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AIRWORTHINESS DIRECTIVE

THE GLIDING FEDERATION OF AUSTRALIA

GFA AD 678 Issue 1

Date: 11 February 2014

Note: This Airworthiness Directive is issued by the Gliding Federation of Australia

Type Approval Holder	SCHEMPP-HIRTH Flugzeugbau GmbH
Manufacturer	SCHEMPP-HIRTH Flugzeugbau GmbH
Types/Models Affected	All types/models with all-flying tailplanes. This Airworthiness Directive does not apply to types that do not have all-flying tailplanes.
Serial Numbers	All serial numbers (with all-flying tailplanes).
Subject	Increased risk of flutter of the tailplane and degraded security of tailplane attachment caused by loose bolts in the tailplane attachment bracket assembly and the tailplane control horn.
Background	Investigations into loose tailplane attaching bolts on the 5th and 6th of October have discovered that due to very dry conditions recently experienced in Australia, the plywood tailplane spars have shrunk, allowing the attaching bolts that mount the tailplane to the fuselage to become slightly loose. Such looseness is transferred to the tailplane attachment and may lead to excessive free-play in the control circuit which increases the possibility of flutter occurring during normal operation. Left unchecked, looseness of the bolts may ultimately lead to excessive wear and damage to the tailplane structure. The bolts are retained by nuts at the rear of the spar however these are not captivated and freely rotate with the bolt when shrinkage of the ply has taken place. Access to these nuts is not possible without cutting holes in the fibreglass. This prevents the bolts from being torqued to the correct specifications. Schempp–Hirth have two different methods of attaching tailplanes in this generation of sailplane, and both methods have been found to exhibit the same problem. Of 6 aircraft inspected (both Cirrus and Nimbus 2) 5 were found to have this issue, with varying numbers of loose bolts. One aircraft was found to have all 8 bolts loose. There are 8 x bolt/nut combinations that affix the tailplane

	to the fuselage. Both methods are shown below in the Appendix with information supplied from GFA members.
Documentation	1. GFA Safety Alert ASA No. 01/13 (8 October 2013). 2. SCHEMPP-HIRTH Flugzeugbau GmbH Kirchheim/Tech TN No. Gen 4 (<i>New epoxy resin-system for glass, carbon and aramid fibres</i>). 3. Schempp-Hirth Flugzeugbau GmbH Technical Note Gen-5, 15 Mar 2013 Approved Repair Design under (EU) No: 748/2012. 4. Schempp-Hirth Flugzeugbau GmbH Repair instruction for loose bolts in elevator attachments - Valid for all-flying tails of Schempp-Hirth gliders. (attached as APPENDIX 2 hereto)
Required Action(s)	1. Inspect the bolts that secure the tailplane to the tailplane attachment bracket and the tailplane control horn in accordance with the attached inspection schedule of APPENDIX 1 to this document. 2. If more than two (2) loose bolts are found, or if two (2) vertically or diagonally adjacent loose bolts are found, re-tighten the bolts in accordance with the attached instructions from Schempp-Hirth after making access holes in the tailplane surface. 3. Conduct a Standard Repair(s) as necessary to close access holes in accordance with the GFA Manual of Standard Procedure (Part 3). Guidance material is included in APPENDIX 1 to assist this process. This material is for guidance only and does not constitute an Approved Repair Scheme. If a Standard Repair in accordance with the GFA Manual of Standard Procedure (Part 3) or a repair in accordance with Appendix 2, Schempp-Hirth standard repair instructions cannot be completed for whatever reason, an approved repair scheme must be obtained from the Manufacturer or CASR21M approved person. 4. After the completion of any repairs on any part of the tailplane surfaces pursuant to this Airworthiness Directive, the tailplane must be weighed and its mass-balance (i.e., hinge moment) determined in accordance with GFA AD 448 (Issue). 5. The results of the inspection must be forwarded in writing to the GFA as soon as possible after the completion of the inspection and any requisite repairs. It is preferred that the results are emailed to: CTO@glidingaustarlia.org
Compliance, Compliance Time(s) and Frequency	Compliance with this Airworthiness Directive is mandatory and compliance, including action taken pursuant to this Airworthiness Directive must be recorded in the aircraft log book.

