

Subject: Exchange of wing root ribs

Applicability: **ASW 15**; Type-Certificate LBA 272; model ASW 15

Reason: If damaged ribs are found during the inspection of the wing root ribs according maintenance instruction G of the ASW 15 these ribs will have to be replaced according TN 29 of the ASW 15 by new ribs from the ASW 15B.

Action: The exchange of the wing root ribs has to be performed in accordance with the data and instructions given in the repair manual. This repair instruction describes a possible process for the exchange of the wing root ribs in addition to the general guidelines. Other procedures are possible and can be used if local conditions make it reasonable. However, despite the different possibilities for the repair the following points are mandatory:

- Only new GFRP-ribs according to the following drawing numbers are allowed to be installed:

151.51.1025 Root rib front left ("Wurzelrippen-Nasenteil li., einbaufertig")

151.52.1025 Root rib front right ("Wurzelrippen-Nasenteil re., einbaufertig")

151.51.1026 Root rib rear left ("Wurzelrippen-Hinterteil li., einbaufertig")

151.52.1026 Root rib rear right ("Wurzelrippen-Hinterteil re., einbaufertig")

These can be obtained from the manufacturer Alexander Schleicher.

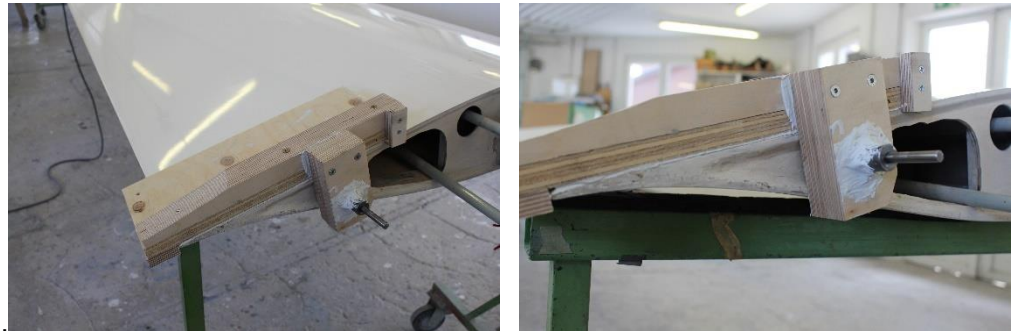
- Only the resin systems specified in the Schleicher repair manual may be used.
- For all structural bonding joints, the following adhesive mixture has to be used:
 - 100 parts by weight of resin + required parts hardener
 - 20 parts by weight cotton flocks
 - 10 parts by weight Aerosil
- The original lift-pin bushings can be re-installed if the free-play between the respective fuselage lift-pin and the lift-pin bushing in the wing is less than 0.1 mm (0.004 in.). In addition, one-sided rubbing wear (ovality) or damages at the bushing are not allowed. If these criteria are not met, new lift-pin bushings (AS P/N 99.332.0082) must be used which can be obtained from the manufacturer.

Normally several wooden ribs of the ASW 15 are affected by damages so that more than one rib has to be exchanged. It is recommended not to change all ribs of the wing at one time in order to maintain the contour accuracy of the wing and to prevent having excessive effort to rebuild the rigging data of the aircraft. For people having less experiences in structural repairs it is recommended to exchange only one rib at one time by accomplishing the following process in total. Repair shops with more experiences can exchange two ribs at one time which are diagonally opposite. This means for example the forward right rib and the rearward left rib at one time. This significantly reduces the time and effort required.

The following working sequence has proven to be practical for replacing the root ribs:

1. Create drilling jig for lift pin bushings

For the installation of the new rib and the lift-pin bushing it is useful to have an easy jig which can be derived from the original wing. This jig should be used to fix the position of the bushing at the root rib plane and in spanwidth direction. The jig can be made of wood and be moulded to the original contour of the wing with the help of polyester putty (use release agent!). It is useful to integrate a drill bushing with flange to the jig so that the flange is flush with the flange of the lift-pin bushing. The alignment of drill bushing and lift-pin bushing is enabled by a steel pin.



2. Remove old root rib

The old root ribs should be removed preferably by the use of a carbide milling tool starting from the openings in the rib. In addition, an oscillating saw can be used to remove the inner part of the rib in a first step. However, the outer flange of the rib has to be removed from the wing shell and the spar only by milling or sanding. Special attention must be paid not to damage the structure of the wing shell or the wing spar. The wing shell is reinforced in the region of the root ribs by unidirectional glass fabric in flight direction which must not be damaged under any circumstances! The wing spar is reinforced outside of the wing shell by a winding which ends directly at the rib. When the rib is removed the winding must not be damaged under any circumstances!

Note:

The original wooden rib of the ASW 15 is reinforced at the bonding flange with glass fabric. These glass layers (2x 92140 & 1x 92110) must be removed completely from the wing shell and the spar if the bonding of the rib is damaged or the space is required for the new rib.



Starting removal of the wooden rib by milling starting from the opening of the aileron control rod.



Wooden rib removed from the wing. The flanges are still in the wing.



Detail on the bonding of the old wooden rib to the spar. The glass fabrics reinforcing the original rib flanges can be seen. These fabrics including the adhesive between the fabrics and the wing structure must be fully removed.



Totally removed old rearward wooden rib.



Details on the removed rib in the region of the trailing edge. It is sufficient to remove the old adhesive so that a pin with 6 mm diameter can be placed between the wing shells.



In the region of the lift-pin bushings the wing shell is reinforced with wedge-shaped pine bars. The end of these bars has to be shorted in spanwidth direction so that the new rib can be inserted wide enough in the wing shell. The front surface of the bars should be perpendicular to the rib plane (see point 3.).



