Service Instruction SI-0018

Technical Portions FAA Approved

Epic Aircraft, LLC ◆ 22590 Nelson Road ◆ Bend OR 97701
Phone: 541-318-8849 ◆ Fax: 541-382-5125 ◆ Web: www.epicaircraft.com

Subject: K004 Rudder Trailing Edge Damage

ATA-Code: 27-20

Labor: 6.0 **Effectivity:** K004

Affected Model(s): E1000 **Due:** Before the next flight

Compliance: Recommended ☐ Mandatory ☒ **Recurrence:** No

1 BACKGROUND AND PURPOSE:

During the Annual Inspection of K004, a crack approximately 0.7” long was found in the rudder trailing edge bondline 2” below the lower Rudder Static Wick location. Exploration of this crack revealed a 24” void between the Left Rudder Skin and bonded adhesive as shown in Figure 2 and Figure 3. Additionally, inspection of the Rudder hinge line on the Fuselage Vertical Fin Spar showed a misalignment of the hinge components. Hinge misalignment condition and position can be found in Figure 4.

This Service Instruction gives procedures to repair the conditions described above.

2 REFERENCES:

Epic E1000 Airframe Maintenance Manual, PN SK05000000

3 WARRANTY:

Parts and labor costs for this Service Instruction are at the owner’s expense.

4 TOOLS:

No.	Description	Qty	Epic Aircraft Supplied	Customer Supplied
1.	Common Hand Tools	A/R	☐	☒
2.	Thermocouples J or K Type	1	☐	☒
3.	Portable Bonding and repair controller and heaters	1	☐	☒

5 PARTS/MATERIALS:

No.	Part Number	Description	Qty	Epic Aircraft Supplied	Customer Supplied
1.	Sandpaper	Aluminum Oxide, 80-220 Grit	A/R	☐	☒
2.	Scotch-Brite	General Purpose Pad 7447	A/R	☐	☒

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3.	White Cotton Flock - W200		A/R	☐	☒
4.	Loctite EA 9360 Aero	Type 1 Bonding paste	A/R	☐	☒
5.	Imron AF740	Clearcoat	A/R	☐	☒
6.	Imron AF700, color Epic White 4192016	Basecoat	A/R	☐	☒
7.	8989S	Accelerator	A/R	☐	☒
8.	13100S	Activator	A/R	☐	☒
9.	-	Isopropyl Alcohol, 99%	A/R	☐	☒
10.	Hermitex 300 or Kimtech P2 or DuPont Sontara AC9165A	Wiping Cloth	A/R	☐	☒
11.	-	Paper, non-lined or plastic mixing cups	A/R	☐	☒
12.	1220S	Primer	A/R	☐	☒
13.	-	Stir sticks	A/R	☐	☒
14.	416	Metal Glaze	A/R	☐	☒
15.	NAS1149F0316P NAS1149F0332P NAS1149F0363P	Flat Washer, 0.203 ID x 0.438 OD 0.016 – 0.063 thick	A/R	☐	☒
16.	Loctite EA 9394 Aero	Type 2 Bonding paste	A/R	☐	☒
17.	-	Mold Release Wax	A/R	☐	☒
18.	-	Teflon Tape	A/R	☐	☒

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6 INSTRUCTIONS:

1. Set the BATT 1 and BATT 2 switches to OFF.
2. Remove all external electrical power from the airplane (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 24-40).
3. Remove the rudder (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 55-40).
4. Place the rudder on a suitable work surface.
5. Remove the paint from the damaged area.
6. Carefully remove the adhesive and damaged material in the discrepant area. Adhesive removal is to extend 0.125" above and below the discrepant area until all damaged material is removed. It is acceptably to trim laminate from the trailing edge to expose the discrepant area, but do not trim past leaving 0.050” of laminate on each side of the trailing edge. See Figure 1 for material removal limits and region.

NOTE: Only remove the minimum amount of laminate required to remove the damage. Take care to avoid damaging surrounding structures during the material removal process.

During the material removal completed per step 6, a void was found between the Left Rudder Skin and Bonded Adhesive in the joint. The void is 24” long, beginning at the bottom edge of the Trim Tab Closeout ending where the bonded joint transitions to a return joggle on the Right Rudder Skin. The void was inspected both visually after removing material from the trailing edge and through the use of feeler gauges to determine depth and length. See Figure 2 and Figure 3 for void area and definition.

