MICROLIGHT AIRWORTHINESS APPROVAL NOTE

MAAN NO: 2283 ISSUE 1 DATE: 6 SEPTEMBER 2010

TITLE: Microlight Airworthiness Approval Note 2283: inspection and modification of the elevator anti-balance tab control mechanisms

APPLICABILITY: UK Savannah aircraft fitted with bungee pitch trimmer (Mandatory Modification 12)

STAGE: AUTHORISATION

1. INTRODUCTION

The Savannah is an amateur built microlight aeroplane described in Microlight HADS HM10. The BMAA is responsible for continued airworthiness.

This MAAN authorises the issue of a service bulletin in response to in-service experience of this type. The service bulletin relates to inspection and modification of the elevator anti-balance tab control mechanisms on aircraft fitted with the bungee pitch trimmer (Mandatory Modification 12). The bulletin is appended to this MAAN.

2. BASIS FOR APPROVAL

The basis for approval of these modifications is BCAR Section S issue 5. Paragraphs affected are S421, S423, S619, S623, S627, S629, S657 and S693.

3. DESCRIPTION

A UK Savannah aircraft fitted with the bungee pitch trimmer (Mandatory Modification 12) suffered a double, in-flight, anti-balance tab failure leaving both anti-balance tabs free to flap in the slipstream. The aircraft remained controllable and a safe landing was made.

To port, the aluminium tab end rib, to which the control horn is riveted, fractured. To starboard, a plastic rod-end on the tab actuating rod failed. The failures are described in detail in section 5 of Service Bulletin 2283 appended to this MAAN. It is not clear which side failed first, but it is assumed that vibration in the pitch control system following the first failure caused the second failure.

Following an investigation it is considered likely that the root cause of the problem is the anti-balance tab operating mechanism. The design of the mechanism is such that at full up elevator the anti-balance tab gearing becomes infinite and therefore prone to being strained.

Once damaged, failure (either of an anti-balance tab end rib or a plastic rod end) was probably due to fatigue rather than overload. Therefore regular inspection should catch future problems before they result in another in-flight failure. It should also be noted that if the anti-balance tabs fail in flight (assuming no further failures are precipitated) the aircraft should remain controllable and allow a safe landing to be made.

UK Savannah Service Bulletin 2283, appended to this MAAN, introduces the following for UK Savannah aircraft fitted with the bungee pitch trimmer (Mandatory Modification 12):

- An ongoing inspection schedule.
- A preliminary modification to replace the plastic rod ends with metal rod ends.
- A deadline to eliminate the problem (by incorporating an approved modification).

At the time of writing the only such approved modification is the UK Savannah electric trim (approved optional modification 4).

4. TECHNICAL INVESTIGATION

The trim tabs were changed to anti-balance tabs during initial UK certification to increase stick-free longitudinal stability and hence pitch control forces. The design of the mechanism is such that at full up elevator the anti-balance tab gearing becomes infinite. This could result in either:

- Air loads on the trim tab over-stressing the mechanism. This is considered unlikely as full up elevator is only normally used at low airspeeds (in the landing flare).
- The anti-balance tab attempting to go 'over-centre'. The tip fairing stops the anti-balance tab going far over-centre, but it can go far enough for the mechanism to be strained as the elevator is lowered forcing the anti-balance tab to jump back into its correct position.

This Service Bulletin introduces a preliminary modification and inspection schedule, which is considered sufficient to keep the fleet flying in the short term, and a deadline for incorporation of an approved modification to eliminate the problem.

5. FLIGHT TESTING

No flight-testing is required.

6. MANUALS, PLACARDS AND INFORMATION

A copy of this service bulletin must be retained with the Aircraft Manual.

The pre-flight inspection schedule must be amended to include the inspection specified by the service bulletin.

7. NOISE CERTIFICATION

Not affected.

8. RADIO

Any radio installation is not affected.

9. INSPECTION

To the service bulletin appended to this MAAN and HADS HM10 in its latest version.

10. WEIGHT AND BALANCE

Not affected.

11. SIGNIFICANT FEATURES AND LIMITATIONS

See section 3. All limitations remain unchanged.

12. CERTIFICATION

I authorise issue of UK Savannah Service Bulletin 2283 issue 1, as appended to this MAAN.

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Savannah post approval file
MAAN File 2283

Service bulletin:

All Savannah registered owners

BRITISH MICROLIGHT AIRCRAFT ASSOCIATION SERVICE BULLETIN

Reference: UK Savannah Service Bulletin 2283 issue 1
Title: Inspection and modification of anti-balance tab operating mechanism
Applicability: UK Savannah aircraft with manual (bungee) pitch trimmer (mandatory modification 12)
Author: Ben Syson, Chief Technical Officer, BMAA
Effective date: 13 September 2010
Classification: Mandatory (mandated by UK CAA Mandatory Permit Directive)

1. Introduction

A problem has been discovered with the geometry of the Savannah anti-balance tab operating mechanism that can result in damage to the mechanism during normal operation. This problem only exists on aircraft with the manual (bungee) pitch trimmer fitted.

