Havarikommissionen
Accident Investigation Board Denmark

BULLETIN

Serious incident

24-5-2015

involving

SCHEMPP HIRTH (Arcus T)

OY-XJT

Certain report data are generated via the EC common aviation database

FOREWORD

This bulletin reflects the opinion of the Danish Accident Investigation Board regarding the circumstances of the occurrence and its causes and consequences.

In accordance with the provisions of the Danish Air Navigation Act and pursuant to Annex 13 of the International Civil Aviation Convention, the investigation is of an exclusively technical and operational nature, and its objective is not the assignment of blame or liability.

The investigation was carried out without having necessarily used legal evidence procedures and with no other basic aim than preventing future accidents and serious incidents.

Consequently, any use of this bulletin for purposes other than preventing future accidents and serious incidents may lead to erroneous or misleading interpretations.

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BULLETIN

General

File number:	HCLJ530-2015-45
UTC date:	24-5-2015
UTC time:	16:00
Occurrence class:	Serious incident
Location:	2.5 nautical miles (nm) east of Arnborg glider airfield
Injury level:	None

Aircraft

Aircraft registration:	OY-XJT
Aircraft make/model:	SCHEMPP HIRTH (Arcus T)
Current flight rules:	Visual Flight Rules (VFR)
Operation type:	General Aviation Competition
Flight phase:	Approach
Aircraft category:	Glider - powered – power plant retractable
Last departure point:	Denmark (Arnborg glider airfield)
Planned destination:	Denmark (Arnborg glider airfield)
Aircraft damage:	None
Engine make/model:	SOLO – 2350

SYNOPSIS

Notification

All times in this report are UTC.

The Aviation Unit of the Danish Accident Investigation Board (AIB) was notified of the serious incident by a member of the Danish Glider Association (Dansk svæveflyver union (DsVU)) on 26-5-2015 at 08:45 hrs.

The Danish Transport Authority (DTA), the German Bundesstelle für Flugunfalluntersuchung (BFU), the European Aviation Safety Agency (EASA) and the Directorate-General for Mobility and Transport (DG MOVE) were notified on 27-5-2015.

Summary

The left wing airbrake bell crank ruptured as a consequence of inadequate weld quality.

The strength of the welds was insufficient to withstand airbrake bell crank operational loads.

FACTUAL INFORMATION

History of the flight

The serious incident occurred during a local VFR competition flight from Arnborg glider airfield.

The pilot made an approach to runway 27 at Arnborg glider airfield.

All of a sudden, the left wing airbrake extended.

The glider was 197 meters above ground level, and the airspeed was 200 kilometres per hour.

The glider inadvertently started a steep left turn in a nose down attitude.

The pilot acted by selecting flaps +1, landing gear down, and airbrakes out.

The right wing airbrake extended, and at a low altitude the pilot regained control of the glider.

With the airbrakes extended, the pilot was forced to land the glider straight ahead in a field.

The sequence of events lasted approximately 30 seconds.

The serious incident occurred in daylight and under visual meteorological condition (VMC).

Injuries to persons

Injuries	*Crew*	*Passengers*	*Others*
Fatal			
Serious			
Minor / None	1	1	

Damage to aircraft

The glider was not damaged.

Personnel information

License and medical certificate

The pilot – male 52 years old – was the holder of a Danish Glider Pilot License (GPL), which was valid until 27-5-2015.

The Medical Certificate was a class two certificate.
The expiry date of the Medical Certificate was 17-2-2016.

Flying experience

All glider types:	4089 flight hours
Arcus T:	165 flight hours

Aircraft information

General

Glider manufacturer:	Schempp-Hirth Flugzeugbau GmbH
Manufacturer's designation:	Arcus T
State of manufacture:	Germany
Serial number:	14
Year of manufacture:	2010
Date of registration in Denmark:	23-7-2012
Engine:	Solo 2350D
Maximum take-off mass (no water):	727 kilogram
Maximum take-off mass (with water):	800 kilogram
Mass at the time of the serious incident:	700 kilogram
Last renewal of the airworthiness certificate:	8-4-2015
Total flight hours:	717 hours

Airworthiness

Annual inspection performed on:	5-4-2015
Total flight hours at annual inspection:	671 hours
Time since last annual inspection:	106 hours

The glider was inspected according to the Danish airworthiness regulations and the manufacturer's specifications.

The airbrake system

Airbrake system description according to the Arcus T Maintenance Manual (MM) October 2010:

"Airbrake control system
Steel push-pull tubes connect the operating handles in the cockpit via a bell crank and over centering levers to the funnels of the automatic hook-up system – see diagram 1.

For "airbrakes closed", a deflection stop is provided at the front end of the actuating tube in the front cockpit.
For "airbrakes extended", a deflection stop is on the tube (mounted to the fuselage skin on the left) guiding the rear end of the airbrake operating tube.

Inside each wing panel, steel push-pull tubes lead from the angular lever on the root rib to the two actuating arms of the Schempp-Hirth type airbrakes, see diagram 3a."

Diagram 1 from the MM is illustrated below.

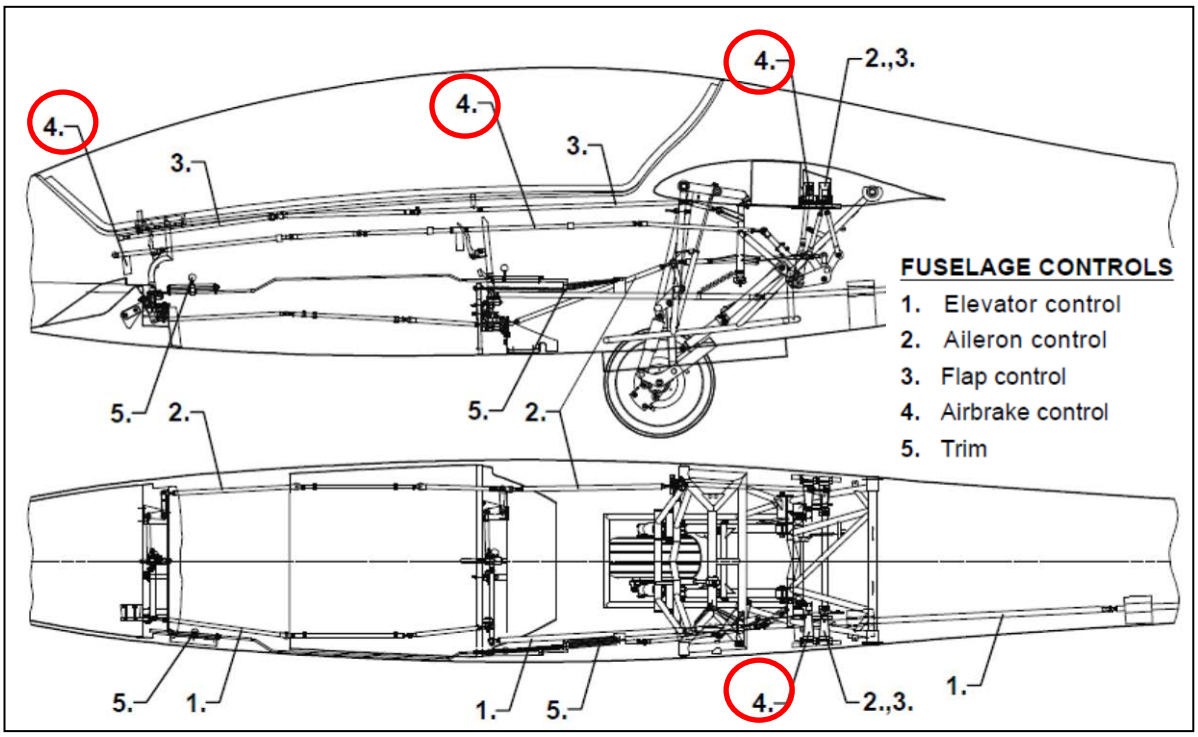
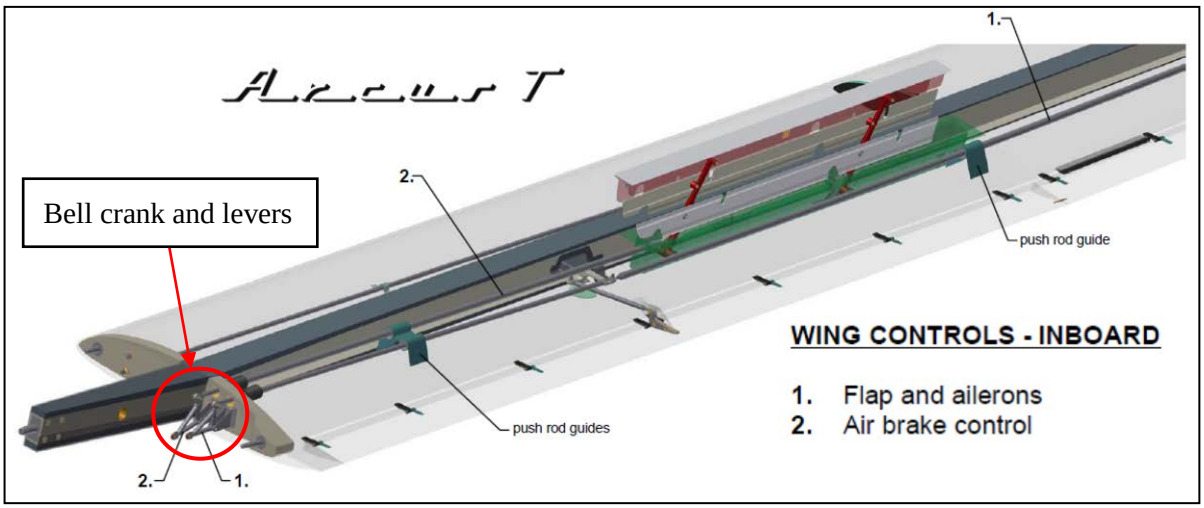


Diagram 3a from the MM is illustrated below (right wing).



