

SERVICE BULLETIN

AA-SB-57-001

Wing Repair – Replacement of Spar Caps

1. PLANNING INFORMATION

1.1. **APPLICABILITY**

R2000 series aircraft. Specific serial numbers as authorised by Alpha Aviation Ltd.

1.2. **CONCURRENT REQUIREMENTS**

Nil

1.3. **REASON**

Severe corrosion has been found on LH Wing Spar Cap Angles P/N 60-57-121-001 (upper) and/or P/N 60-57-123-001 (lower), and/or RH Wing Spar Cap angles P/N 60-57-122-001 (upper) and/or P/N 60-57-124-001 (lower) of some aircraft.

1.4. **DESCRIPTION**

This Service Bulletin provides descriptive data for the replacement of spar cap angles on affected wings.

1.5. **COMPLIANCE**

Carry out repairs described in section 2 – Accomplishment Instructions.
Make a log book entry stating compliance with this Service Bulletin.

1.6. **APPROVAL**

By delegated authority (Alpha Aviation Concept Ltd, DO75992) COA AA/60/1109

1.7. **WEIGHT AND BALANCE**

Negligible effect on weight or balance

1.8. **REFERENCES**

R2000 Service Manual.
Drawing 60-57-901 'Repair Wing Spar Assembly R2000'
Drawing 60-57-121 'Upper Spar Cap LH'
Drawing 60-57-123 'Lower Spar Cap LH'
Drawing 60-57-122 'Upper Spar Cap RH'
Drawing 60-57-124 'Lower Spar Cap RH'

1.9. **OTHER PUBLICATIONS AFFECTED**

Nil

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2. ACCOMPLISHMENT INSTRUCTIONS

2.1. Preparation

1. Remove the wing from aircraft in accordance with the R2000 Service Manual paragraph 4.3.3.1.
2. Prepare a suitable work area. A sturdy flat table may suffice, or a holding jig could be constructed if required to make the job easier to accomplish. A holding jig could consist of wooden frames shaped to accept the wing leading edge, with padding to protect the skin against damage. A steel support to the wing attach points may be employed to further support the wing.
3. Remove upper aft wing skin. Remove sufficient rivets from upper leading edge skin to allow the skin to be peeled back to gain access to the spar front. Inspect the interior of the wing for corrosion to ensure all structurally significant corrosion is contained by the components to be replaced.
4. Remove the spar cap angles. This is accomplished by the following steps: Remove the locking collars from the swage pins through the spar cap angles (upper, lower or both); With a punch and small hammer, carefully tap the swage pins out. Also remove rivets attaching skin to spar cap in the case of the lower spar. The spar cap angles can now be withdrawn from the wing by pulling them inboard. NOTE: only one cap to be removed at a time and in the sequence in 2.2 & 2.3 below.
5. Prepare the Replacement Spar Cap Angles for installation. Inspect Spar Cap Angles to conform to the appropriate spar cap drawing, with NO HOLES drilled in the spar cap. The angles can be worked by hand using the removed spar cap angles as template to achieve conformity with the drawing. If work exposed bare metal, the exposed metal must be treated with ALODINE and a good two pot primer.
6. General comment about swarf control: This repair scheme requires holes to be opened up and reamed, followed by the installation of an interference fit X bolt, before reaming the next hole. Because of this process, there is no opportunity to remove the spar cap angle and clean any swarf that may have become trapped between the components. Firm clamping adjacent to the hole should be successful in preventing swarf entrapment during the drill/reaming process. If this is not successful the alternative (preferred) method will need to be followed: This method uses Epoxy Adhesive (Aerospace grade Araldite or Nuplex K138) to bond the layers being drilled together after the holes have been transferred at standard size and the parts have been cleaned. Once the parts are bonded together (utilising clamping and standard temporary bolts) no swarf can be trapped, and opening and reaming of holes can proceed without further problem. This method is preferred, as the bonding also provides good sealing of the mating surfaces and would prevent moisture ingress and corrosion.
7. Fastener Torque Settings. All replacement fasteners shall be torqued to the figure found in Table 2-6 of the R2000 Service Manual.

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2.2. Lower Spar Cap Angle Installation