	The inspection of the bolts in accordance with item 1 of the Required Actions of this Airworthiness Directive must be completed by a GFA Authorised Inspector endorsed for Annual Inspection FRP prior to March 31, 2014. The results of the inspection must be forwarded to the GFA as soon as possible after the completion of the inspection and any requisite repairs. Repairs must be completed by a GFA Authorised Inspector endorsed for Major Repairs FRP. The inspection of the bolts in accordance with item 1 of the Required Actions of this Airworthiness Directive must be conducted at every Annual Inspection completed after the effective date of this Airworthiness Directive.
Effect on Weight and Balance	1. The effect on the weight and balance of the sailplane is not expected to be significant; however, the authorised person completing any repairs should take into account the actual repairs undertaken when determining whether or not the sailplane needs to be reweighed and a new empty moment arm determined. 2. After the completion of any repairs on any part of the tailplane surfaces, the tailplane must be weighed and its mass-balance (i.e, hinge moment) checked in accordance with GFA AD 448 (Issue)
Effective Date	12 February 2014
	Issued by: Len Diekman  Acting Chairman, GFA Airworthiness Department

APPENDIX 1 [AD 678 (Issue 1)]

INSPECTION SCHEDULE

General

There are two configuration "Styles" for connecting the tailplane attachment bracket to the fin for Schempp-Hirth sailplanes with "All Flying Tails".

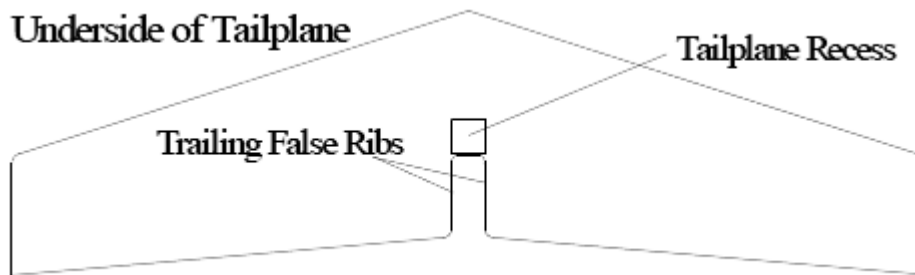


Figure 1. Plan view, Schempp-Hirth "all Flying Tailplane"

1. "Style A"

"Style A" consists of a tailplane attachment bracket fitted into the tailplane recess and attached to the tailplane by 8 Bolts passing through the tailplane spar. These are the bolts referred to in this Airworthiness Directive for "Style A" and their locations are shown in figure 2.