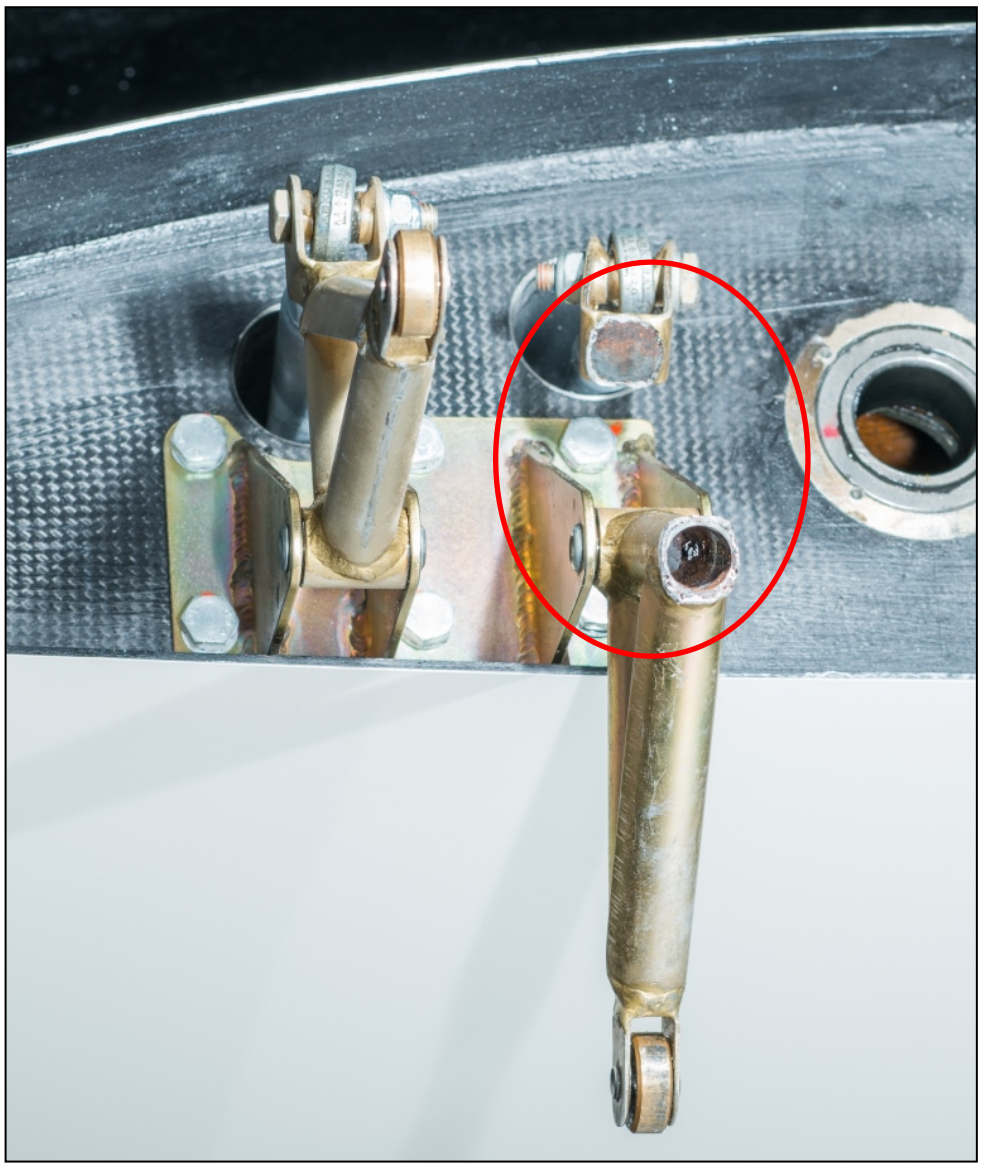
Meteorological information

General meteorological conditions:	CAVOK
Wind direction:	231°
Wind speed:	10 knots
Turbulence:	None

Airbrake system examination

Initial examination

After removal of the left wing from the fuselage, an initial examination revealed rupture of the airbrake bell crank. See below.



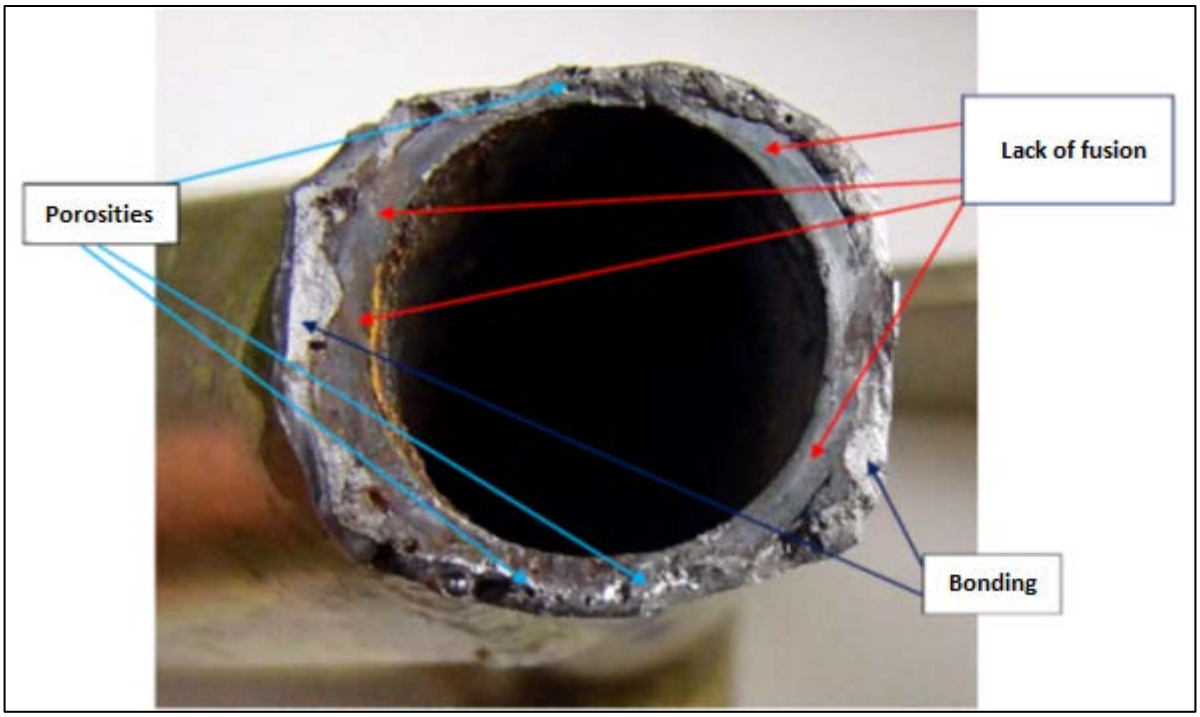
Airbrake bell crank laboratory examination

The ruptured parts revealed porosities and lack of fusion.

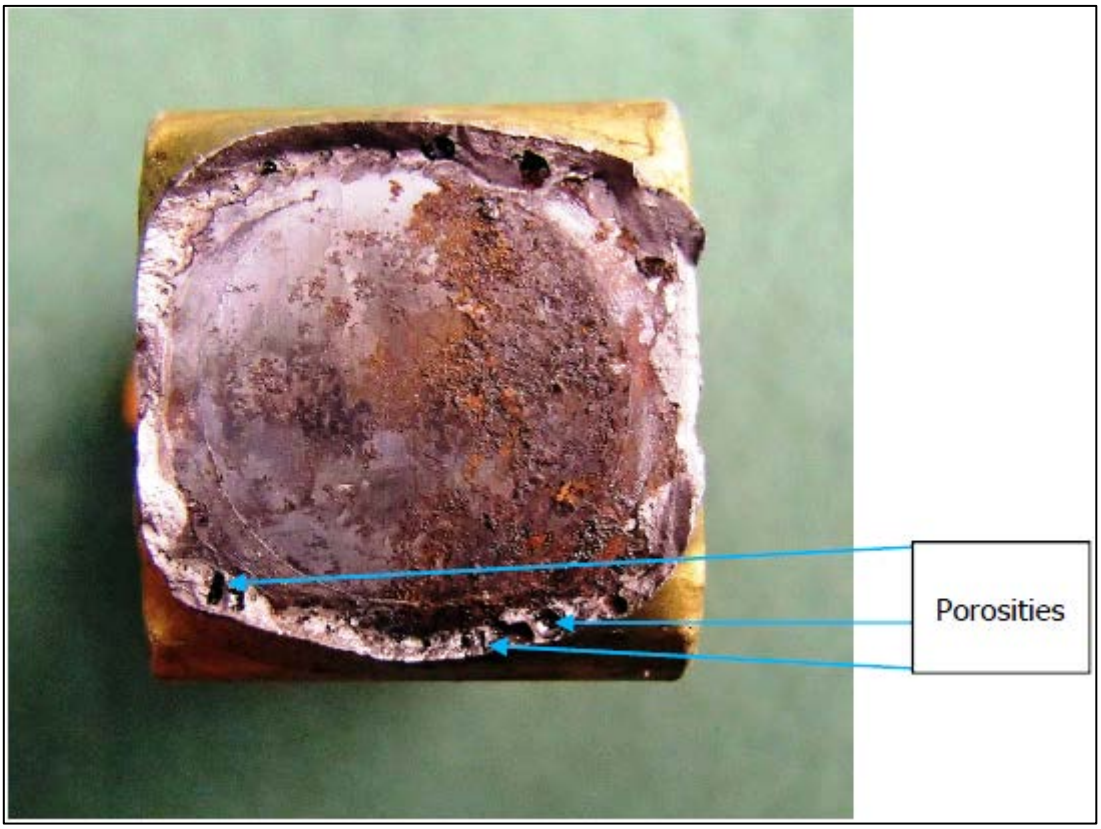
Bonding was only observed in the light gray areas (see below).

The pictures of this section of the bulletin were part of the laboratory examination report.

The laboratory examination report - see appendix 1.



An examination of the “fork” part weld also revealed porosities (see below)



An x-ray examination of the similarly placed weld of the intact airbrake bell crank from the right wing showed similar porosities.

A subcontractor to the glider manufacturer produced the above mentioned bell crank and levers
At the time of the serious incident, the subcontractor no longer existed.

Airbrake and aileron bell crank and levers

The installed airbrake and aileron bell crank and levers were not the correct types for the Arcus T.

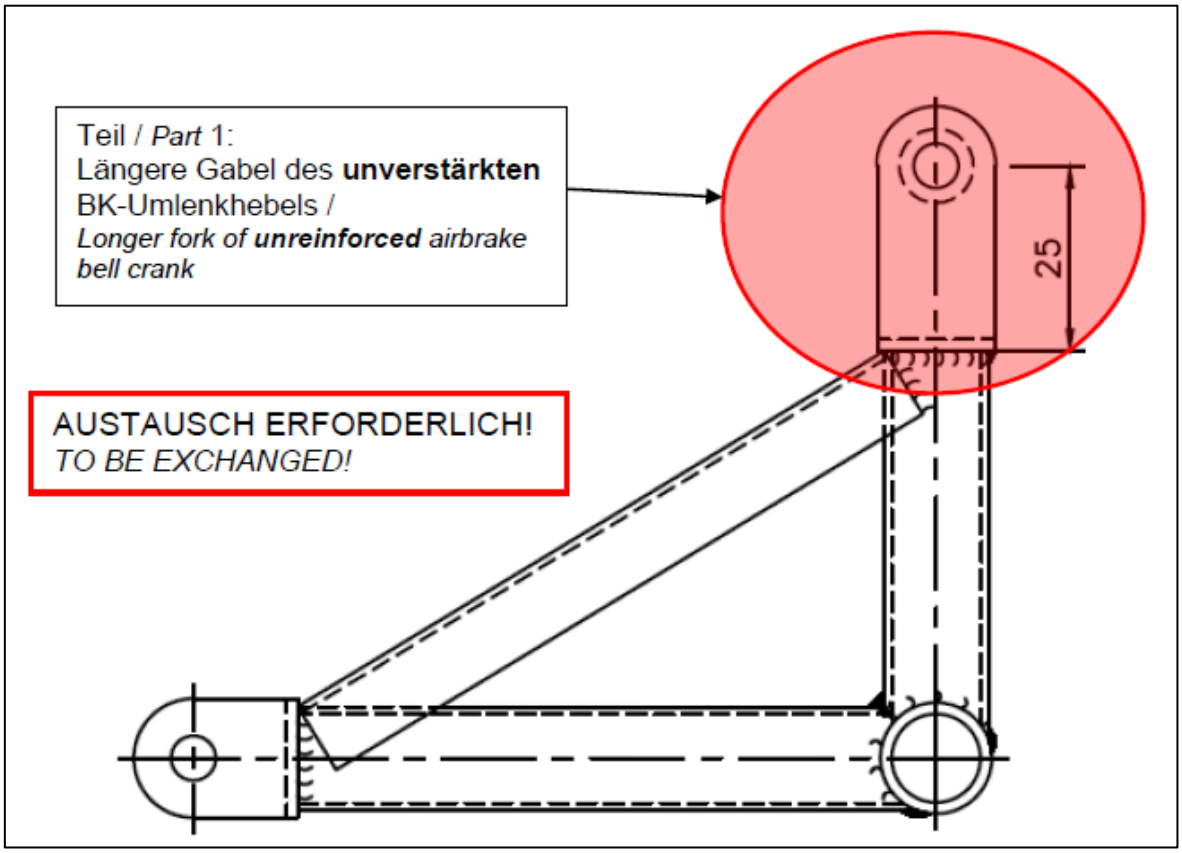
The bell crank and levers were installed from new.