1. Place the lower spar cap angle(s) P/N 60-57-123-001 (LH) and/or 60-57-124-001 (RH) in position, and hold in place with as many clamps as possible.
2. Turn the wing over and drill off the lower spar angle skin rivet holes from the skin side. Care is required to prevent damage to the holes in the skin.
3. Unclamp and clean out drill swarf. Place clecos or other temporary fasteners through the skin to lower spar cap angle holes to hold the angle aligned with the skin. Re-clamp the angle to the spar web using as many clamps as required and suitable holding fixtures, to ensure proper positioning during the following drilling operation.
4. Use a drill guide located in the spar web holes and drill pilot holes through the spar cap. Refer to drawing 60-57-901 for fastener sizes and using a drill guide block drill the holes to just below standard size for the fasteners specified on the drawing and then ream to standard size. Remove the spar cap angle and clean all swarf from the wing and spar angle.
5. Return the lower spar cap angle to its position in the wing. Use standard size close tolerance bolts as temporary fasteners (or stepped pins), to keep the spar cap angle in position relative to the spar web and use clecos or similar temporary fasteners to secure the skin to the cap. Supplement with clamps as required either side of the working area.
6. Install solid rivets MS20470-AD5 with length as required through the bottom skins through the spar cap angle.
7. Refer to swarf control in 2.1.6 above and ream holes in line through the lower spar cap angle and the spar assembly to dimensions suitable for the fasteners specified on drawing 60-57-901 being the X bolt sizes .2631 to .2641 or .2006 to .2016 respectively. Install each bolt as soon as the hole is reamed, before reaming the next hole. Install NAS6204-X and NAS6203-X oversize bolts for over sized holes. In all cases install with washer NAS1587-4C and NAS1587-3C respectively under the bolt head to clear radius under bolt head. Up to 2 NAS1149G0363P or NAS1149G0463 washers may be used under the nut to adjust grip. Ensure no part of the structure bears on the bolt thread. (Open up washer holes the minimum required to ensure fit with bolt where washer do not clear bolt diameter. Caution - make sure the countersink is still sufficient to ensure clearance on the bolt head radius.) Do not ream or install bolts through the Wing Root Reinforcement Plates P/N 60-57-145-001 and 60-57-146-001 yet. These plates may be required to be replaced, but they can be used as initial drilling guides while in place.

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2.3. Upper Spar Cap Angle Installation

1. Now move to the installation of the upper spar cap angles, P/N 60-57-121-001 (LH) and/or 60-57-122-001 (RH). Place the wing in the holding fixture and ensure there is no twist present in the wing. Use clamps if required.
2. Place the upper spar cap angle loosely in position. Make up a number of 1" wide 6" long, 0.040" thick aluminium strips – one for each rib. The purpose of these strips is to represent the upper skin while the actual skin is removed or peeled away to gain access. Transfer the holes in the ribs to these strips and cleco them in place over the top of the upper spar cap angle, attached to both the nose and tail ribs by at least 2 holes. Now move the spar cap angle up so that it touches these strips along the length of the wing and clamp in place using as many clamps as possible.
3. Use a drill guide located in the spar web holes and drill pilot holes through the spar cap. Using a drill guide block drill the holes to just below standard size specified on the drawing and then ream to standard size to suit standard size fasteners as specified on drawing 60-57-901. Remove the spar cap angle and clean all swarf from the wing and spar angle.
4. Return the upper spar cap angle to its position in the wing. For the installation of oversize X-bolts, standard size bolts can be used temporarily to locate the spar cap angle to the web prior to drilling and reaming the holes to the oversize dimension. Supplement with clamps as required.
5. Refer to swarf control in 2.1.6 above and ream holes in line through the upper spar cap angle and the spar assembly. The X bolt sizes are .2631 to .2641 or .2006 to .2016 respectively. Install each bolt as soon as the hole is reamed, before reaming the next hole. Install NAS6204-X and NAS6203-X oversize bolts of the appropriate length for oversized holes. (Bolt lengths specified on drawing 60-57-901 were determined from the latest design data available, but require verification on assembly.) In all cases install with washer NAS1587-4C and NAS1587-3C respectively under the bolt head to clear radius under bolt head. Up to 2 NAS1149G0363P or NAS1149G0463 washers may be used under the nut to adjust grip. Ensure no part of the structure bears on the bolt thread. Do not ream or install bolts through the Wing Root Reinforcements P/N 60-57-145-001 and 60-57-146-001 yet. These plates may be required to be replaced, but they can be used as drilling guides while in place.

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2.4. Wing Root Reinforcement Inspection/Replacement

1. Inspect existing Wing Root Reinforcements P/N 60-57-145-001 and 60-57-146-001 IAW R2000 Service Manual Section 3.3.9 – Wing 3500 hr inspection. If any cracking or elongation of the plates is found or wing attachment bolt holes are damaged, replace the wing Root Reinforcements by proceeding with step 2. If the Wing Root Reinforcements are serviceable, they may remain in place, in which case steps 2 to 5 may be skipped. (Depending on how many hours the wing has been in service, it may be an economical decision to replace the wing root reinforcements regardless.)
2. Remove existing Wing Root Reinforcements P/N 60-57-145-001 and 60-57-146-001 from the wing assemblies. Clean and put aside to be used as drill jigs to drill off the holes in the new Wing Root Reinforcements.
3. Prepare new Wing Root Reinforcements P/N 60-57-145-001UD and 60-57-146-001UD for installation by transferring the holes accurately from the removed parts to the new parts. Use drill guides, and drill sizes ensuring the holes are no larger than standard size, to allow the holes to be opened and reamed in assembly to first oversize for NAS6204-X bolts.
4. Place the Wing Root Reinforcements in place and clamp in position with standard size bolts.
5. Drill and ream holes one at a time and install NAS 6204-X oversize bolts with NAS1587-4C washers under the bolt heads. (Washers may require opening up slightly to clear bolt diameter.)
6. The 6 main wing attachment bolts are to be assessed during wing installation.(see 2.6 below)

