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| <b>TITLE</b>          | Sail degradation testing and repairs.                   |
| <b>CLASSIFICATION</b> | P&M Aviation have classified this bulletin as Advisory. |
| <b>COMPLIANCE</b>     | At each annual permit revalidation inspection.          |
| <b>APPLICABILITY</b>  | All P&M supported flexwing microlight aircraft.         |

**INTRODUCTION**

The materials used in P&M flexwing aircraft sails are all subject to degradation by UV light with the exception of the PTFE thread used in the seams of later aircraft. In order to maintain airworthiness a regular degradation test program is necessary using standard techniques as described. This SB supercedes information in aircraft manuals issued to date.

Issue 3 clarifies some information and refers all Aramid/Technora reinforcement testing to SB 132 current issue.

In the following, for the UK “Inspector” means a BMAA inspector with A and I ratings. All inspectors must use approved test equipment.

**1) Test methods**

The test methods are visual inspection and the Bettsometer, which is a 2kg range spring balance connected to a 1.2mm diameter needle and a separate hook.

A P&M test instrument with a 10kg range and 1.5mm hook has been introduced to test Aramid and Technora reinforcements directly. See Service Bulletin 132.

**2) Test Technique**

**Bettsometer fabric test**

3 types of sail fabric are used. Plain sailcloth type TNF210, plain sailcloth type TNF215 UV Coated and HTP square, which is a ripstop type weave. See figs 3 and 4.

The sail should be locally tensioned at least enough to stop it puckering at the needle under the test load. It is acceptable to test with the sail de-tensioned or tensioned rigged for flight.

The needle is inserted and then the test load in table 1 is gradually applied parallel to the surface, in the Warp (approximately spanwise) and Weft (approximately chordwise) fibre directions. Fabric ripping at any load up to the test load indicates the sail is no longer usable for flight.

BMAA inspectors are NOT expected to test to more than the loads in table 1. It is possible for an owner to test to see what margin of strength exists. New material fails at approximately 3 times the test loads of table 1. If the cloth fails, an approved repair scheme will be required.

**Bettsometer stitching test**

For test of stitching, the load is applied by passing the Bettsometer hook through a stitch and gradually applying the test load, perpendicular to the surface. See fig 1. Stitch breakage below the test load indicates the sail is no longer usable for flight.

In addition, visually examine the general condition of the stitching and inspect suspect areas using a magnifying glass. Look for damage including abrasion and broken fibres.

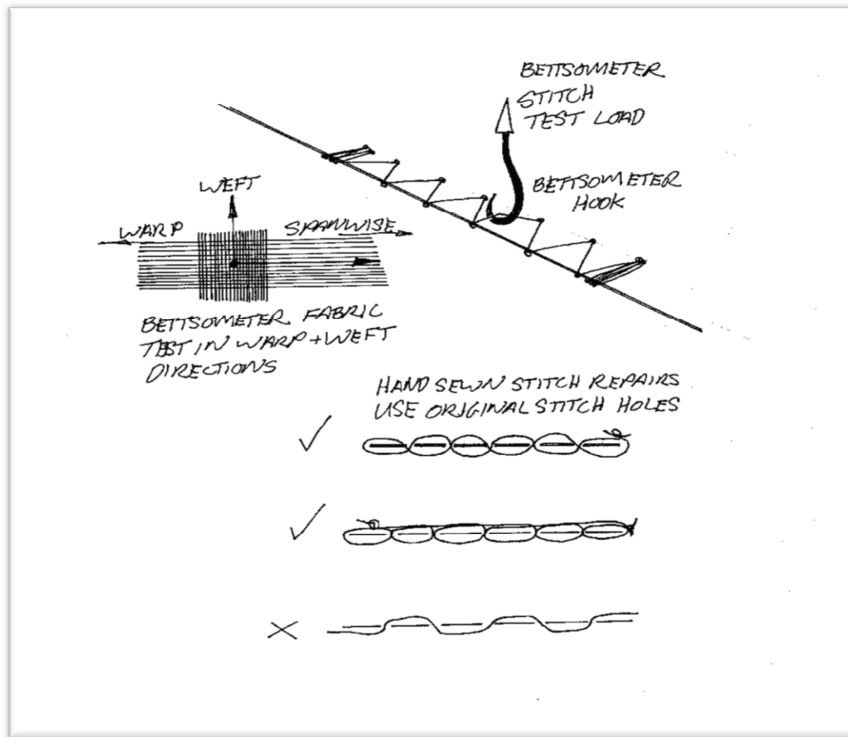


Fig 1. Cloth test, stitch test and repairs.