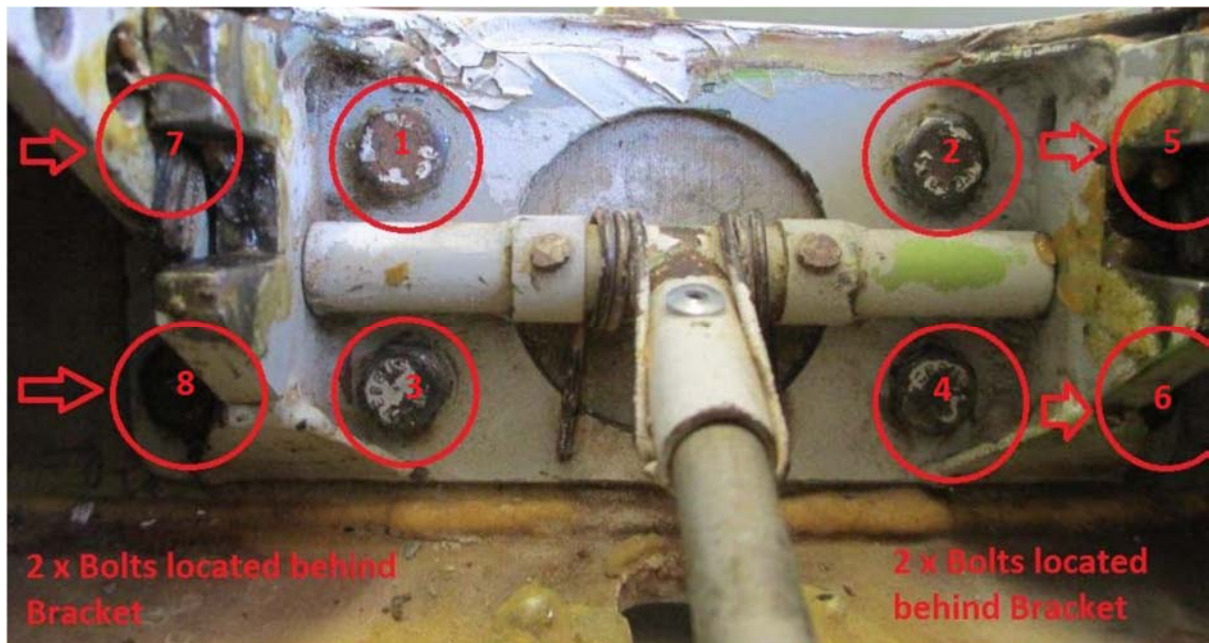


Figure 2. Locations of bolts to be inspected for "Style A" attachment bracket to all-flying tailplane.

The tailplane attachment Bracket in "Style A", has two fore and aft slotted plates and a spring loaded latch mechanism with two hooked claws. When the tailplane is fitted to the fin of the glider and moved backwards to lock it in place, these slotted plates engage onto steel plates on the receptor mechanism mounted on the fin and the spring loaded hooked claws rise and then drop down over a pivot bar on the receptor mechanism. The tailplane is then locked in place.

The underside of the tailplane has a bushing for a spigot on the fin attachment mechanism which, when the tailplane is mounted with an attachment on the fin mechanism, constitutes the control horn for the tailplane.

"Style A" is NOT affected by loose bolts at the control horn. For "Style A", the bolts to be inspected are the bolts fitted to the tailplane attachment bracket only, **NOT** the bolts fitted to the control horn. There are 8 bolts to be inspected for "Style A".

2. Style "B"

"Style B" consists an attachment bracket fitted into the tailplane recess and attached to the tailplane by 8 bolts that pass through the tailplane spar. These bolts are 8 of the 12 bolts to be inspected for "Style B" as referred to in this Airworthiness Directive. The locations of these 8 bolts are shown in figure 3.



Figure 3. Locations of 8 of the 12 bolts to be inspected for "Style B"

The tailplane attachment bracket in Style "B" includes an arm with a bushing bore at the bottom of the arm. When the tailplane is fitted to the fin, the arm is placed downwards into the fin where it is secured by a spring-tensioned, locking bolt through the bushing bore. In the centre of the tailplane attachment bracket, there are 4 bolts, the heads of which can be seen by external inspection. Inside of the tailplane cavity, the control horn for the tailplane is fitted to the tailplane at the forward position of the tailplane spar by these 4 bolts which must be inspected in pursuant to this Airworthiness Directive, together with the 8 bolts previously referred to for "Style B".

For “Style B”, the bolts to be inspected are the 8 bolts fitted to the tailplane attachment bracket **AND** the 4 bolts fitted to the control horn. There are 12 bolts to be inspected for “Style B”.

Securing Nuts (for both configuration “Styles”)

The bolts through the tailplane spar for both styles of configuration are secured in-place by self-locking nuts on the front side of the spar inside the tailplane leading edge cavity. These self-locking nuts are not captive. Therefore, the bolt and nut torque settings originally applied cannot be restored by tightening the bolt head without securing the nut. Access through the FRP shell must be made to access the nuts before the original torque setting can be re-applied. The bolts to be inspected are principally loaded during flight in shear stress, hence the function of the nuts is hold the bolts in place, rather than maintain a torque for the attachment fittings to the tailplane spar.