The same was valid for the right wing installation.

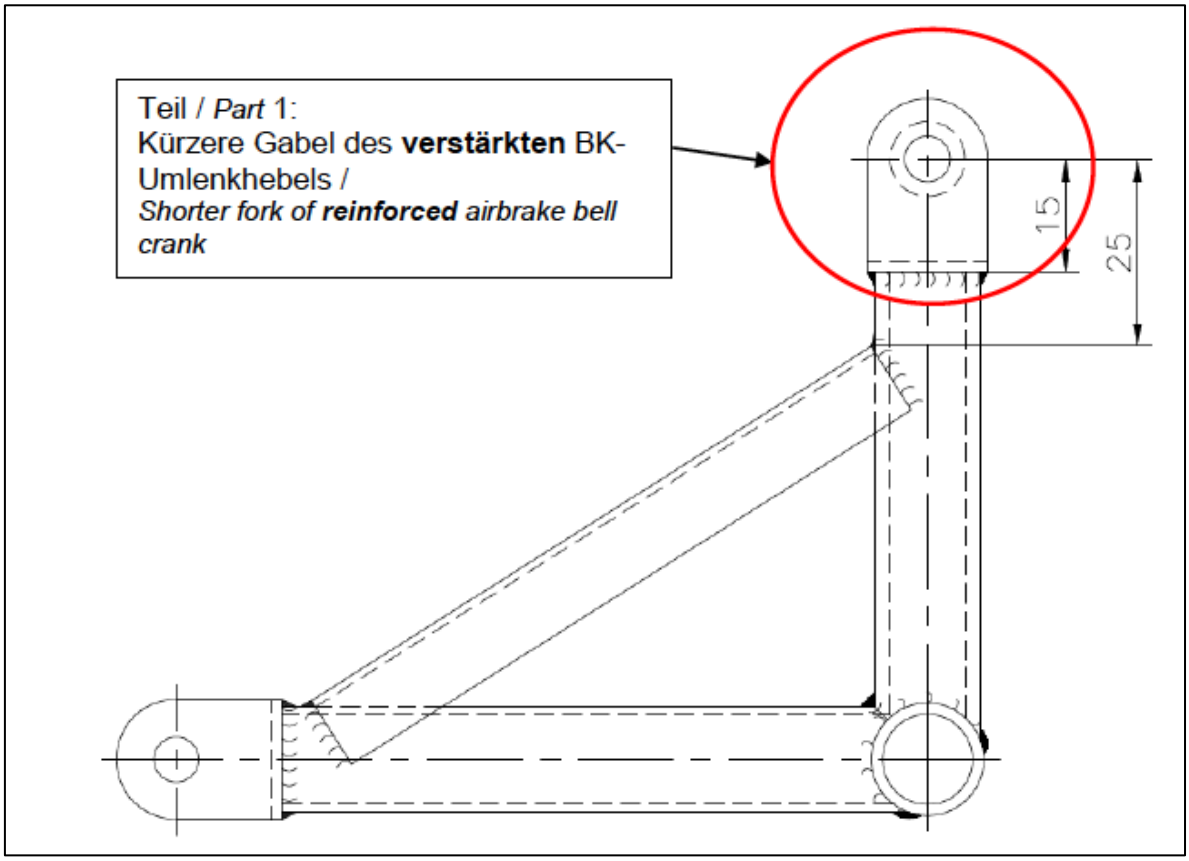
According to the glider manufacturer, this type of bell crank and levers should not have been installed on the Arcus T.

At the time of the serious incident, the manufacturer was preparing modification information to the airworthiness authorities in Germany and EASA.

The installed airbrake and aileron bell crank is illustrated below.



The reinforced bell crank is illustrated below.



ANALYSIS

The weather had no influence on the serious incident.

The pilot's total flying experience had a positive impact on aircraft handling at low altitude when the left wing airbrake inadvertently extended.

The examination of the ruptured airbrake bell crank and lever welds revealed lack of fusion and porosities.

The AIB finds the areas of weld bonding minimal and therefore insufficient to withstand operational load over time.

Because the subcontractor no longer existed, the AIB did not make any further investigation into the manufacture and welding of the – no longer used – bell cranks.

CONCLUSIONS

The left wing airbrake bell crank ruptured as a consequence of inadequate weld quality.

The strength of the welds was insufficient to withstand airbrake bell crank operational loads.

SAFETY INITIATIVES

During the investigation, safety initiatives were taken by the following organisations:

- Regarding inspection of the airbrake system, the DsVU issued a safety note on 27-5-2015
- The glider manufacturer prepared a Technische Mitteilung A532-4 (Technical Note) on 16-6-2015. See appendix 2
- EASA issued an Airworthiness Directive, AD No.: 2015-0140, on 15-7-2015. See appendix 2

Because the glider manufacturer delivered the above mentioned bell crank and levers modification to the owners of OY-XJT immediately after the serious incident, Arcus T S/N 14 was not covered by the EASA AD No.: 2015-0140.

APPENDICES

Appendix 1	Laboratory examination report
Appendix 2	Airworthiness Directive AD No.: 2015-0140 including the Technische Mitteilung A532-4

Appendix 1

Table of Contents

At your request, FORCE Technology has examined a broken airbrake bell crank from a glider aircraft.

Two bell cranks were received, one fractured from the left side wing and one intact from the right side wing of the glider.

Background information

According to the information supplied, the left wing spoiler of the glider deployed unintentionally on approach at an altitude of approximately 200 m forcing the aircraft to roll left and subsequently pitch downwards.

The glider registration is OY-XJT.

Purpose of examination

The purpose of the examination was to identify the cause of the fracture in the broken bell crank from the left side spoiler and examine the condition of the welds in the similar positions on the intact bell crank for the right spoiler.

Examination and results

For the examination, we received the parts shown in figures 1-2.

The examination included the following:

1. Visual inspection
2. Digital x-ray testing of the bell crank

Re 1 Visual inspection

The fractured surface was examined using stereomicroscopy. The fracture appeared in the welding section between the tube and the mounting fitting. The quality of the weld is considerably poor, leaving large areas lacking fusion, as well as the presence of cold runs and areas with notable porosity. The bonded area is less than 10 %. Cf. figures 3 - 6.

Re 2 Digital X-ray testing of the bell crank

In order to determine the quality of the similarly placed welds on the intact bell crank from the right wing spoiler, digital X-ray testing was performed. The results showed a similarly poor weld

quality with pores measuring up to a diameter of 1.1 mm. Cf. figures 7 – 8, where the dark rounded areas within the weld represent the presence of pores.

Concluding remarks

The observed fracture in the left wing bell crank was caused by the grossly unsatisfactory weld quality.

The strength of the welds is insufficient to withstand the operational loads on the bell crank.

The limitations of digital X-ray testing have not made it possible to examine the areas with lack of fusion, which require destructive metallographic examination.

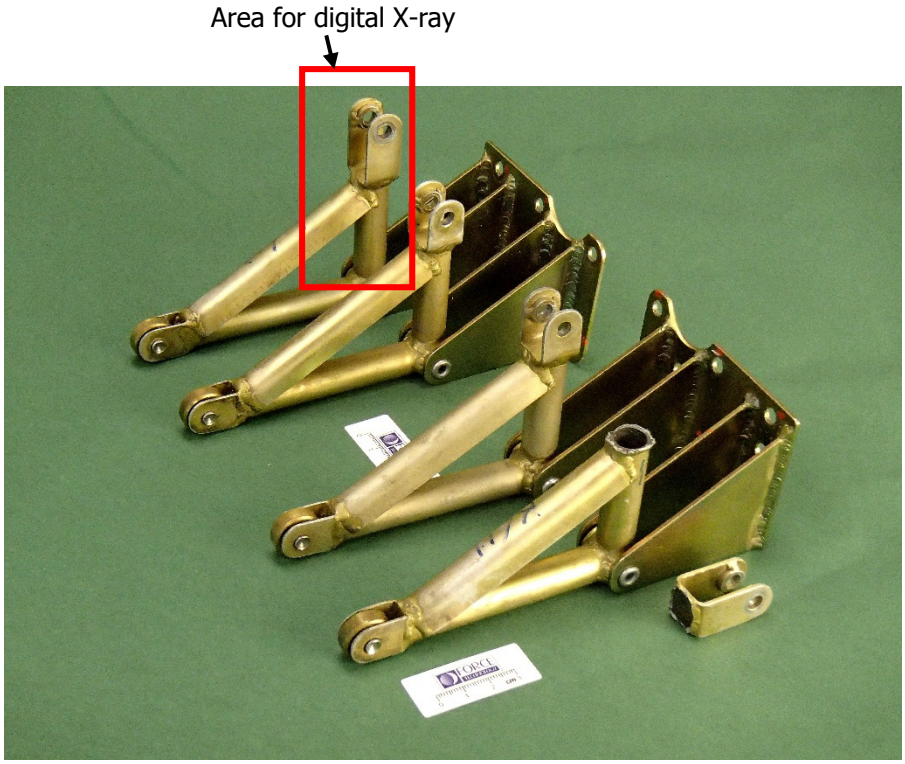


Figure 1 The two bell cranks from aircraft OY-XJT as received.

Figure 2 The left wing fractured bell crank as received.

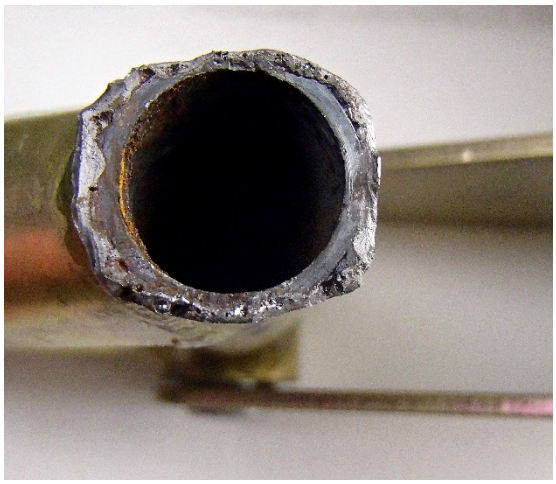


Figure 3 The fractured surface on the bell crank side.