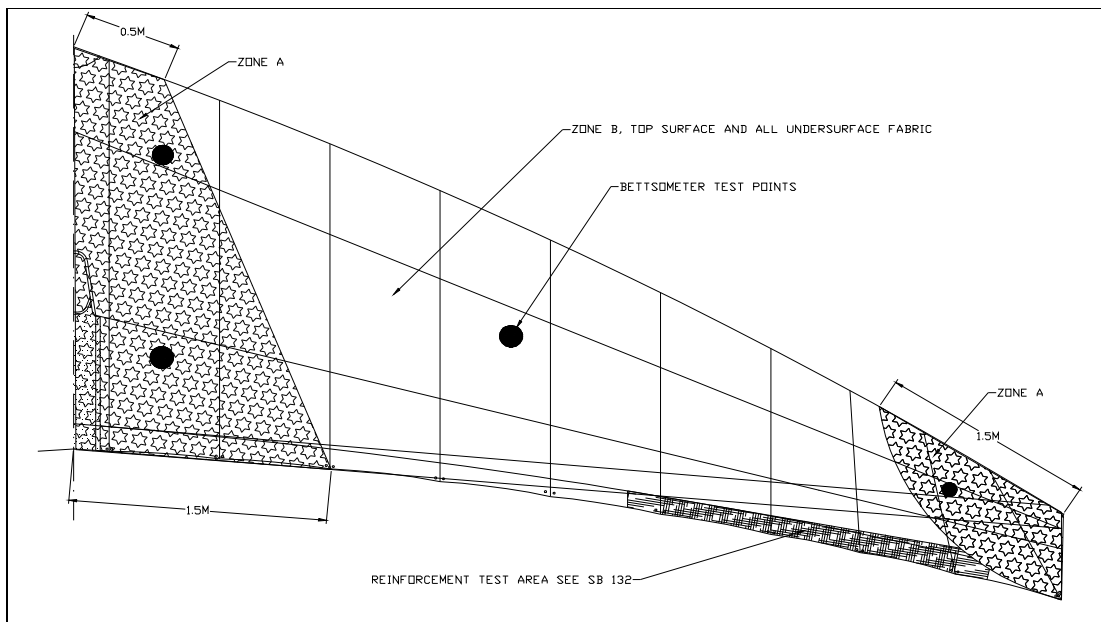


Fig 2. Test zones for the sail.

Some areas of the sail take more load than others. Depending on storage conditions some areas may degrade quicker than others. Zone A carries high loads, zone B less.



Fig 3. Bettometer test, plain sailcloth



Fig. 4 Bettometer test – HTP square material, note the rip-stop weave.  
The fine fibres within each square are tested.  
Test load must not rip the small square between each ripstop cord

| Wing type   | Zone A Fabric test, grammes force          | Zone A stitch test, grammes force | Zone B Fabric test, grammes force | Zone B stitch test, grammes force |
|---|--|-----------------------------------|-----------------------------------|-----------------------------------|
| All Mainair Wings   | 1050                                       | 1050                              | 1050                              | 1050                              |
| XL  | 1000                                       | 1000                              | 1000                              | 1000                              |
| Q1  | 1360                                       | 1360                              | 1000                              | 1000                              |
| Q2, Quik, GT450 (Yellow Aramid reinforcement)                 | 1360                                       | 1360                              | 1000                              | 1000                              |
| Q2, Quik, GT450 (Black Technora reinforcement)                | 1000                                       | 1360                              | 1000                              | 1000                              |
| QuikR (HTP square main body and Yellow Aramid reinforcement)  | 400 (small fibres in ripstop squares only) | 1360                              | 400                               | 1000                              |
| QuikR (HTP square main body and Black Technora reinforcement) | 400 (small fibres in ripstop squares only) | 1360                              | 400                               | 1000                              |
| QuikR, GTR ( TNF 215 & Black Technora reinforcement)          | 1000                                       | 1360                              | 1000                              | 1000                              |

Table 1 Bettometer test loads for sailcloth and stitching

**4) Repairs.**

Small rips up to 25 mm long and more than 50mm from a seam and 100mm from the trailing edge may be repaired by the use of self-adhesive insignia patch material each side of the cloth, with a minimum 25mm overlap. Alternatively sailcloth of the same weight as the part to be repaired may be used, with 3M VHB double sided tape used to attach the patch. The fibres should run in the same directions as the material being repaired. Gentle heat and pressure will improve the bond. The Q2, Quik, GT450 and QuikR (sails built after June 2011) use a 5oz dacron on the main body of the sail. The XL uses a 4oz material and the QuikR (sails built prior to June 2011) uses HTP square 180 grams/sq.metre.

Stitches may be repaired by hand using the original stitch holes as shown, providing they are not damaged. The maximum seam length that can be hand sewn is 150mm. Note that the stitches must be pulled tight and there must be 2 threads passing through each hole. The ends must be tied off securely. The stitch material used in current production is Gore Tenara spun PTFE, style TR, part no. M1000TR-WH-5. This does not degrade with UV light. Stitch ends must be tied off securely as it has low friction. Alternatively metric 40 nylon or V69 polyester thread may be used.

Larger repairs usually involve removal of the sail from the airframe and sewing in a patch or panel replacement according to P&M Aviation approved repair scheme R223.

**5) UV protection**

Sailcloth type TNF215 has a UV coating which improves (but does not stop) the rate of UV degradation. Exterior UV coatings are sacrificial and break down themselves. P&M Aviation recommend an annual treatment with "Nikwax Tent & Gear Solarproof" which is a spray-on coating which should be applied to all exterior sail surfaces. Again this will not totally arrest UV degradation. The fabric strength tests described in this SB still apply.

**6) Documentation**

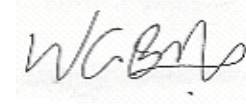
This service bulletin must be attached to the operator's manual.

**7) Continued Airworthiness**

A Bettsometer test of the fabric and stitching must be carried out at each permit revalidation inspection. A P&M test of the aramid (yellow) or Technora (black) reinforcement cords to SB 132 must be carried out at the same time. The tests must be carried out by an inspector and the results noted in the aircraft technical log.

ISSUED BY W.G.Brooks

DATE 18 june 2013

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