This service bulletin introduces:
- A pre-flight inspection to carefully inspect the affected area for any damage.
- An initial modification – which is only a partial solution to the problem – that must be completed within 3 months.
- A deadline of 31 December 2011 to completely eliminate the problem (by incorporating an approved modification).

The contents of this service bulletin are as follows:

2. Aircraft Affected by this Service Bulletin

Only UK Savannah aircraft with manual (bungee) pitch trimmer (mandatory modification 12) are affected by this service bulletin. Note that UK Savannah aircraft with electric trim (approved optional modification 4) are not affected.

3. Implementation of this Service Bulletin

- **The elevator anti-balance tab control mechanisms (port and starboard) must be carefully inspected as part of every pre-flight inspection. See section 3.1. This inspection regime must be commenced within 1 month of the effective date of this service bulletin (although it is recommended that it be commenced immediately).**

- **Within 3 months of the effective date of this service bulletin the plastic rod-ends must be replaced with metal rod-ends. See section 3.2. Careful pre-flight inspection as per section 3.1 must continue.**

- **By 31 December 2011 the anti-balance tab operating mechanism must be modified to eliminate the problem using an approved modification. See section 3.3.**

- This service bulletin must be kept with the aircraft manual.

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3.1. Pre-Flight Inspection

Both elevator anti-balance tab control mechanisms (port and starboard) must be carefully inspected as part of every pre-flight inspection.

- Carefully inspect the end 'closure' ribs for any signs of cracking, deformation or other damage. Ensure that no rivets – either those attaching the control horn to the end 'closure' rib, or those attaching the end 'closure' rib to the anti-balance tab – are loose. This inspection requires good illumination: use a bright torch if necessary.
- Only the aft rod-ends on the actuating rods can be visually inspected for deformation or other damage because of the elevator tip fairings. Therefore carefully check for any play (backlash) in the actuating rod-ends indicative of a loose bush. Perform this by holding the elevator steady with one hand while attempting to move the trim tab trailing edge up and down with the other.

If any damage is discovered the aircraft must not be flown until repaired. Please inform the BMAA Technical Office with details including good quality photographs (if possible and appropriate). Note that repairs must be performed in accordance with BMAA procedures.

3.2. Part 1 – Initial Modification and Inspection

Within 3 months of the effective date of this service bulletin the plastic rod-ends must be replaced with metal rod-ends. The metal rod-ends are provided by Sandtoft Ultralight Partnership together with fitting instructions. This modification does not stop the requirement for careful pre-flight inspection.

Before further flight the modification must be inspected by a suitably qualified BMAA Inspector (groups B, 3-axis aircraft, and H, all metal structures) to confirm that:

- The rod-ends have been fitted in accordance with the fitting instructions and to a satisfactory standard. In particular: the threaded rod and aluminium tube are in satisfactory condition; the aluminium tube ends are cut square; the threaded rod is not cut too short (insufficient exposed length to satisfactorily screw the rod ends onto – minimum 8mm at each end) or too long (aluminium tube is loose with rod ends screwed fully down).
- The elevator and tab deflections match those specified in HADS HM10 in its latest issue.
- There is no undue strain on the anti-balance tab or anti-balance tab operating mechanisms at full up or full down elevator when operated using the control stick from the cockpit.
- There is no existing deformation or other damage to the anti-balance tabs, anti-balance tab end 'closure' ribs or anti-balance tab operating mechanisms. If any damage is discovered the aircraft must not be flown until repaired. Please inform the BMAA Technical Office with details including good quality photographs (if possible and appropriate). Note that repairs must be performed in accordance with BMAA procedures.

Assuming everything is satisfactory, the following entries must be made in the airframe logbook:

- An entry signed and dated by the person doing the work stating that the plastic rod-ends have been replaced with metal rod-ends in accordance with the fitting instructions provided by Sandtoft Ultralight Partnership.
- An entry signed and dated by the BMAA Inspector stating that:

  "BMAA Service Bulletin 2283 (anti-balance tab) Part 1 satisfactorily completed.
  Part 2 must be completed by 31 December 2011."

3.3. Part 2 – Final Modification and Inspection

By 31 December 2011 the anti-balance tab operating mechanism must be modified to eliminate the problem using an approved modification. At the time of writing the only such approved modification is the UK Savannah electric trim (approved optional modification 4). However the BMAA is happy to assess other modifications to eliminate the problem with the anti-balance tab operating mechanism without removing the bungee trim.