Detail of the removed rib in the region of the wing spar. On the right part of the picture the ending of the winging can be seen. This end is directly at the beginning of the old wooden rib.



Fully removed old front wooden rib.



Detail on the removed front wooden rib in the region of the leading edge. In addition to the reinforcing pin bars behind the lift-pin bushings there are further bars at the leading edge which were used to bond the two wing shells. These bars have to be shortened as well up to the required depth.

3. Adapt the new rib

The new ribs are delivered without a drill for the lift-pin bushing and with flanges longer than required. At the first step it has to be checked that the new ribs fit into the opening of the wing to have enough clearance to the wing shell and the spar. If required, additional clearance has to be established in the region of the trailing edge. If the general fit of the rib is ensured it will have to be checked that the pine bars behind the lift-pin bushings are short enough. The same applies to the support bars at the leading-edge bonding. In addition, the flange of the rib to the spar has to be shortened so that the flange is flush with the end of the winding of the spar. All other flanges can initially be left unmachined.

The correct fit of the rib is established when the plane of the rib is parallel to the wing-fuselage separation joint and the pedestal for the lift-pin bushing has about 2 mm clearance to the flange of the joint from step 1. If the correct fit is ensured the drill for the lift-pin bushing will have to be inserted. This is done using the joint from step 1. Due to the missing bushing a 2 mm thick washer has to be inserted between the rib and the jig. Prior to drilling the hole, the rib must be temporarily fixed. It is sufficient to drill the hole 1-2 cm deep under these conditions. If the drilling position and alignment in the rib is fixed the final drilling can be performed with the rib taken from the wing. The final drill needs 21 mm (0.827 in.) diameter and a depth of 36 mm (1.417 in.).

Depending on the position of the lift-pin bushings in the rib it can be required to remove the flange of the rib so that a proper fit of the bushing flange on the pedestal of the rib is ensured.



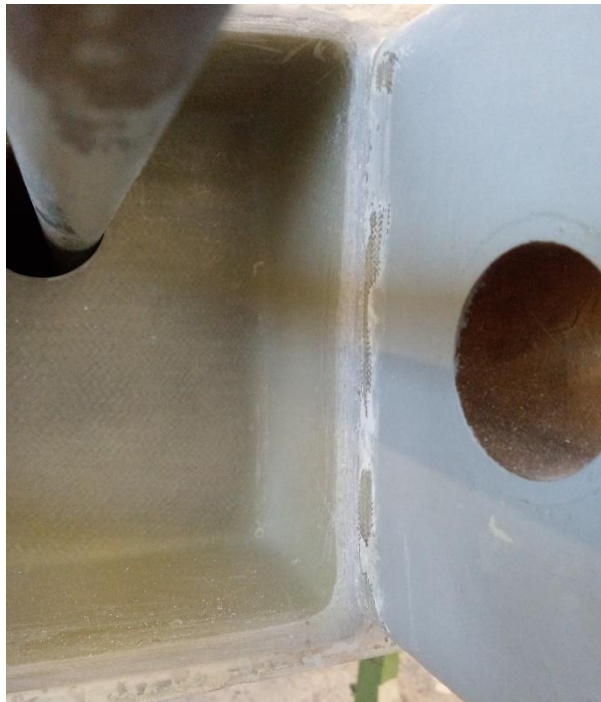
4. Bonding of the new rib

For the bonding of the rib into the wing the lift-pin bushing is placed without adhesive in the drill at the rib. If required, thin tape can be wound around the bushing to adjust the clearance of the bushing in the drill. If the bushing is properly inserted to the rib (be aware of the correct fit of the flange) the jig from step 1 can be used to ensure the correct position of the rib during bonding. At the region of the wing spar, it should be checked that the rib flange is flush with the spar winding.

The new ribs are bonded to the wing structure using the adhesive mixture which is defined in the introduction. The usual procedures for handling structural bonds must be observed. The adhesive mixture should be applied on the rib and the wing. Subsequently the rib is slid into the opening of the wing. Through the openings at the rib surplus adhesive can be removed at the inner side.



Finally bonded new GFRP rib.



Details of the contact between rib flange und spar winding.

5. Bonding of the lift-pin bushings

When the bonding of the rib is hardened the jig and the temporarily installed lift-pin bushing are removed. For the final bonding of the bushing, it is recommended to rig the aircraft to ensure a correct orientation and alignment of the bushing. Prior to the bonding process the areas at the fuselage and the root rib have to be protected by tape or special release agent for surplus adhesive mixture. Subsequent adhesive mixture as defined at the introduction is applied to the bushing and the hole in the rib and the bushing placed in the rib. Surplus resin escaping from the hole has to be removed directly. Finally, the aircraft is carefully rigged so that there is only minor movement of the bushing that is to be bonded. It is recommended to use adjustable supports during rigging to protect from unintended motion of the wings. In addition, the region of the root rib should be supported so that the contour of the wing are flush with the contour of the fuselage.



Final front GFRP rib prior to preserving.



Final rearward GFRP rib prior to preserving.

6. Cutting and preserving

In the last working step, the protruding flanges of the rib must be shortened to the edge of the wing shell. Finally, all open GFRP edges (cutting and grinding edges) have to be preserved with epoxy resin.

7. Cutting and preserving

All repair points must be tempered in accordance with the information in the repair manual.

Notes:

The exchange of the wing root ribs has to be considered as a complex maintenance task regarding aviation law. The respective regulations must be applied.

Poppenhausen, 28.06.2021

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