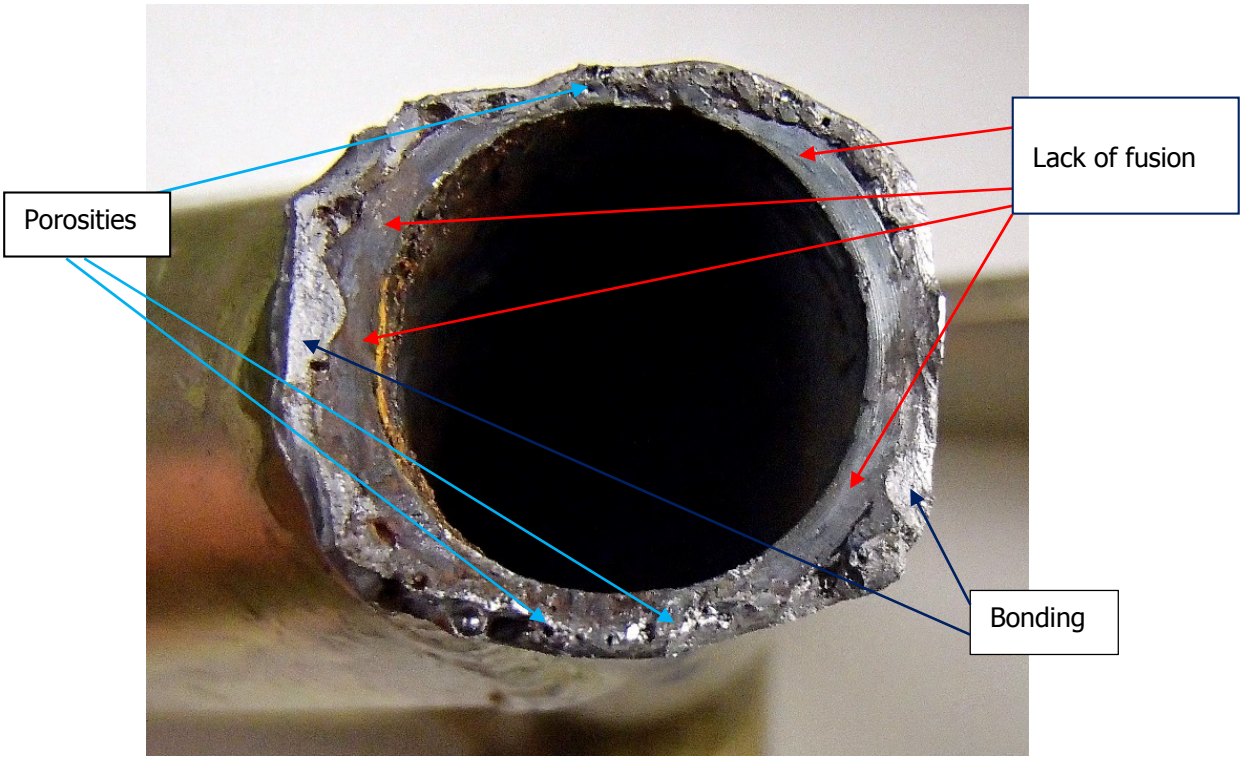


Figure 4 Close up of figure 3. Note bonding is only observed in the light grey areas.

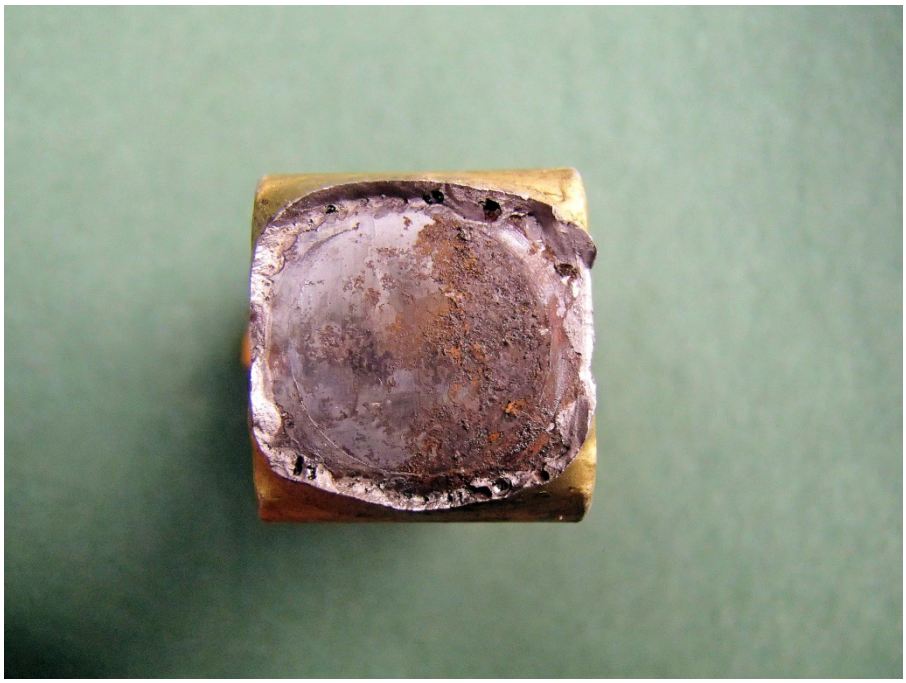


Figure 5 The fracture surface from the opposite side.

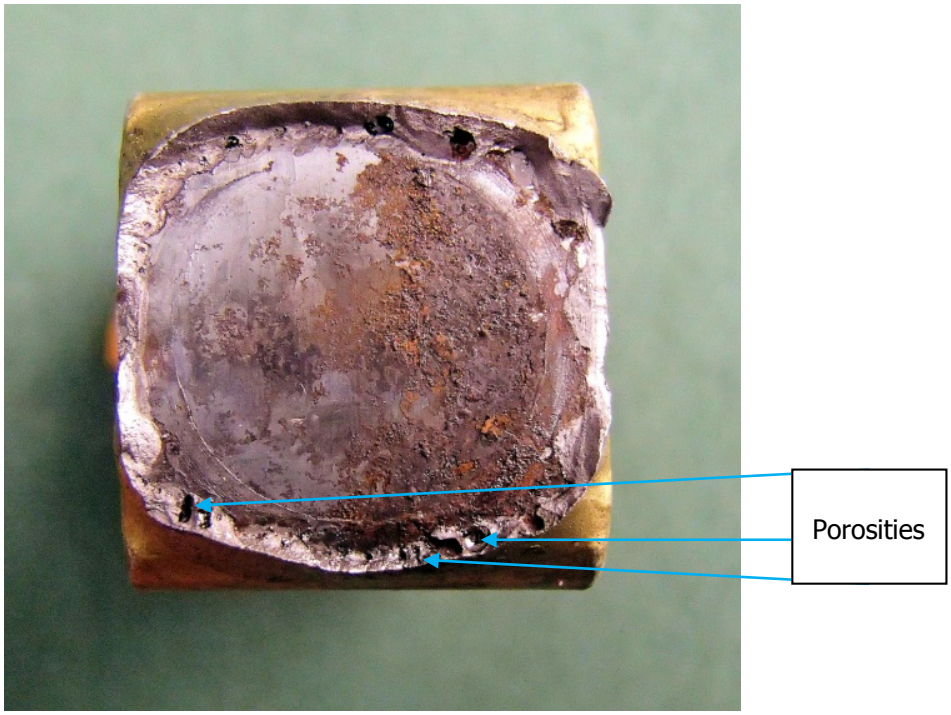


Figure 6 Close up of figure 5.

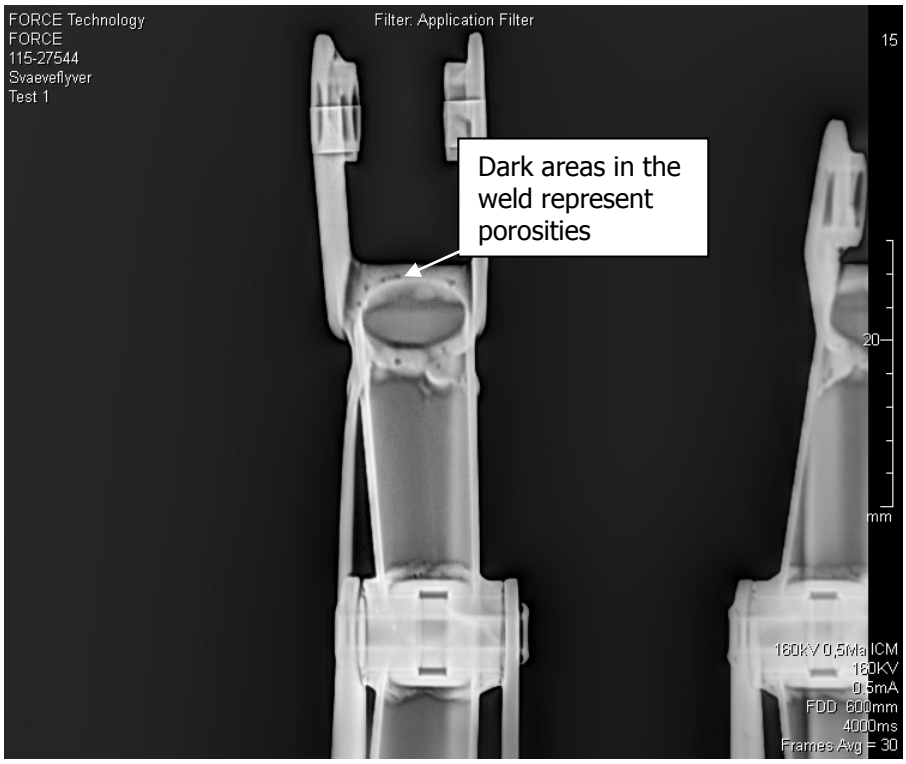


Figure 7 Digital X-ray of the red squared area in figure 1.

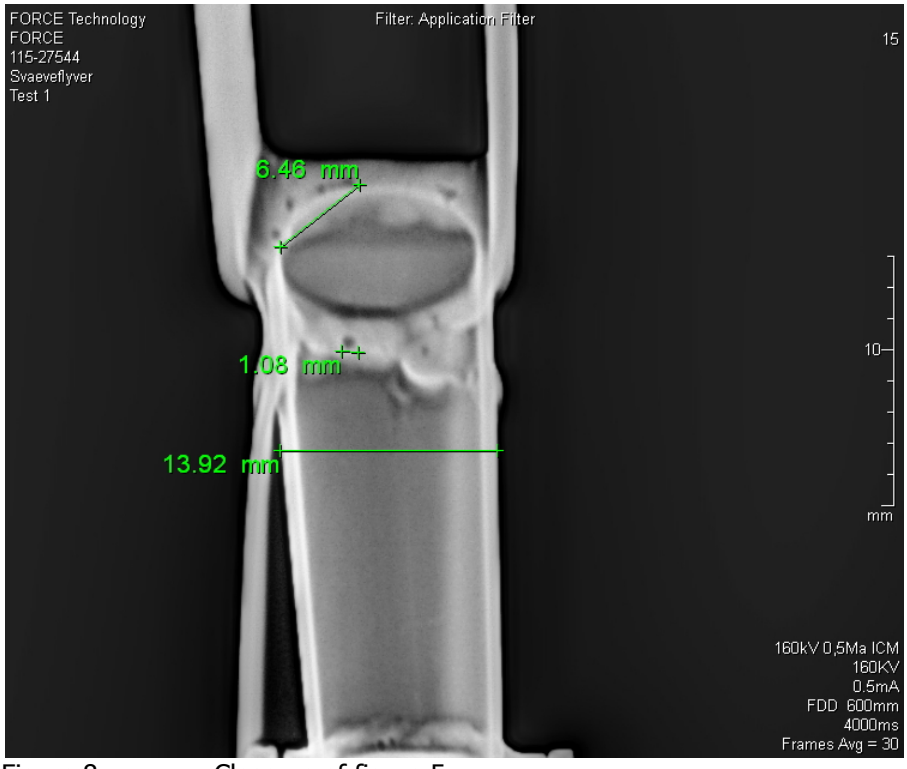


Figure 8 Close up of figure 5.

EASA	AIRWORTHINESS DIRECTIVE
	AD No.: 2015-0140 **[Correction: 16 July 2015]** **Date: 15 July 2015** Note: This Airworthiness Directive (AD) is issued by EASA, acting in accordance with Regulation (EC) No 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation.

This AD is issued in accordance with EU 748/2012, Part 21.A.3B. In accordance with EU 1321/2014 Annex I, Part M.A.301, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified by the Agency [EU 1321/2014 Annex I, Part M.A.303] or agreed with the Authority of the State of Registry [EC 216/2008, Article 14(4) exemption].