After incorporation of such an approved modification an additional entry must be made, signed and dated in the airframe logbook by a BMAA Inspector stating that:

"BMAA Service Bulletin 2283 (anti-balance tab) Part 2 satisfactorily completed."

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4. Contact Details

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5. Background Technical Information

A UK Savannah aircraft fitted with the bungee pitch trimmer (Mandatory Modification 12) suffered a double, in-flight, anti-balance tab failure leaving both anti-balance tabs free to flap in the slipstream. The aircraft remained controllable and a safe landing was made.

A geared trim tab (attached to the rear of a control surface) automatically deflects relative to the control surface when the control surface is moved by the pilot. An anti-balance tab is a geared trim tab in which the tab moves in the same direction as the control surface. Anti-balance tabs are used to increase stability and control forces.

UK Savannah aircraft have two anti-balance tabs fitted to the trailing edge of the elevator (one on the port side and one on the starboard side). Each anti-balance tab has its own control mechanism located at the outboard end of the elevator and protected by a fairing. Figure 1 shows the control mechanism for the starboard anti-balance tab.

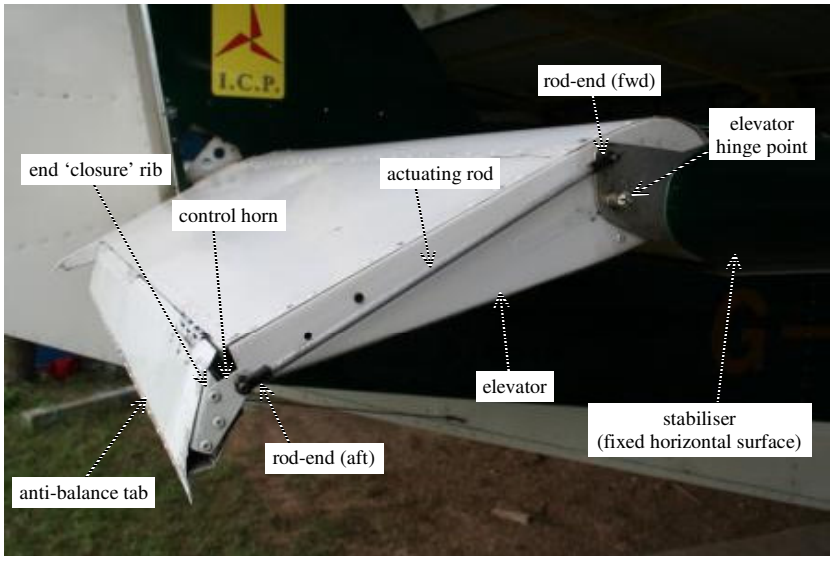

Figure 1: View of starboard end of starboard elevator with fairing removed to show the anti-balance tab control mechanism. This aircraft has manual, 'bungee', pitch trim fitted. The control horn is riveted to the end 'closure' rib. The end 'closure' rib is riveted into the end of the anti-balance tab (upper and lower surfaces).

On the affected aircraft both control mechanisms failed!

- To port, the end 'closure' rib fractured so that the control horn was no longer positively attached to the anti-balance tab. Figure 2 shows the fractured end 'closure' rib.
- To starboard, a rod-end on the actuating rod failed. The rod ends are plastic retaining a brass bush. The plastic had enlarged so that the bush was no longer retained.

It is not clear which side failed first, but it is assumed that vibration in the pitch control system following the first failure caused the second failure.

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Figure 2: Fractured end 'closure' rib held in original position in port end of port anti-balance tab. The rivets attaching the control horn in place on the end 'closure' rib, and the rivets attaching the end 'closure' rib to the anti-balance tab, were drilled out subsequent to the in-flight failure.

Following an investigation it is considered likely that the root cause of the problem is the anti-balance tab operating mechanism. The design of the mechanism is such that at full up elevator the anti-balance tab gearing becomes infinite and therefore prone to being strained. In particular, at full up elevator the anti-balance tap can attempt to go 'over-centre'. The tip fairing stops the anti-balance tab going far over-centre, but it can go far enough for the mechanism to be strained as the elevator is lowered forcing the anti-balance tab to jump back into its correct position.

6. Handling a Failed Anti-Balance Tab

It is considered that the original failure was probably due to fatigue (either of an anti-balance tab end 'closure' rib or a plastic rod end) following damage to the mechanism. Therefore the inspection specified by this service bulletin should catch future problems before they result in another in-flight failure.

If the anti-balance tabs fail in flight (assuming no further failures are precipitated) the aircraft should remain controllable and allow a safe landing to be made. Slow down to a minimum safe airspeed and consider landing as soon as possible.

END