

LAMINATE SAILCLOTH TESTING

**1. Introduction**

Traditionally, Microlight sails, or covers, are made from woven polyester sailcloth (commonly known as 'Dacron', a DuPont trade name). The strength of this sailcloth degrades over time, especially when exposed to sunlight (due to its high ultraviolet light content). The Betts test was devised – specifically for this kind of sailcloth – in the early 1990s following concern that aircraft were continuing to be flown after their sails / covers had degraded to such an extent that they were no longer safe.

More recently laminated sailcloth has been used to cover Microlights. Laminated sailcloth comes in all kinds of flavours combining traditional woven fabric, film and scrim; this latter being a loose weave, or lattice, of high-strength strands. Laminated sailcloths can still be degraded by sunlight, although to what extent depends on the particular sailcloth. However the Betts test may or may not be appropriate depending on the laminate's precise construction.

This leaflet clarifies the test requirements for Microlights covered with laminated sailcloth. It is raised to issue 2 to clarify that the specified tests are required to be performed and passed for Permit revalidation; they are not only recommended or advisory.

**THIS LEAFLET MAY NOT BE UP-TO-DATE**  
IF THE TADS/HADS FOR THE AIRCRAFT TYPE IN QUESTION HAS BEEN UP-ISSUED SINCE  
THIS LEAFLET WAS WRITTEN ENSURE THE SAILCLOTH TEST HAS NOT CHANGED

**2. Aircraft types addressed by this leaflet**

The aircraft types addressed by this leaflet (on subsequent pages) are (in no particular order):

- |                         |  |
|-------------------------|--|
| <i>a. Cyclone AX3</i>   | <i>d. Ikarus C42</i>                                   |
| <i>Cyclone AX2000</i>   | <i>e. Raj Hamsa X'Air</i>                              |
| <i>b. Thruster TST</i>  | <i>Raj Hamsa X'Air Falcon</i>                          |
| <i>Thruster T300</i>    | <i>f. Sky Ranger</i>                                   |
| <i>Thruster T600</i>    | <i>g. Air Creation iXess (Clipper or Tanarg trike)</i> |
| <i>c. SLA Executive</i> | <i>h. Air Creation Bionix</i>                          |
| <i>Clipper</i>          |  |

Notes:

- The P&M Aviation *Quantum*, *Quik* and *subsequent* P&M Aviation flex-wing designs have special test requirements for their reinforcement bands. These requirements are in addition to Betts test requirements for the sailcloth.
- Although there are special test requirements for later Air Creation wings (iXess and Bionix), the Betts test is fully applicable to *Air Creation Fun* and *Kiss* wings.

**3. Visual inspection of laminated sailcloth**

Some aircraft types with laminated sailcloth that is affected by sunlight but for which the Betts test is not applicable do not have an alternative test specified. The type-approval holders for these types have informed the BMAA that the condition of these coverings should be assessed visually.

When assessing the condition of laminated sailcloth visually:

- Follow any instructions in the TADS/HADS or aircraft Manual(s) or otherwise published by the type-approval holder;
- Look for direct signs of degradation such as delamination of the laminate, broken strands within the laminate, embrittlement of the laminate (typically evidenced by 'crumbling') and signs of distress around stitch holes at seams;
- Look for indirect signs of degradation such as fading or other changes in colour (between upper and lower surface for example);
- If in doubt contact the type-approval holder and get advice in writing.

**4. Aircraft types not addressed by this leaflet**

The default Betts test is a test of fabric and stitching to 1360 grams. This default test applies to all aircraft with woven polyester sailcloth ('Dacron') covers for which there is no requirement in the TADS/HADS.

For any aircraft covered with laminated sailcloth for which there is no requirement in the TADS/HADS (and which is not addressed by this leaflet) contact the type-approval holder (supported type-approved Microlights) or the BMAA (orphan, type-accepted and amateur-built Microlights) for instructions.

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Type(s)	<b>Cyclone AX3</b> <b>Cyclone AX2000</b>
TADS / HADS	TADS BM45 issue 4 TADS BM53 issue 9
Status	Type-approved, supported
Continued airworthiness responsibility	P&M Aviation Ltd
Summary	<ul style="list-style-type: none"> <li>○ Dacron and laminate coverings have been fitted.</li> <li>○ Betts test requirement in TADS.</li> </ul> <p>P&amp;M Aviation Ltd clarification:</p> <ul style="list-style-type: none"> <li>○ Betts test requirement in TADS fully applicable to Dacron covers; fabric and stitching to be tested.</li> <li>○ For laminate coverings Betts test requirement in TADS only applicable to stitching; assess condition of laminate coverings visually.</li> </ul>