Design Approval Holder's Name:	**Type/Model designation(s):**
SCHEMPP-HIRTH FLUGZEUGBAU GmbH	Arcus sailplanes and powered sailplanes

TCDS Number:	EASA.A.532
Foreign AD:	Not applicable
Supersedure:	None

ATA 27	**Flight Controls – Air Brake Bellcrank – Inspection / Replacement**
Manufacturer(s):	Schempp-Hirth Flugzeugbau GmbH
Applicability:	Arcus sailplanes, serial numbers (S/N) 1 to 9 inclusive. Arcus T powered sailplanes, S/N 1 to 12 inclusive, and S/N 15 to 31 inclusive. Arcus M powered sailplanes, S/N 1 to 46 inclusive.
Reason:	Operational experience shows that application of an excessive load on the air brake system may induce damage to the air brake bellcrank at the root ribs of the wing. This condition, if not detected and corrected, could lead to bellcrank failure and uncontrolled actuation of the air brakes (symmetric or asymmetric), possibly resulting in reduced control of the (powered) sailplane. To address this potential unsafe condition, Schempp-Hirth Flugzeugbau GmbH developed a reinforced bellcrank and issued Technical Note (TN) A532-4 to provide inspection instructions of the non-reinforced parts. For the reasons described above, this AD requires repetitive inspections of non-reinforced (pre-drawing HS-50.016 Revision a) air brake bellcranks and clearance checks of the air brake control system. This AD also requires replacement of all non-reinforced bellcranks with reinforced parts. This AD is re-published to correct a typo in the number of the Schempp-Hirth Flugzeugbau GmbH service instruction.
Effective Date:	29 July 2015

Required Action(s) and Compliance Time(s):	Required as indicated, unless accomplished previously: (1) Within 40 days after the effective date of this AD, check if any non-reinforced air brake bellcrank corresponding to pre-drawing HS 50.016 Revision a is installed on a (powered) sailplane. If any non-reinforced air brake bellcrank (pre-drawing HS 50.016 Revision a) is found to be installed on a (powered) sailplane, before next flight, and thereafter at intervals not to exceed 50 flight hours, inspect the affected air brake bellcrank and check the clearances of the air brake control system in accordance with the instructions of Schempp-Hirth Flugzeugbau GmbH TN A532-4. (2) If, during any inspection as required by paragraph (1) of this AD, any crack or damage is detected in an air brake bellcrank, before next flight, replace each damaged air brake bellcrank with a reinforced part, corresponding to drawing HS11-50.016 Revision a, or a later approved drawing, and accomplish all the corrective actions in accordance with the instructions of Schempp-Hirth Flugzeugbau GmbH TN A532-4. (3) If, during any clearance check as required by paragraph (1) of this AD, discrepancies are detected, before next flight, accomplish all applicable corrective actions in accordance with the instructions of Schempp-Hirth Flugzeugbau GmbH TN A532-4. (4) Unless already accomplished as required by paragraph (2) of this AD, within 12 months after the effective date of this AD, replace each non-reinforced (pre-drawing HS-50.016 Revision a) air brake bellcrank with a reinforced part in accordance with the instructions of Schempp-Hirth Flugzeugbau GmbH TN A532-4. (5) Replacement on a (powered) sailplane of each non-reinforced (pre-drawing HS-50.016 Revision a) air brake bellcrank with a reinforced part, as required by paragraph (4) of this AD, constitutes terminating action for the repetitive inspections and clearance checks as required by paragraph (1) of this AD for that (powered) sailplane. (6) From the effective date of this AD, installation of an air brake bellcrank on a (powered) sailplane is allowed, provided the part corresponds to Schempp-Hirth Flugzeugbau GmbH drawing HS11-50.016 Revision a, or to a later approved drawing.
Ref. Publications:	Schempp-Hirth Flugzeugbau GmbH TN A532-4 dated 16 June 2015. The use of later approved revisions of this document is acceptable for compliance with the requirements of this AD.
Remarks:	1. If requested and appropriately substantiated, EASA can approve Alternative Methods of Compliance for this AD. 2. Based on the required actions and the compliance time, EASA have decided to issue a Final AD with Request for Comments, postponing the public consultation process until after publication. 3. Enquiries regarding this AD should be referred to the Safety Information Section, Certification Directorate, EASA. E-mail: ADs@easa.europa.eu. 4. For any question concerning the technical content of the requirements in this AD, please contact: Schempp-Hirth Flugzeugbau GmbH, Krebenstrasse 25 73230 Kirchheim/Teck, Germany Telephone: +49 7021 7298-0, Fax: +49 7021 7298-199 Email: info@schempp-hirth.com.

GEGENSTAND: Kontrolle des Bremsklappen-Umlenkhebels an den Wurzelrippen der Tragflügel

SUBJECT: *Inspection of airbrake bell cranks at the root rib of the wings*

BETROFFEN: TCDS EASA.A.532 Arcus T

- Baureihe **Arcus T**: Werknummer 1 bis 12, 15 bis 31
- Baureihe **Arcus M**: Werknummer 1 bis 46
- Baureihe **Arcus**: Werknummer 1 bis 9

AFFECTED: *TCDS EASA.A.532 Arcus T:*

- *Model **Arcus T**: SN 1 to 12, 15 to 31*
- *Model **Arcus M**: SN 1 to 46*
- *Model **Arcus**: SN 1 to 9*

DRINGLICHKEIT:

Maßnahme 1: Spätestens 40 Tage nach Inkrafttreten der zugehörigen EASA-AD.

Maßnahme 2: Wenn bei Maßnahme 1 festgestellt wurde, daß die veraltete Version des Bremsklappen-Umlenkhebels eingebaut wurde. Wiederholung der Maßnahme 2a) alle 50 Flugstunden bis Maßnahme 3 durchgeführt wurde.

Maßnahme 3: Vor dem nächsten Start, wenn bei Prüfung nach Maßnahme 2a) eine Beschädigung der BK-Umlenkhebel festgestellt wurde. Spätestens aber 12 Monate nach Inkrafttreten der zugehörigen EASA-AD.

URGENCY:

Action 1: Within 40 days after the effective date of the corresponding EASA-AD.

Action 2: If action 1 shows that the outdated version of the airbrake bell crank is installed. Repetition of action 2a) every 50 flying hours until action 2 has been conducted.

Action 3: Before next take off, if inspection according to action 2a) shows damage to the airbrake bell crank. Otherwise the latest 12 month after effective date of the corresponding EASA-AD.

VORGANG: Es können veraltete Bremsklappen-Umlenkhebel an der Wurzelrippe des Flügels eingebaut worden sein. Diese veraltete Version des Bremsklappen-Umlenkhebel weist ein geringeres Festigkeitsniveau auf, so daß die Gefahr von unkontrolliertem Ausfahren der Bremsklappe im Flug, unter Umständen auch nur einseitig, besteht.
Es wird ein Verfahren zur Kontrolle des betroffenen Bauteils etabliert sowie der Austausch der Bremsklappen-Umlenkhebel durch entsprechend verstärkte Versionen festgesetzt.

REASON: *Permanent excessive loads on the automatic connections of the airbrake control system can cause damage to the airbrake bell cranks at the root ribs of the wings. In case of damage there is the risk of uncontrolled extraction of the airbrakes, which can also occur under certain circumstances only on one side of the wing.*
A procedure for the inspection of the affected components is established and the airbrake bellcranks have to be replaced by reinforced versions. Furthermore the airbrake control system in the wings has to be checked.

MASSNAHMEN / *Actions*:

Massnahme 1 / *Action 1*:

Kontrolle der eingebauten Version des Bremsklappen-Umlenkhebels */ Check of installed airbrake bell crank version*

Mit Hilfe des folgenden Bildes wird die Version des eingebauten BK-Umlenkhebels kontrolliert. Auf Bild 1 ist die verstärkte Version des BK-Umlenkhebels dargestellt. Die beiden Versionen des Umlenkhebels lassen sich gut anhand der unterschiedlichen Dimensionen von Teil 1 unterscheiden:
With the aid of the following picture 1 the version of the installed airbrake bell crank can be determined. The picture shows the reinforced version of the airbrake bell crank. Both version of the bell crank vary in the dimensions of part 1:

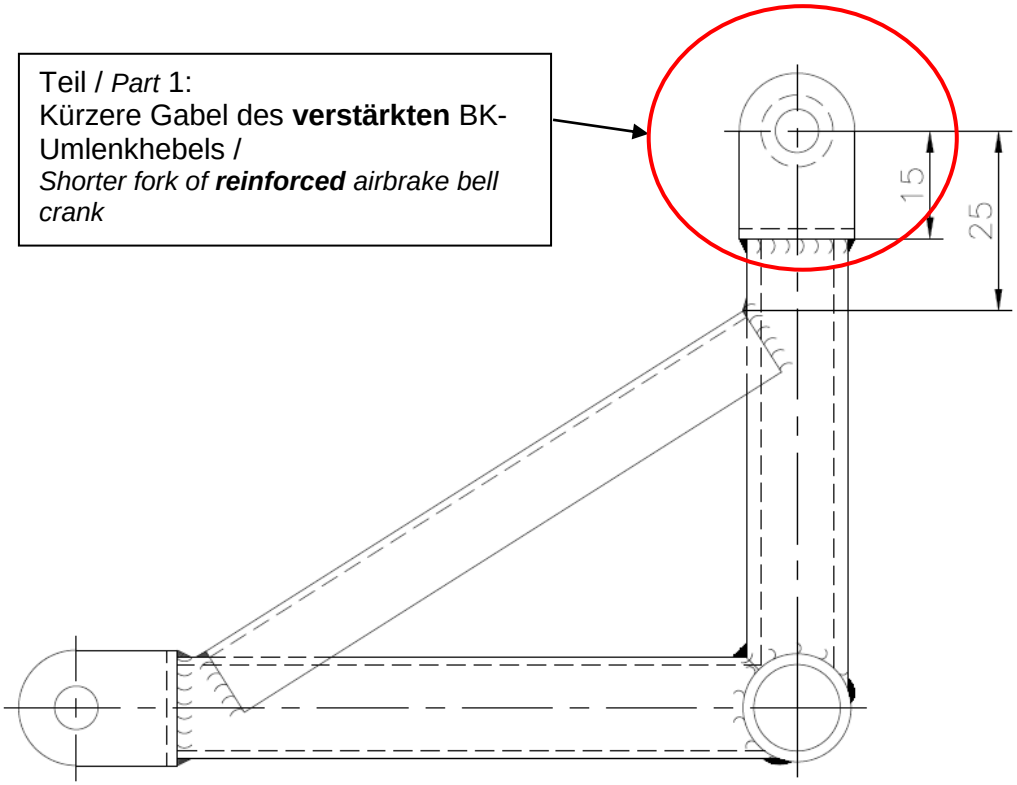


Bild 1: Verstärkte Version des BK-Umlenkhebels nach HS11-50.016 ab Revision a
Picture 1: Reinforced version of airbrake bell crank according to HS 11-50.016, Revision a or later

Die verstärkte Version des BK-Umlenkhebels ist an der kürzeren Gabel (Teil 1) zu erkennen. Beträgt der Abstand zwischen Bohrungsmitte und Unterseite der Gabel 15 mm, so muß der BK-Umlenkhebel nicht ersetzt werden und Maßnahme 2 und 3 sind hinfällig.
The reinforced version of the airbrake bell crank can be recognized on the shorter fork (part 1). If the distance between the hole center and the bottom of the for is 15 mm long, the airbrake bell crank has not to be replaced and the actions 2 and 3 are obsolete.