Cautionary Note on Applied Torque Settings for Re-tightening Bolts

Torque settings provided by the Manufacturer for retightening are the maximum settings to be applied to bolt and nut combinations and it is important that higher torques are **NOT APPLIED** otherwise the wooden tailplane spar may be compressed and damaged. Even if such damage is not sustained at the time of tightening, the moisture content of the wood will increase during prolonged periods of high ambient relative humidity and the wood will expand in volume and may suffer compression and consequential damage if the bolt and nut combinations have been tightened with excessive torque.

Inspection Process

Identification

Determine the configuration “Style” for the tailplane attachment, as described above.

Testing “Style A” Configuration

“Style A” configuration for the tailplane attachment bracket has 8 attachment bolts and all are visible and accessible for inspection and testing from the underside of the tailplane.

When testing for looseness of the 8 bolts, only a minimum torque is to be applied in a clockwise direction to determine looseness. **DO NOT** apply excessive torque to the bolt heads during the testing process. Loose bolts previously found have turned easily. Applying excessive torque may damage the spar by compressing the wood fibres.

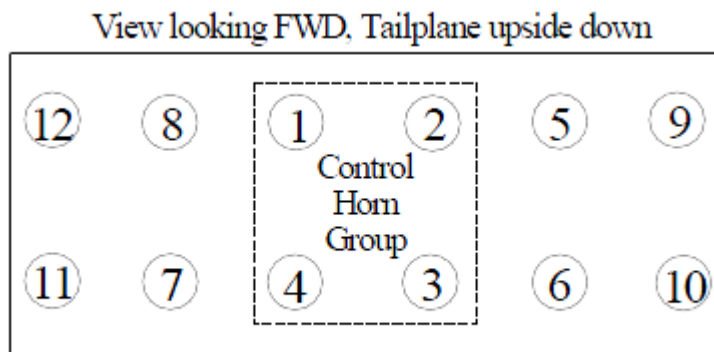
If a bolt resists turning, as described above, the bolted attachment is considered serviceable.

Testing Style “B” installation

“Style B” configuration for the tailplane attachment bracket has 8 bolts through the tailplane attachment bracket as well as 4 bolts through the control horn at the centre section. 8 of these bolts are visible and accessible for inspection and testing from the underside of the Tailplane.

When testing for looseness of the 8 bolts, only a minimum torque is to be applied in a clockwise direction to determine looseness. **DO NOT** apply excessive torque to the bolt

heads during the testing process. Loose bolts previously found have turned easily. Applying excessive torque may damage the spar by compressing the wood fibres.