Type(s)	<b>Thruster TST</b> <b>Thruster T300</b> <b>Thruster T600</b>
TADS / HADS	TADS BM22 issue 12 TADS BM34 issue 9 TADS BM52 issue 7 TADS BM61 issue 3 TADS BM62 issue 3 TADS BM63 issue 4 TADS BM64 issue 3 TADS BM73 issue 2
Status	Type-approved, supported
Continued airworthiness responsibility	Thruster Air Services Ltd
Summary	<ul style="list-style-type: none"> <li>○ Original coverings were Dacron; later coverings were laminate (approved modification TAS 010).</li> <li>○ Betts test requirement in TADS.</li> </ul> <p>Thruster Air Services Ltd clarification:</p> <ul style="list-style-type: none"> <li>○ Betts test requirement in TADS fully applicable to Dacron covers; fabric and stitching to be tested.</li> <li>○ For laminate coverings Betts test requirement in TADS only applicable to stitching; assess condition of laminate coverings visually.</li> </ul>

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Type(s)	<b>SLA Executive Clipper</b>
TADS / HADS	TADS BM74 issue 2 TADS BM79 issue 1
Status	Type-approved, supported
Continued airworthiness responsibility	Mr C Draper (Medway Microlights)
Summary	<ul style="list-style-type: none"> <li>○ Original coverings were Dacron; later coverings were laminate.</li> <li>○ There is no test specified in the TADS.</li> </ul> <p>Medway Microlights clarification:</p> <ul style="list-style-type: none"> <li>○ For Dacron covers the default Betts test applies; fabric and stitching to be tested to 1360 grams.</li> <li>○ For laminate coverings Betts test stitching to 1360 grams; assess condition of laminate coverings visually.</li> </ul>

Type(s)	<b>Ikarus C42</b>
TADS / HADS	TADS BM68 issue 9
Status	Type-approved, supported
Continued airworthiness responsibility	Lisa Leah & Malcolm Stewart (Red-Air)
Summary	<p>There is no test specified in the TADS for the C42 covers.</p> <p>Red-Air clarification:</p> <ul style="list-style-type: none"> <li>○ Assess the condition of the stitching using the BMAA's Betts test (see below). If any stitching fails, the Owner may refer to Red-Air for further investigation and a possible life extension.</li> <li>○ Do not Betts test the fabric, but assess the condition of the sailcloth visually.</li> </ul> <p>BMAA instructions:</p> <ul style="list-style-type: none"> <li>○ Assess the condition of the stitching using the Betts test with a test load 1000 grams. If any stitching fails, the Owner may refer to Red-Air for further investigation and a possible life extension. Any life extension must be authorised in writing by Red-Air, and the written authorisation submitted with the Permit to Fly revalidation application.</li> </ul>

Type(s)	<b>Raj Hamsa X'Air Raj Hamsa X'Air Falcon</b>
TADS / HADS	HADS HM1 issue 29 HADS HM5 issue 16
Status	Amateur built
Continued airworthiness responsibility	BMAA
Summary	<ul style="list-style-type: none"> <li>○ Original coverings were Dacron.</li> <li>○ Laminate coverings also approved (X'Air approved option 18; Falcon approved option 17).</li> <li>○ Betts test requirement in HADS applies to both covering types.</li> <li>○ Fabric and stitching to be tested.</li> </ul>

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Type(s)	<b>Sky Ranger</b>
TADS / HADS	HADS HM4 issue 13
Status	Amateur built
Continued airworthiness responsibility	BMAA
Summary	<ul style="list-style-type: none"><li>○ Original coverings were Dacron.</li><li>○ Laminate coverings also approved (approved option 13).</li><li>○ Betts test requirements in HADS for both covering types.</li><li>○ Fabric and stitching to be tested.</li></ul>

Type(s)	<b>Air Creation iXess (Clipper or Tanarg trike)</b>
TADS / HADS	HADS HM13 issue 3 HADS HM16 issue 4
Status	Amateur built
Continued airworthiness responsibility	BMAA
Summary	<ul style="list-style-type: none"><li>○ The standard Betts test technique is unsuitable for this sail fabric, although the stitching is Betts tested.</li><li>○ At Permit revalidation the sail condition must be assessed in accordance with the relevant Annex to the Pilot Operator's Handbook; this requires a sailcloth sample to have been tensile tested within the last 3 years.</li><li>○ The Inspector must ensure that this test has been done and passed.</li></ul>

Type(s)	<b>Air Creation Bionix</b>
TADS / HADS	HADS HM16 issue 4
Status	Amateur built
Continued airworthiness responsibility	BMAA
Summary	<ul style="list-style-type: none"><li>○ The standard Betts test technique is unsuitable for this sail fabric, although the stitching is Betts tested.</li><li>○ At Permit revalidation the sail condition must be assessed in accordance with the relevant Annex to the Pilot Operator's Handbook; this requires a sailcloth sample to have been tensile tested within the last 3 years.</li><li>○ The Inspector must ensure that this test has been done and passed.</li><li>○ A continued airworthiness test for the reinforcement band is under development – the HADS will be up-issued when this is finalised.</li></ul>