MASSNAHMEN / *Actions*: (Fortsetzung / *continued*)

Massnahme 1 / *Action 1*: (Fortsetzung / *continued*)

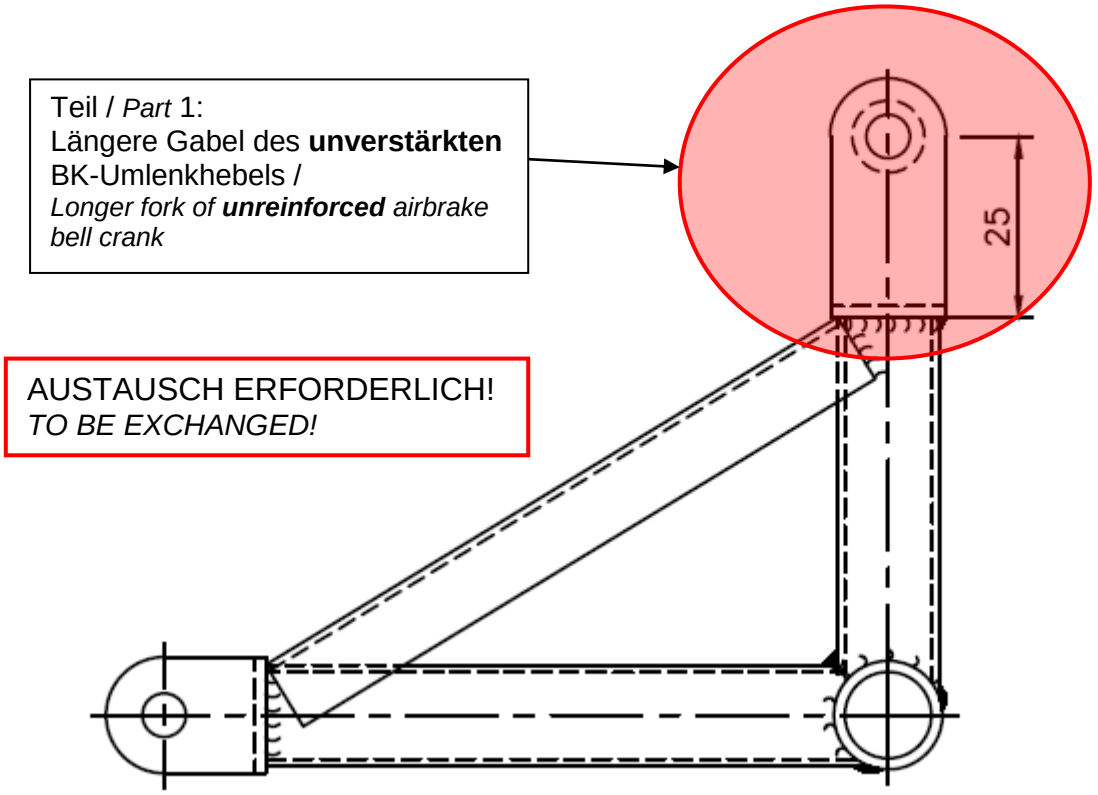


Bild 2: Unverstärkte Version des BK-Umlenkhebels
Picture 2: Unreinforced version of airbrake bell crank

Beträgt der Abstand dagegen 25 mm so ist der BK-Umlenkhebel durch die verstärkte Version zu ersetzen. Nach Durchführung der Maßnahmen 2a) und 2b) kann das Flugzeug für 50 Flugstunden weiter betrieben werden. Die Prüfung nach Maßnahme 2a) muß dann alle 50 Flugstunden widerholt werden, bis Maßnahme 3 durchgeführt wurde.
If the distance is 25 mm long, the airbrake bell crank has to be replaced by the reinforced version. After implementation of action 2a) and 2b), the aircraft can be operated for 50 operating hours. The inspection according to action 2a) has to be repeated every 50 operating hours until action 3 has been implemented.

Massnahme 2 / *Action 2*:

a) Kontrolle der eingebauten Bremsklappen-Umlenkhebels auf Risse / *Inspection of installed airbrake bell cranks for cracks*

Am abgebauten Flugzeug an der Wurzelrippe beider Flügel die Bremsklappen-Umlenkhebel kontrollieren. Dabei besonders auf mögliche Risse und Beschädigungen an den Schweißnähten achten. Für die Kontrolle der Bremsklappen-Umlenkhebel handelsübliche Lupen (mind. 3-fache Vergrößerung) und Spiegel verwenden:
With the wings disassembled check the airbrake bell cranks at the root rib of both wings. Pay special attention to possible cracks and damages at the welding seams. For the control of the airbrake bell cranks use standard magnifiers (at least 3 times magnification) and mirrors:

MASSNAHMEN / *Actions*: (Fortsetzung / *continued*)

Massnahme 2 / *Action 2*: (Fortsetzung / *continued*)

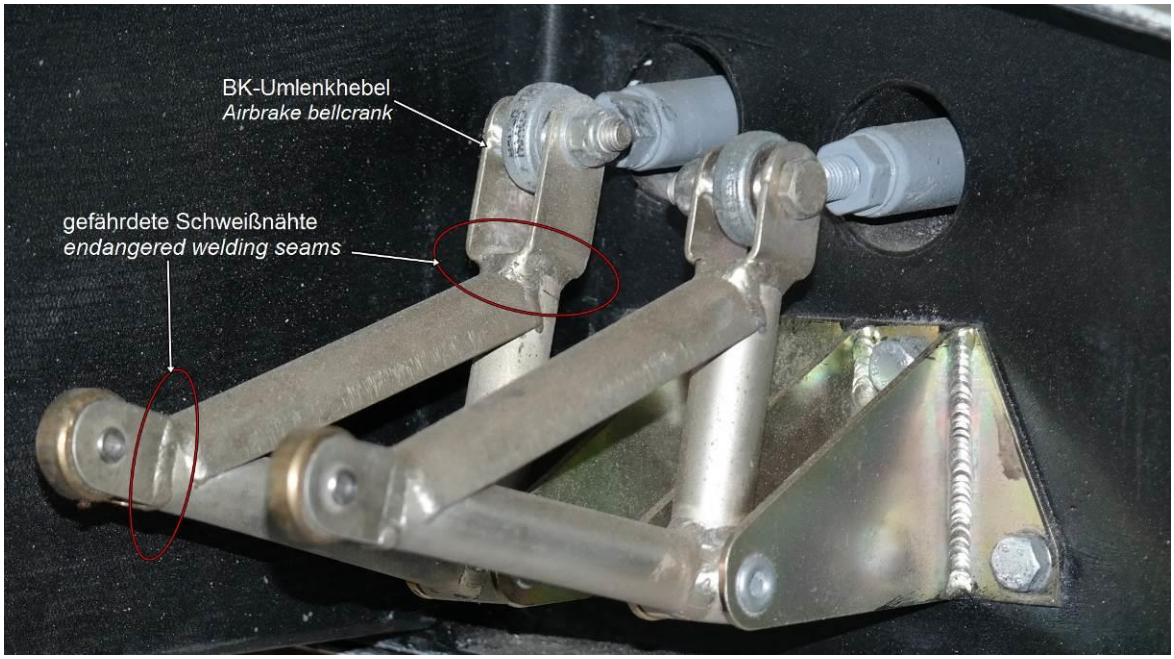


Bild 3 */ Picture 3*
Wurzelrippe beim Arcus (T/M) */ Root rib of Arcus (T/M)*

Sind Risse bzw. Beschädigungen an den BK-Umlenkhebeln zu erkennen, so ist vor dem nächsten Start Maßnahme 3 durchzuführen.
Sind keine Risse bzw. Beschädigungen an den Umlenkhebel zu erkennen, kann das Flugzeug, nach Durchführung von Maßnahme 2b) für jeweils 50 Flugstunden weiter betrieben werden, bevor Maßnahme 2a) erneut durchgeführt werden muß bzw. bis Maßnahme 3 durchgeführt wurde.
If cracks resp. damages at the Airbrake bellcranks have been found, action 3 has to be conducted before the next take off. If no cracks resp. damages can be found, after the implementation of action 2b) the aircraft can be operated for 50 operating hours before action 2a) has to be repeated resp. until action 3 has been implemented.

b) Kontrolle der Freigängigkeit der Bremsklappen-Steuerung / *Check clearance of airbrake control system:*

Die Freigängigkeit der Bremsklappen-Steuerung im Flügel ist anhand der beigefügten Arbeitsanweisung (Angaben zu Maßnahme 2b) zu kontrollieren. Ist die Freigängigkeit der Bremsklappen-Steuerung nicht gegeben, so muß Maßnahme 3 sofort durchgeführt werden und die Freigängigkeit der Steuerung muß hergestellt werden.

The clearance of the airbrake control system in the wings has to be checked according to the attached working instruction (information to action 2b). If the clearance of the air brake control system in the wings is not sufficient, action 3 has to be conducted immediately and the clearance of the airbrake control system in the wings has to be established before the next take off.

MASSNAHMEN / *Actions*: (Fortsetzung / *continued*)

Massnahme 3 / *Action 3*:

Ausbau des Lagerbocks / *Removal of the mounting plate*:

Den Lagerbock für die Umlenkhebel an der Wurzelrippe nach den Angaben der Arbeitsanweisung demontieren. Den im Austausch erhaltenen Lagerbock wieder entsprechend der Arbeitsanweisung einbauen.
Dismantle the mounting plate for the bell cranks at the root rib of the wings according to the instructions given in the respective working instructions. Reinstall the mounting plate received in exchange according to the working instructions.

MATERIAL:
- Arbeitsanweisung zu TM 532-4
- Bremsklappen-Umlenkhebel nach Zeichnung HS11-50.016, Revison a oder neuer, wenn benötigt.
- M6-Stoppmuttern, Anzahl entsprechend der auszutauschenden Teile

MATERIAL:
- *Working instructions for TN 532-4*
- *Airbrake bell crank according drawing HS11-50.016, Revision a or later, if necessary*
- *M6 locking nuts, number corresponding to parts that have to be replaced*

GEWICHT: Das Leergewicht des Flugzeuges bleibt unverändert.
WEIGHT: *The airplane's empty mass remains unchanged.*

SCHWERPUNKTLAGE: Der Leergewichtsschwerpunkt bleibt unverändert.
C.G. POSITION: *The empty mass C.G. remains unchanged.*

HINWEIS: Die durchzuführenden Maßnahmen 1, 2 und 3 sind nachprüfpflichtig durch Freigabe-berechtigtes Personal und müssen im Bordbuch bescheinigt werden.
NOTE: *Accomplishment of action 1, 2 and 3 must be checked and entered in the log book by authorized certifying staff.*

Kirchheim/Teck, 16.06.2015 *Kirchheim/Teck, May 11th 2015* ausgestellt: *issued:* C. Wannenmacher	Zugelassen durch die EASA am: *EASA approved on:* 25.06.2015 Mit Zulassungs-Nr.: *under approval-No.:* *10053813*

1. Arbeitsanweisung zur Maßnahme 2 / *Working Instructions for action 2*

b) Kontrolle der Freigängigkeit der Bremsklappen-Steuerung
b) Inspection of clearance of airbrake control system

Die größte Last auf die Bremsklappen-Umlenkhebel an der Wurzelrippe treten beim Überschreiten der Totpunktlage (Verknien) beim Verriegeln der Bremsklappen auf. Dabei werden die Federn innerhalb des Bremsklappen-U vom Bremsklappen-Deckel zusammengedrückt.
The biggest load on the airbrake bellcrank at the root rib of the wings occurs when the dead center position is exceeded while retracting the airbrakes. The springs inside the airbrake-U are then compressed by the airbrake cover.