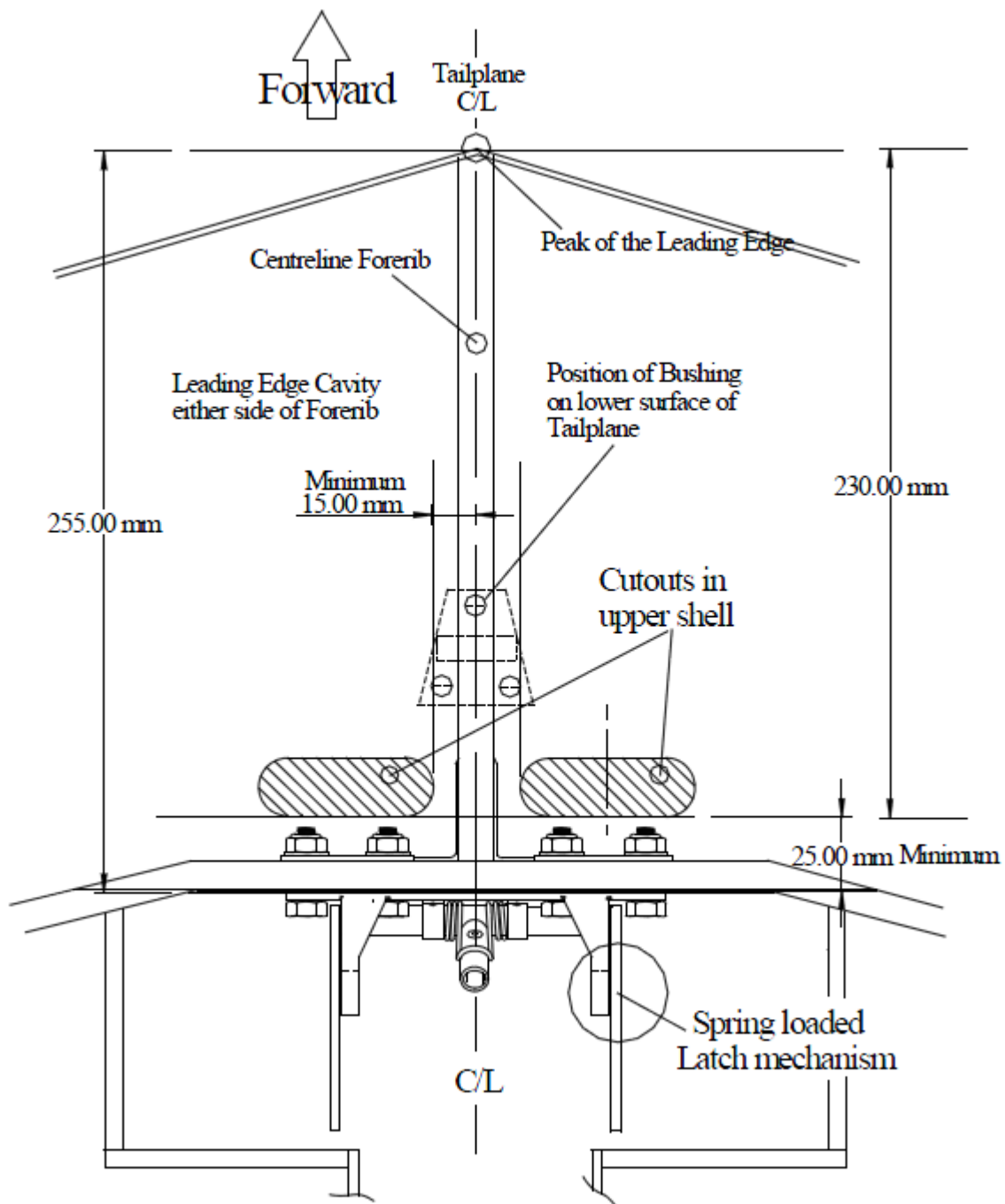
Structure Drawings and Cut-out positions

**For the “Style A” with 8-Bolt Installation Drawing No. 1 and,
For the “Style” with 12-Bolt Installation Drawing No.2.**

- NOTE:**
1. It has been reported that some installations may have a total of six bolts.
 2. Full appraisal of these drawings is required to understand the structural positions and hardware locations. There may be minor dimensional differences between Tailplanes of the Styles "A" and "B" Installations.