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2.5. Closing Wing

1. Rivet the front wing skin back down onto the forward ribs with MS20470-AD5 solid rivets for ribs 1 through 6 and MS20470-AD4 solid rivets for ribs 7 through 10.
2. Taking precautions not to damage the skins, transfer the holes from the upper skin to the upper spar cap angle. (Drill Φ 4.1 mm holes. This operation may be conducted with the rear upper skin clecoed in position if required to support the forward upper skin.)
3. Carry out all required inspection of the wing internals and apply corrosion proofing as appropriate before closing the rear panel.
4. Return the rear upper skin to the wing and rivet front skin and rear skin to the spar top angle with MS20470-AD5 solid rivets.
5. Rivet the top skins to the ribs using CR3213-5 Cherrymax rivets (ribs 1 through 6) and CR3213-4 Cherrymax rivets (ribs 7 through 10). Alternative Intermax CR4193-4 and CR4193-5 may be used.
6. Complete riveting of the upper rear skin trailing edge with Cherrymax CR3213-4 (item 4) or alternative Intermax CR4193-4 rivets (item 5) in figure 2.5.1 below:

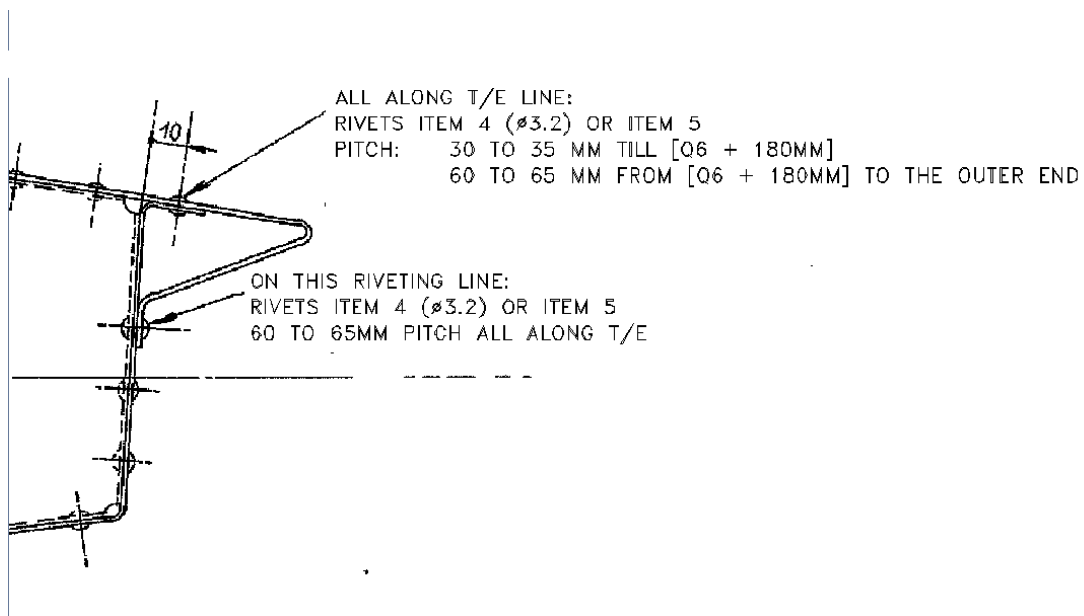


Figure 2.5.1: Riveting at trailing edge.

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2.6. Wing Installation

1. Install the wing IAW Alpha R2000 Service Manual paragraph 4.3.3.2.
2. Wing attach bolt holes should be a good close fit, but are not required to be an interference fit.
3. If any of the attach holes are damaged and need to be oversized, the affected hole should be reamed with wing in place while all the other wing attachment bolts are in position.
4. Maximum allowed oversize for wing attachment bolts is 10.3mm.

2.7. FASTENER SUBSTITUTION

1. The following table may be used to select alternate fasteners from those specified in drawing 60-57-901 when assembling the wing spar assembly.
2. Fastener holes must be reamed to produce a 0.0002" – 0.0005" [0.005mm – 0.012mm] interference fit.
3. Original (standard size) fasteners may be used only if the existing hole diameters will produce the fit specified above.

Original Fastener	Alternate Fastener	Alternate Collar
Standard Hole – 0.190	NAS1466-*	-
Standard Hole – 0.250	NAS1468-*	-
NAS6203-*X	HL62-6-* HL62PB6*	HL79, HL84
NAS6204-*X	HL62-8-* HL62PB-8-*	HL79, HL84

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3. FEED BACK

Maintenance organisations are requested to provide feedback on the accuracy of the data and repair process provided. Please also provide feedback on any problems encountered and any suggested improvements to this repair scheme. Please use Alpha form DES 22 (Design Feedback Form) for this purpose. A copy of the form and mailing details can be found in the Service Manual (latest revision) or request the form from Alpha Aviation. (Feedback by e-mail to tech.support@alphaaviation.co.nz will also be welcomed.)

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