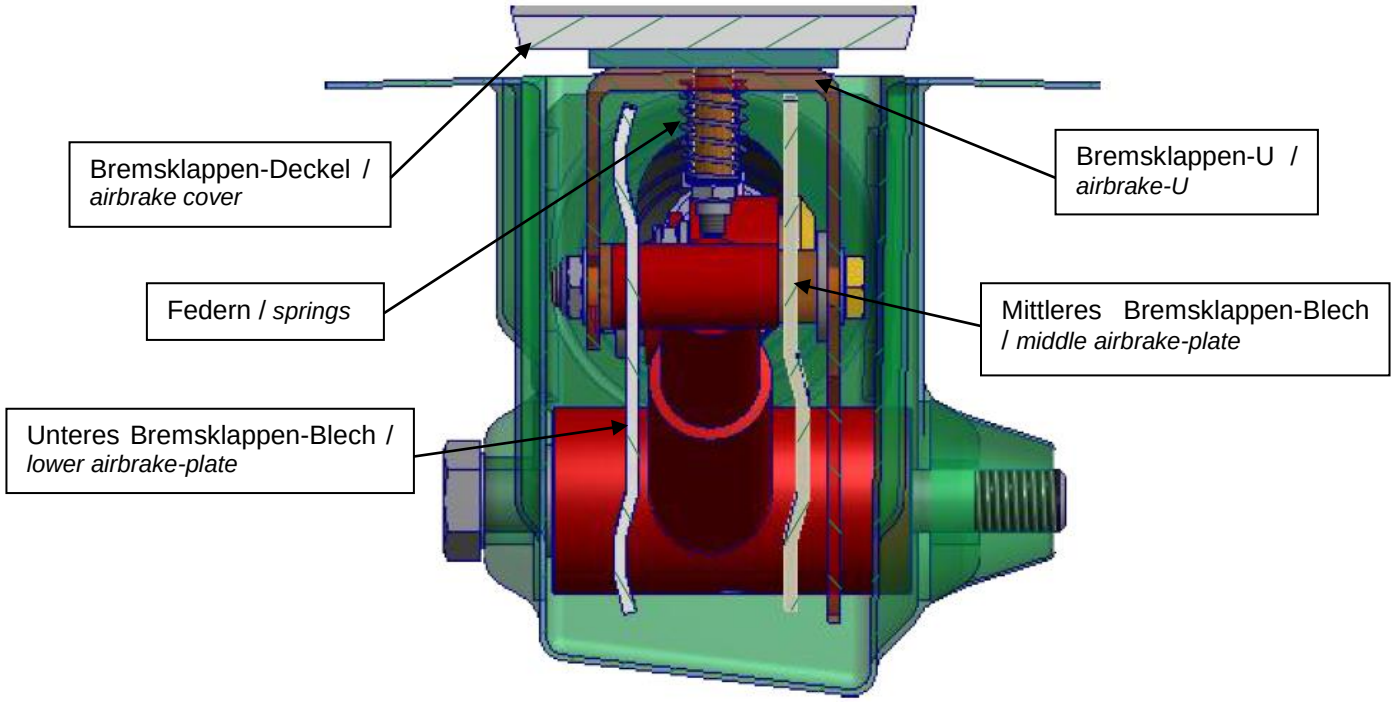


Bild 1: Schnitt in Flugrichtung durch Bremsklappenkasten bei eingefahrener Bremsklappe
Picture 1: Section in direction of flight through airbrake box with retracted airbrakes

Die Last auf die Umlenkhebel wird unzulässig groß, wenn beim Verknien der Bremsklappen zusätzlich zur Kraft der Federn eine weitere Last zu überwinden ist. Zusätzliche Lasten auf die Bremsklappensteuerung können auftreten wenn das Verriegeln der Bremsklappen z.B. durch ein Hindernis erschwert wird.
The load on the airbrake bellcrank will be too large, if an additional load is added to the forces caused by locking the airbrakes. Additional loads on the airbrake control system may occur, for example, if the locking of the airbrakes is hindered by an obstacle.

Der kritische Bereich der Bremsklappen-Steuerung, der auf eine Behinderung des Einfahrvorgangs der Bremsklappen kontrolliert werden muß, befindet sich zwischen den Bremsklappen-Umlenkhebeln an der Wurzelrippe und der Bremsklappe selbst im Bremsklappenkasten.
The critical part of the airbrake control system that has to be checked for interference of the retraction process of the airbrakes is between the airbrake bellcranks at the root ribs of the wings and the airbrake itself in the airbrake box in the wings.

b1) am abgebauten Flugzeug / *with glider derigged*:

An der Wurzelrippe kontrollieren, daß die Bremsklappen-Steuerstange frei in der Führung durch die Wurzelrippe läuft. Dabei vor allem die Freigängigkeit bei den Maximal-Ausschlägen kontrollieren.
Check at the root rib that the airbrake control rod moves freely in the guide through the root rib. Check clearance especially for the extreme deflections of the airbrake bellcrank.
Über die Inspektionsöffnungen auf der Unterseite des Tragflügels mit Hilfe eines Spiegels, eines Endoskops oder einer Finger-Kamera den Bereich der Bremsklappen-Steuerung zwischen Wurzelrippen-Durchführung und Durchführung im Bremsklappen-Kasten untersuchen. Der gesamte Verfahrweg bis zu den jeweiligen Anschlägen muss freigängig sein und darf nicht durch Hindernisse (Harztropfen, aufstehendes Gewebe etc.) gehemmt oder behindert werden.
Check the area between the guides through the root rib and the guide into the airbrake box with the aid of a mirror, an endoscope or a finger camera through inspection openings on the lower side of the wing. The complete travel distance to the respective stops has to be clear and must not be inhibited or impeded by obstacles (resin drops, upstanding fabric, etc.)

b2) am aufgebauten Flugzeug / *with glider rigged*:

Bei aufgebauten Flugzeug die Flügel an der Trennstelle zwischen Innen- und Außenflügel mit zwei Flügelstützen ca. 50 cm nach oben drücken und erst dann mit der Überprüfung der Bremsklappen-Steuerung beginnen.
Push the wings at the section between inner and outer wing with the aid of two wing supports about 50 cm / 20 in / 1.64 ft upwards before you start with the inspection of the airbrake control system.

b2.1)

Im ersten Schritt kontrollieren ob die Bremsklappen-Bleche beim Verriegeln der Bremsklappen ungehindert in den Bremsklappen-Kasten einfahren können.
Dazu mindestens an den auf dem folgenden Bild bezeichneten Stellen eine Knetraupe in Flugrichtung über die ganze Breite des Klappenkastens anbringen.
As first step check if the airbrake plates can move freely into the airbrake box when retracting the airbrakes. For this purpose install a line of plasticine at least at the positions shown on the picture below.

Positionen für Knetabdruck / *Position for Plasticine impression*

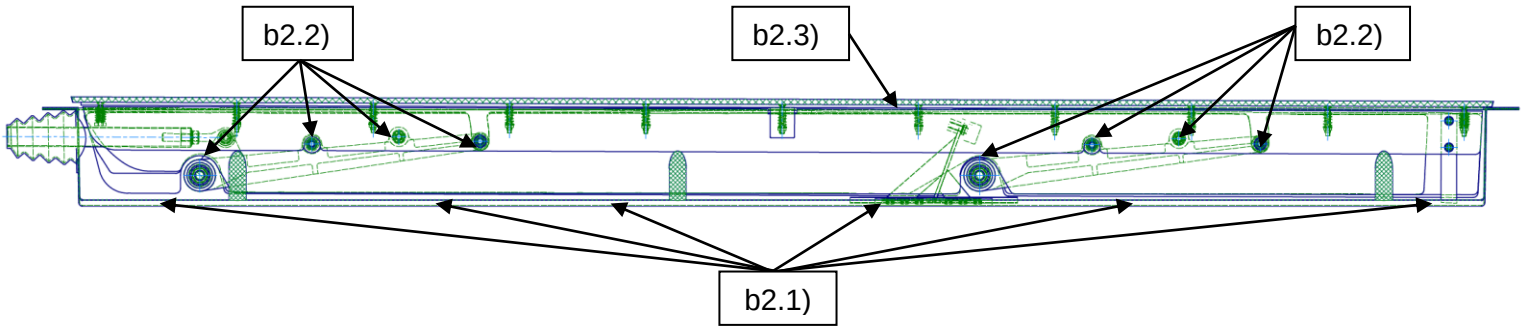


Bild 2: Schnitt durch Bremsklappenkasten bei eingefahrener Bremsklappe
Picture 2: Section through airbrake box with retracted airbrakes

Anschließend die Bremsklappen einfahren und verriegeln, danach wieder ausfahren. Im ausgefahrenen Zustand anhand des Knet-Abdrucks im Bremsklappen-Kasten kontrollieren wie groß der Abstand der Bremsklappen-Bleche zum Boden des Bremsklappen-Kastens ist. Ist dieser Abstand bei allen Abdrücken größer als 1 mm, so ist die Einstellung der Bremsklappen in Ordnung.

Sollte der Knetabdruck an einer Position oder an mehreren Positionen kleiner als 1 mm sein, so müssen die Einstellung der Bremsklappen bzw. die Bremsklappen-Bleche selbst überarbeitet werden. Dazu Kontakt mit dem Hersteller bzw. dessen Vertreter aufnehmen.
Afterwards retract and lock the airbrakes and extend the airbrakes again. Check the distance between the airbrakes plates and the bottom of the airbrake box with extended airbrakes using the impression of the airbrake plates on the plasticine lines. If the distance is greater than 1 mm on all plasticine lines, the adjustment of the airbrakes is good. If the distance is on one or more positions less than 1 mm, the adjustment of the airbrakes resp. of the airbrake plates has to be redone. For this purpose contact the manufacturer resp. his representative.

b2.2)

Beim Einfahren der Bremsklappen besteht außerdem die Möglichkeit, daß die Aussparungen in den Bremsklappen-Blechen mit den Schwenkhebeln kollidieren und dadurch erhöhte Lasten auf den Bremsklappen-Umlenkhebel an der Wurzelrippe erzeugt werden.
Aus diesem Grund müssen die Bremsklappen-Bleche in diesem Bereich genau kontrolliert werden, ob Schleifspuren oder Ähnliches auf eine Kollision mit den Schwenkhebeln schließen lassen. Im Zweifelsfall Knetabdruck durchführen.
Sollte hier eine Kollision vorliegen, so sind die weiteren Schritte mit dem Hersteller bzw. dessen Vertreter abzuklären.
It is also possible, that the airbrake lever arms collide with the recesses of the airbrake plates during retraction and thus generate increased loads on the airbrake bellcrank at the root rib.
For this reason, the airbrakes plates and the airbrake lever arms have to be controlled precisely in this area, whether grinding marks or the like indicate a collision. If in doubt, use plasticine lines.
If signs for a collision are present, the next steps have to be clarified with the manufacturer resp. his representative.

b2.3)

Des Weiteren sollte die Oberseite des mittleren und unteren Blechs kontrolliert werden, ob beim Einfahrvorgang eine Kollision mit den darüber liegenden Blechen bzw. mit den Schrauben des Bremsklappen-Deckels vorliegt. Sollte hier eine Kollision vorliegen, so sind die weiteren Schritte mit dem Hersteller bzw. dessen Vertreter abzuklären.
Furthermore check the top of the middle resp. of the lower airbrake plate if there is a collision with the airbrake plates above or with the bolts of the airbrake cover. If a collision occurs, the next steps have to be clarified with the manufacturer resp. his representative.

b2.4) Kontrolle der Bremsklappen-Steuerung im Rumpf / *Inspection of airbrake control system in fuselage*:

Bremsklappen einfahren und verriegeln. Der Abstand zwischen dem vorderen Ende der Betätigungsstange und dem Anschlag im Rumpf muß zwischen 1 mm und 5 mm liegen, siehe Bild:
Retract and lock airbrakes. The distance between the front end of the airbrake actuation rod and the forward stop in the fuselage has to be between 1mm / 0.04 in and 5 mm / 0.20 in:

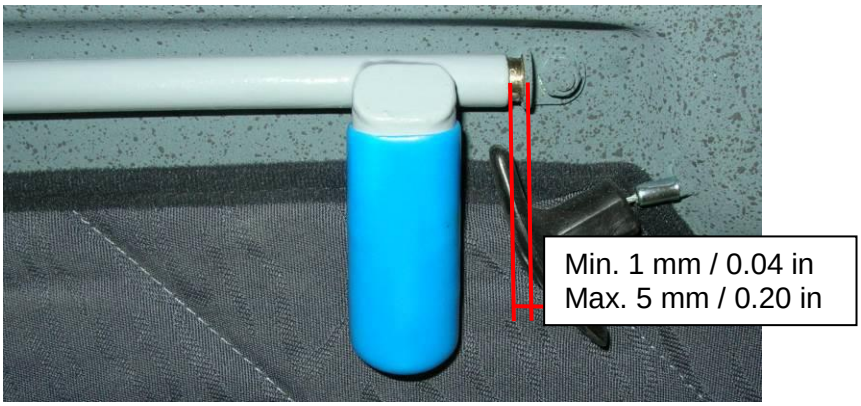


Bild / *Picture* 3: Einstellung Bremsklappen-Gestänge / *Adjustment of airbrake control system*

Für alle Maßnahmen zur Wieder-Herstellung der Freigängigkeit der Bremsklappen-Steuerung Kontakt mit dem Hersteller bzw. dessen Vertreter aufnehmen (siehe Seite 7 für Kontaktadressen).
For actions regarding the re-establishment of clearance of the airbrake control system, contact the manufacturer resp. his representatives (see page 7 for contact address).

2. Arbeitsanweisung zur Maßnahme 3 / *Working Instructions for action 3*

a) Ausbau des Lagerbocks / *Removal of the mounting plate*:

Im ersten Schritt muß die Verbindung zu den Steuerstangen im Flügel gelöst werden. Dazu die entsprechenden Schrauben für die Bremsklappen- und die Flaperon-Steuerung lösen, siehe Bild 3:
First disconnect the push rods from the bell cranks by removing the respective bolts for the airbrake-and the flaperon control system, see picture 3:

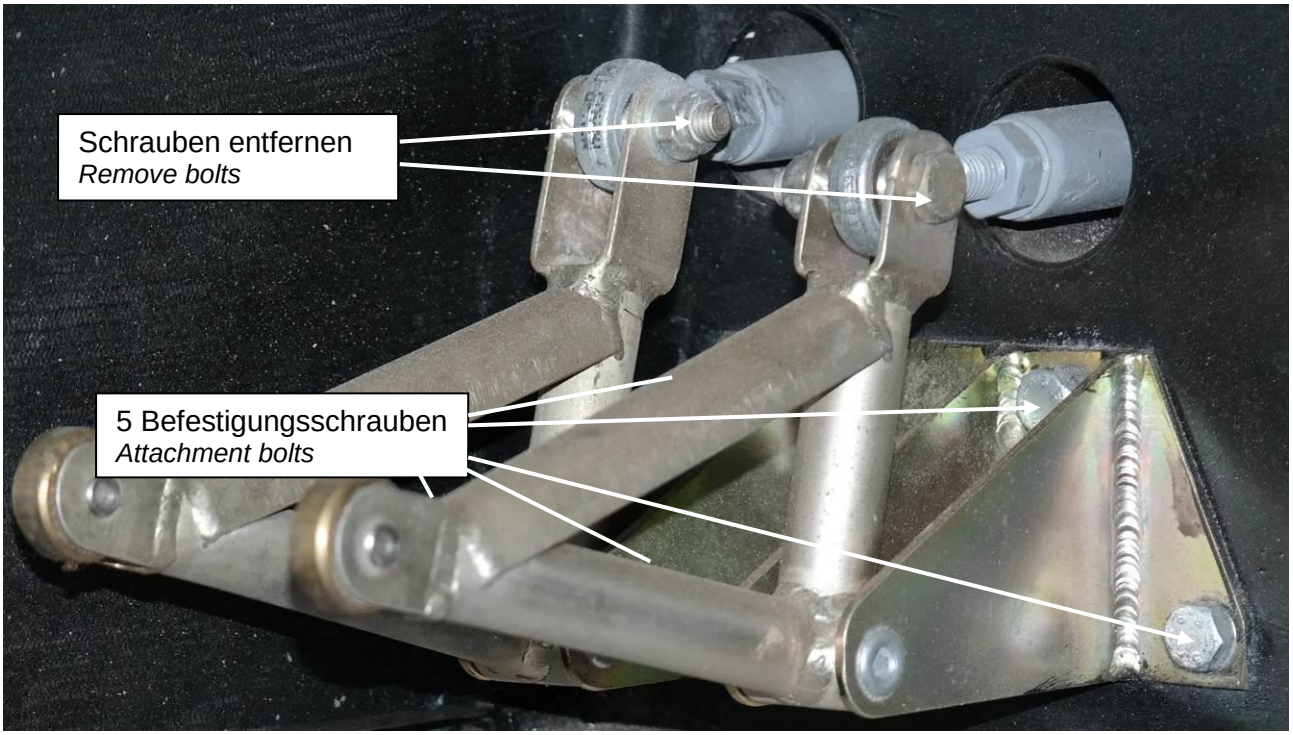


Bild 4: Lagerbock der Umlenkhebel an der Arcus (T/M) Wurzelrippe/
Picture 4: Mounting plate for bell cranks at root rib

Beim Ausbau der Schrauben darauf achten, daß die Länge der Gelenkstangenköpfe nicht verändert wird. Außerdem die Einbau-Richtung der Schrauben notieren. Im nächsten Schritt werden die Befestigungsschrauben des Lagerbocks entfernt und der Lagerbock abgenommen.
Der Wiedereinbau des Lagerbocks mit der verstärkten Version des BK-Umlenkhebels erfolgt in der umgekehrten Reihenfolge.
Beim Wiedereinbau die Befestigungsschrauben des Lagerbocks mit mittelfester Schraubensicherung (Loctite 243) setzen und neue Stopp-Muttern für die Verbindung der Steuerstangen verwenden. Auf die gleiche Einbaurichtung der Schrauben wie zuvor achten!
Nach dem Einbau des neuen Lagerbocks ist die Flügelsteuerung nach den Angaben von Maßnahme 3 b) zu kontrollieren und, wenn nötig, entsprechend einzustellen.
Take care that the length of the head of joint rod is not modified when removing the bolts. Note the direction of installation of the bolts. In the next step remove the attachment bolts of the mounting plate and remove the mounting plate from the root rib.
The re-installation of the mounting plate with the reinforced version of the airbrake bellcrank has to be performed in reversed order.
Use medium strength thread locker (e.g. Loctite 243) for the reinstallation of the attachment bolts and use new self-locking nuts for the connection of the push rods to the bell cranks. Take care that the bolts are used in the same direction of installation as before.
After the reinstallation of the mounting plate, the control system of the wings has to be checked according to the instruction of action 3 b). If necessary, the control system has to be adjusted.

b) Kontrolle der Steuerung / *Inspection of control system*

Die Freigängigkeit der Bremsklappen-Steuerung im Flügel nach den Angaben zu Maßnahme 2b) kontrollieren. Anschließend auch die Einstellung der Flaperon-Steuerung gemäß den Angaben im Wartungshandbuch (Seite 2.1.2) prüfen und bei Bedarf die Einstellung anpassen.
Check the clearance of the airbrake control system in the wings according to action 2b) of this working instructions. Then check the setting of the flaperon-control system as specified in the maintenance manual (page 2.1.2) and readjust if necessary.

Außerdem müssen folgende Punkte der Bremsklappen-Steuerung beachtet werden / *In addition, the follwing points regarding the airbrake control system have to be observed*:

- Gleichmäßiges Ausfahren der Bremsklappen / *Equal extension of airbrakes*:

  Dazu am aufgebauten Flugzeug die Bremsklappen gerade entriegeln und die entsprechende Ausfahrhöhe der Bremsklappen-Deckel an deren innerem Ende gegenüber der Flügeloberseite vergleichen, siehe folgendes Bild. Der Unterschied zwischen beiden Flügeln darf nicht mehr als 5 mm betragen:
  For this purpose just unlock the airbrakes at the rigged aircraft and compare the distance between the upper side of the airbrake cover and the upper wing surface on the inner side of the airbrakes on both wings. The difference has to be less than 5 mm / 0.20 in:

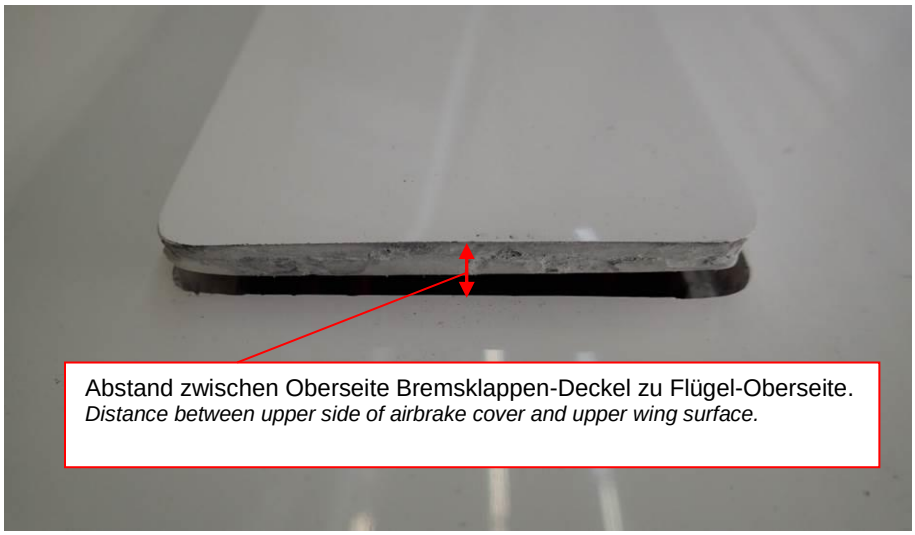


Bild / *Picture* 5: Vergleich Ausfahrhöhe / *Comparison of Extension height*

- Einstellung des Bremsklappen-Gestänges im Rumpf:

  Die Einstellung des Bremsklappen-Gestänges im Rumpf ist wie in Maßnahme 2 b2.4) beschrieben zu kontrollieren.
  The adjustment of the airbrake control system in the fuselage has to be checked according to action 2 b2.4).

Fahren die Bremsklappen nicht gleichmäßig aus oder ist der Abstand des Bremsklappen-Gestänges zum vorderen Anschlag im Rumpf nicht innerhalb der Toleranzen, so ist die Einstellung der Bremsklappen-Steuerung entsprechend anzupassen.
Bei Problemen mit der Einstellung bitte Kontakt zum Hersteller bzw. dessen internationaler Vertreter aufnehmen.
If the airbrakes doesn't extend equally or the distance between the front end of the airbrake actuation rod to the forward stop in the fuselage is not within its limits, the airbrake control system has to be readjusted.
If you have problems with the adjustment please contact the manufacturer or its international representative.

Kontakt / *Contact*:

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E-Mail: service@schempp-hirth.com

Internationale Vertreter / *International representatives*:

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