hole so that all the boom end load is taken through the ball. The brackets themselves should be tight on the cross boom and the restraint cable thimbles should have short sections of plastic tube in as an anti-kink measure.

15. Anti Float Webbing
This can very occasionally get caught between the ball and socket and be damaged – look for nicks and cuts in it. The webbing also gets worn on the keel sleeve and rubbed on the Velcro. If in doubt, replace it.

16. Nose Catch Pip Pin, Swan Neck Catch And Shackle.
If the nose of the wing is dropped onto concrete, cases have been known of the pip pin head cracking and detaching from the rest of the pin making it insecure. Give the head of the pip-pin a sharp tug to ensure it is secure.
The pin through the stainless steel shackle must be peened over so it cannot unscrew. Check the holes in the swan neck catch for distortion/cracks.

18. Fin Tube
Where the fin tube connects to the kingpost, originally a hollow pin with pop rivets was used. Sometimes the rivets come out – check they are secure. They can be changed for the simple M6 bolt with thin nyloc nut now used.

XL wing

19. Tip Attachment
The tip attachment on the XL wing is by means of a nylon cord. This must be attached to the webbing loop on the sail with a bowline knot and than wrapped around the leading edge attachment bolt and webbing loop 3 times. The leading edge should be pulled up so that the V of the sail is approximately 20mm from the centre of the attachment bolt.

20. Hang Bracket
The XL hang bracket is of steel and tends to wear, holes should be checked for ovalising.

21. Leading Edge Bolts
It is recommended that modification PG123 is carried out, which is to fit 10mm bolts to the leading edge joint with a bush, similar to the Q/Q2 wing modification PG123 described above.

Quik wing

The design of the Quik wing is similar to the Q2 and the same points apply. The main difference is the use of aerofoil uprights and kingpost.

Kingpost
The kingpost rests on a dome headed bolt. In the original design, the kingpost was located by a steel cable strop

intended to locate the kingpost onto the dome bolt. Sometimes it failed to do so and so mandatory modification P&M 104 was introduced to fit a long shackle inside the bottom of the kingpost to ensure correct engagement. It must be checked this shackle is in place and slides correctly inside the kingpost.

Uprights
It must be checked that service bulletin 116 / modification P& M 124 has been carried out, to fit 2 additional Advel monobolt rivets in each upright, 7mm below the top edge of the upright tube.
The joint must be inspected for security, the uprights inspected for straightness and damage, especially at the hang bracket end.
Later Quiks use the larger extrusion from the GT450, which has a top joint with 6 countersunk rivets and a bottom joint with a rotation feature, allowing the upright to twist a few degrees, rotating on a nylon bearing inside the upright.

Trim System
The pulleys in the trim system should be inspected for wear, and the cord for fraying. Check also the steel cable for broken strands, especially where it wraps onto the trim wheel drum.

GT450

Rocker System
The GT450 is similar to the Quik, except the lower rear rigging has a rocker system in it. The bushes and tang should be inspected for wear and the fasteners in the rocker must be inspected for security.

Tip Fins
The tip fins should be inspected for cracks – the vulnerable point is the area outboard from the wing leading edge. The Velcro must be in place which protects the sail stitching from the tip fin.

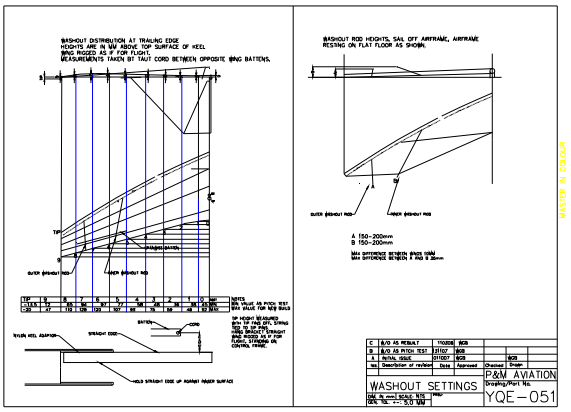
QuikR

The QuikR has a number of novel features.

Washout Rod Cord
The QuikR wing is provided with an automatic means of placing the washout rods in the correct position when the wing is rigged. Sometimes on tensioning the wing, the inner washout rod can get caught in front of the cross boom. It is best to rig the tension half way, then lift the rod over the crossboom through the inspection zip panel. If either washout rod gets caught and the owner continues to apply tension, either the washout rod cord will break or the becket (webbing loop) will pull out of the sail at the wing root.

The cord can stretch slightly with use. The cord must position the washout rods such that the inner washout rod is as far out as it can go inside the double surface. The outer washout rod should be set directly above the slit in the sail undersurface. The slit is for access by M8 spanner should adjustment to washout rod height be necessary.

Washout Distribution
Note that the washout distribution in the wing is critical for pitch stability and MUST conform to drawing YQE-051, also shown in the operator's manual. The wing should be supported rigged as if for flight, with the hang bracket straight, with the keel approximately level and supported at the back (we use a cord attached to the ceiling for this).



The inner washout rod is essentially fixed. If the washout is wrong, remove the inner washout rod and ensure it is bent to the batten plan. On reassembly, ensure the cable strop is not damaged and check it engages properly in the bolt at the end of the washout rod.

The outer washout rod is adjustable. Detach the M5 bolt securing the washout rod cord, cable and bungee. It may help at this stage to have an assistant with a rod pushed in through the wingtip to keep the bungee under tension. Rotate the rod clockwise to drop the rod and vice versa. 1 turn is approximately 6mm at the trailing edge.

Lift Strut Brackets
These are of robust construction in stainless steel and attached to the crossboom with several avdel monobolts. Check the assembly for cracks and loose rivets. If an attempt has been made to fold the wing flat on the ground with the struts attached (never do this!), the

brackets will be distorted. There will also be marks and possible distortion of the strut end fittings.

Sail Keel Pocket Webbing

Unlike the Q series the QuikR has no fin tube and the sail is restrained by being attached to the cross boom restraint stud by a grommet. Under very high positive g load there have been cases of the grommet pulling out of the keel pocket webbing.

A service bulletin has been issued on the keel pocket webbing (SB 128) requiring modification M229 to be carried out within 2 years or 300 hours. The new modified standard is a 50mm wide webbing.

Trailing Edge Buzz

It has been found that on some wings over 50 hours old, some buzz develops in the trailing edge especially above 80mph. A modification M230 has been introduced to insert and bond a trailing edge GRP strip between battens 5 and 7, which eliminates this problem.

Stall Characteristics

Some examples of the QuikR, especially when very new (hence minimum washout) have shown some tendency to drop a wing at the stall. It is thought this is caused by the slight bulge in the leading edge caused by the inboard washout rod. Any wing dropping tendency becomes worse in the rain.

The problem can be eliminated by a slight reduction in the camber of battens 5 and 6 – contact the factory if this problem is found.