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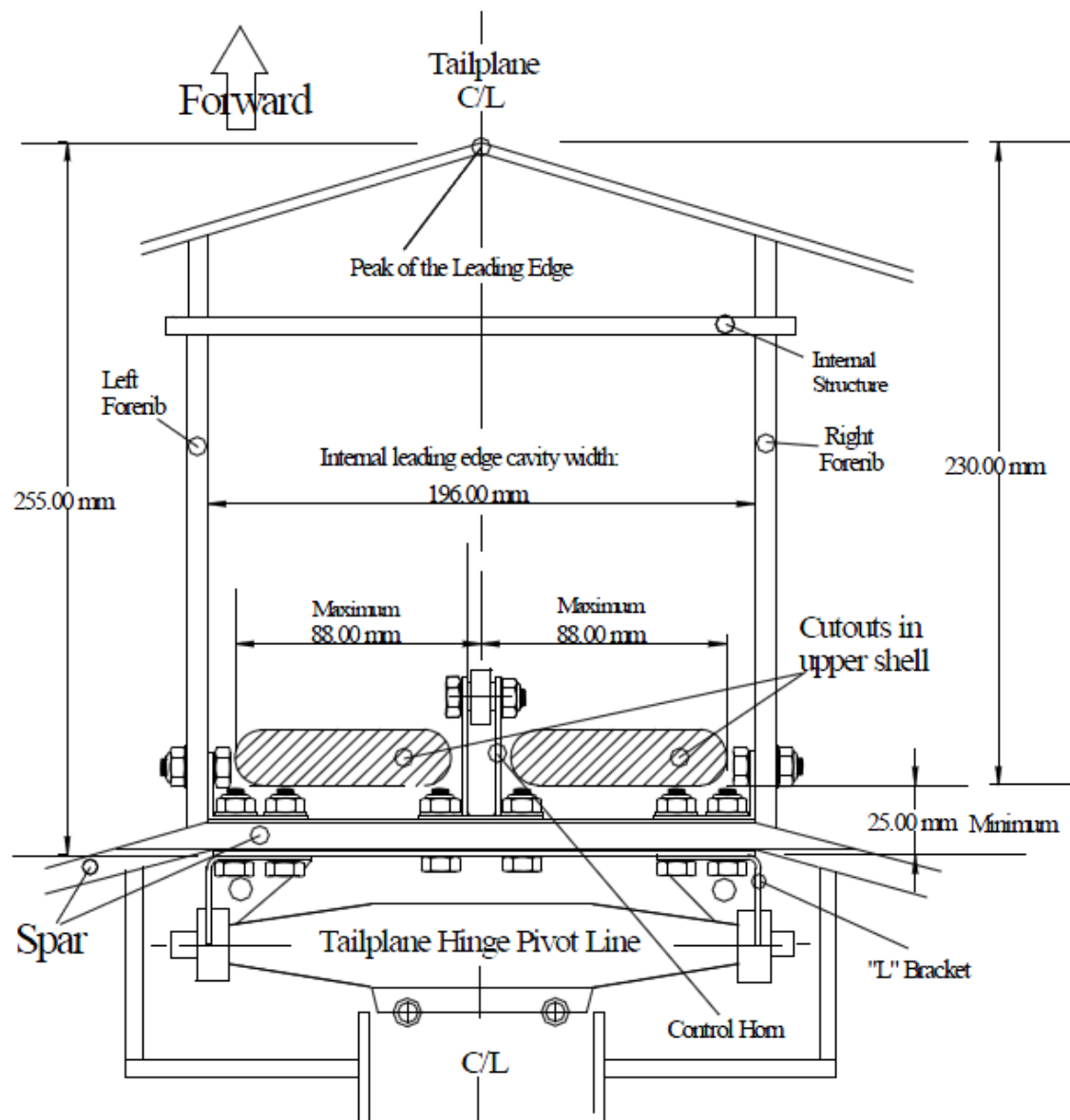
1. Style "A" - Tailplane Attachment Bracket with spring-loaded latch - 8 Bolts:



Plan View looking down onto the top surface of the Tailplane, guidance dimensions, structure and hardware shown.

Choose the dimension of the cut-outs so that a suitable tool can be used for securing the nuts.

2. Style "B" - Tailplane Attachment Bracket with Bushed Arm and Control Horn - 12 Bolts:

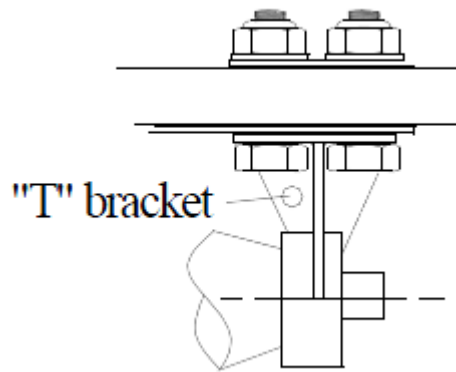


Plan View looking down onto the top surface of the Tailplane, guidance dimensions, structure and hardware shown.

Choose the dimension of the cut-outs so that a suitable tool can be used for securing the nuts.

Possible Modification made to some Schempp-Hirth sailplanes during production

As can be seen from the structure drawing above, the outer pairs of bolt heads on Style "B" will be difficult to reach, especially as some aircraft may have "T" Brackets at the ends of the installation instead of "L" brackets. If bolts are positioned behind the upright of a "T" bracket, they will be difficult to reach and cutouts in the shell will be required.



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Guidance for Inspection Work Process

Repairs must be completed by a GFA Authorised Inspector endorsed for Major Repairs FRP. The repair notes in this APPENDIX 1 are for guidance only and do not constitute an Approved Repair Scheme.

The followed numbered list of sequenced actions is provided as guidance.

1. Weigh the tailplane prior to commencement of any repair work.
2. Confirm all positioning dimensions for the cut-outs prior commencement of making any cut-outs for access to nuts.
3. When the initial holes are made, confirm the positions (distance) of the structure at the LHS and RHS and to the rear of the slots. Locate obstructions, such as bolt threads and nuts, and for “Style B” configurations, locate the position of the control horn.
4. If there is sufficient working clearance, continue to remove slot material by firstly working inwards towards the centreline then work in an outwards direction.
5. Clean the edges of the cut-outs and protect the foam core and FRP edges from contact with oil or grease from hands or tooling during the repair stages by masking the exposed material at the sides of the cut-out hole with masking tape.
6. Remove all produced FRP dust and debris from the internal structure by vacuum suction.
7. When suitable access to the bolt and nut combinations is achieved, test the bolt and nut combinations for axial and radial looseness. Also inspect the grip and threads of bolts for corrosion by withdrawing bolts one at a time.
8. AXIAL Looseness: If the bolts can be moved in an axial direction only, the bolts, nuts and washers can be replaced straightforwardly by following directions given in the paragraphs numbered 10 to 18 below, inclusive.
9. AXIAL play and RADIAL play: If the bolt and nut combinations can be moved both axially and radially, then, when replacing the bolts the following is to be carried out:
 - i) The bolts, when replaced are to be treated with a release agent.
 - ii) Clean the bolt holes using a drill or reamer.
 - iii) Treat each bolt with epoxy resin and move it carefully into the hole.

Then proceed with the bolt, washers and nut fixing and tighten the combination as at paragraphs 10. to 18., inclusive.

NOTE: For “Style B” configurations, the centre four bolts hold the control horn in place and only two (at most) of the bolts should be withdrawn at any one time, to retain the control horn on place.

10. When withdrawing the bolts for inspection for corrosion, always leave at least two bolts and nuts in the attachment bracket installation.
11. Attach tooling to the nuts inside the shell, hold the bolt heads with suitable tooling and remove the nuts.

12. Withdraw the bolts one at a time to inspect for corrosion where the grip section of the bolt has been through the plywood core of the spar.
13. Discard corroded bolts and fit new bolts.
14. Replace the bolts in turn when inspected.
15. Fit washers and new nuts to the bolt threads and wind the nuts onto the threads. Tighten each combination until resistance is felt. Torque load the bolt and nut combination in a criss-cross pattern to an initial Torque of 5Nm (44 inch-lbs). Apply a final Torque of no more than 8-10 Nm (71-88 inch-lbs).
16. Where possible, prime and paint the bolt heads, washers, nuts and threads with enamel primer and paint.
17. Carry out a final vacuuming to ensure dust particles are removed.
18. Using a solvent suitable for the area to be repaired, clean the exterior surface area.

Closing out the Cut-outs after re-installing hardware

Close the cut-outs by following procedures for Standard FRP Repairs, if appropriate (otherwise refer to the body of this AD if a Standard Repair is not possible), using a layered repair.

The Fabric Layup structure and core of the upper shell from outside to inside is likely to be as follows (refer to the attached APPENDIX 2 - Repair instructions from Schempp-Hirth) and should be confirmed by the repairer for suitability:

- i) 1 x Glass Cloth 92110, 0/90 degrees.
- ii) 1 x Glass Cloth 92110, at plus/minus 45 degrees.
- iii) PVC Foam DYVINICELL C60 or AIREX 70.55.
- iv) 1 x Glass Cloth 92110, 0/90 degrees.

Refinish the exterior coating with gelcoat or paint as applicable and comply with the weight and balance requirements of this Airworthiness Directive

(Overleaf: APPENDIX 2 **Schempp-Hirth Repair** Instructions for loose bolts in elevator attachment – Valid for all-flying tails of Schempp-Hirth gliders)



Reparaturanweisung lose Schrauben bei den Beschlügen im Höhenleitwerk

Gültig für alle Pendelhöhenleitwerke von Schempp-Hirth- Flugzeugen

ARBEITSANWEISUNG

1. Öffnen der Höhenflossenschale auf der Oberseite der Höhenflosse, entsprechend den beigefügten Skizzen für Lagertyp A und Lagertyp B, so dass mit einem geeigneten Schlüssel die Muttern erreicht werden
2. **Fall 1 Schrauben lassen sich nur axial bewegen:**
 - Muttern mit geeignetem Werkzeug festhalten und Schrauben mit max. Anzugsmoment 8 – 10 Nm anziehen
3. **Fall 2: Schrauben haben Axial- und Radialspiel:**
 - Schrauben einzeln komplett lösen und komplette Oberfläche mit Trennmittel oder Fett behandeln
 - Die jeweilige Bohrung reinigen (Bohrer oder Reibahle verwenden)
 - Schraube mit Epoxydharz bestreichen und wieder in Bohrung einsetzen
 - Mutter mit Drehmoment 8-10 Nm festziehen
4. Öffnungen auf der Leitwerksobenseite laut Reparaturanweisung des Reparaturhandbuchs schließen

Repair Instruction for loose bolts in elevator attachments

Valid for all-flying tails of Schempp-Hirth gliders

OPERATING PROCEDURE

1. cut out the upper shell according to the attached sketch for attachment type A or attachment type B. Chose the dimension of the cut outs so that a suitable tool can be used for fixing the nuts
2. **Case 1: bolts can be moved in axial direction only:**
Fix the nuts with a suitable tool and tighten the bolt up to a bolting torque of 8 – 10 Nm
3. **Case 2: bolts can be moved in axial and radial direction**
 - unscrew each bolt separately and treat the complete bolt either with release agent or grease
 - Clean the hole (using a drill or a reamer)
 - Treat the bolt with epoxy resin and move it carefully into the hole
 - Fix the nut and tighten the bolt with a bolting torque of 8 – 10 Nm
 - Repeat this procedure for all bolts
4. close the cut outs in the upper shell according to the instructions in the maintenance manual



FABRIC STRUCTURE OF THE UPPER SCHELL

From Outside to Inside:

1. 1 X glass cloth 92110 0/90°
2. 1 X glass cloth 92110 $\pm 45^\circ$
3. PVC foam DYVINICELL C 60 or AIREX 70.55
4. 1 X glass cloth 92110 0/90°

Reinforcement along the spar:

2 X glass cloth 92125 $\pm 45^\circ$, width: 30 mm front and rear side

Reinforcement symmetric to the centre line of the elevator, 300 mm wide

1 X glass cloth 92110 $\pm 45^\circ$

450

300

Massenausgleich 400g (Bleis)

1 Lag
im M

A

cutouts in the upper shell

12 Sph.

min 30mm

Gewebewinkel
92 110

min 15mm

4

min 25
190

min 15

2

min 15

84

3

98

B

Tailplane attaching
style A

Styropor-Rippe 4 mm s.
Beidseitig 1 Lage 9211