7. Trim the trailing edge of the rudder in the void region as needed to provide access to the bondline. It is acceptable to trim laminate from the trailing edge but do not trim past the outward facing rudder skin thickness of 0.050” on each side. See Figure 5 for material removal region.
8. Clean and surface prep the remnant adhesive and inner surface of the Left Rudder Skin along the length of the void region as follows:
    a. Wash the surface with isopropyl alcohol.
    b. Abrade the surface with 80 - 150 grit sandpaper.
    c. Remove abrading dust with a vacuum before dry-wiping the surface with a clean, dry, lint-free cloth.

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d. Final clean the surface by thoroughly wetting the surface with isopropyl alcohol then immediately wiping with a clean, dry, lint-free cloth in a single stroke. After each wipe, turn the drying cloth to a clean surface.

NOTE: It is acceptable to perform surface prep operations listed above using a stir stick with the appropriate cloth, sandpaper or alcohol wipe attached to the end.

9. Mix Loctite EA 9360 Aero bonding paste with cotton flock filler at a ratio of 8% by weight.

NOTE: Set aside a small amount of neat (not mixed with flock) EA 9360 Aero Bonding paste for use in step 10.

10. Within 25 minutes of step 9, wet out the surface of repair region using neat EA 9360 Aero Bonding paste. Apply paste in a thin layer on the remnant adhesive and exposed laminate in the repair region.
11. Within 25 min of step (10), completely fill the repair region with the bonding paste-cotton flock mix.

NOTE: Take care to apply adhesive such that no air bubbles or discontinuities are introduced to the repair region.

12. Cure as follows:
    a. Cure for 24 hours at room temperature, or
    b. Cure by applying an air temperature ramp from ambient to 95 deg F at a max rate of 3 deg per minute. Once 95 deg is reached maintain air temperature at 95 deg +/- 5 deg for 120 minutes before allowing to cool.
13. Visually inspect for defects and tap test to make sure there are no voids.
14. Final cure as follows:
    a. Apply air temperature ramp from ambient (100°F or lower) to 160±10°F at a max rate of 5°F per minute.
    b. Maintain the air temperature at 160±10°F for a minimum of 90 minutes.
    c. Cool down the air temperature to 110°F or lower at a max rate of 5°F per minute before allowing to cool.
15. Prep, prime and paint the repair (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 51-20).
16. Check the balance of the rudder (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 55-40).

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17. Remove AK53000002, Mid Rudder Horn Assembly, from its installed position on the Vertical Fin Spar by removing the (4X) AN3-11A fasteners installed at the base.
18. Using NAS1149F03(xx)P washers installed between AK53000002 and the mating surface of the Vertical Fin Spar, shim AK53000002 aft as required to achieve proper alignment of the Upper, Mid, and Bottom Rudder Horn Assemblies (AK53000001, AK53000002, and AK53000003). It is acceptable to install up to two washers at each fastener location.
19. Remove shimmed AK53000002 assembly and associated hardware before cleaning and surface prepping the mating surface of the Vertical Fin Spar as follows:
    a. Wash the surface with isopropyl alcohol.
    b. Abrade the surface with 80 - 150 grit sandpaper.
    c. Remove abrading dust with a vacuum before dry-wiping the surface with a clean, dry, lint-free cloth.
    d. Final clean the surface by thoroughly wetting the surface with isopropyl alcohol then immediately wiping with a clean, dry, lint-free cloth in a single stroke. After each wipe, turn the drying cloth to a clean surface.
20. Apply mold release wax or Teflon tape to the AN3-11A fasteners and mating surface of AK53000002.
21. Mix EA 9394 Aero bonding paste at a ratio of 100:17 by weight (Part A: Part B).
22. Within 90 minutes of step 21, apply mixed EA 9394 Aero Bonding paste to the surface prepped area from step 19 and install AK53000002 using the waxed AN3-11A fasteners shimmed with the NAS1149F03XXP washer configuration found in step 18. Acceptable to install fasteners hand tight.
23. Cure as follows:
    a. Cure for 24 hours at room temperature, or
    b. Cure by applying an air temperature ramp from ambient to 95 deg F at a max rate of 3 deg per minute. Once 95 deg is reached maintain air temperature at 95 deg +/- 5 deg for 120 minutes before allowing to cool.
24. Visually inspect for defects and tap test to make sure there are no voids.
25. Final cure as follows:
    a. Apply air temperature ramp from ambient (100°F or lower) to 160±10°F at a max rate of 5°F per minute.

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b. Maintain the air temperature at 160±10°F for a minimum of 90 minutes.

c. Cool down the air temperature to 110°F or lower at a max rate of 5°F per minute before allowing to cool.

26. Prep, prime and paint the repair region as needed (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 51-20).

27. Remove the Teflon Tape or wax from the mating surface of AK53000002 prior to re-installing to the Vertical Fin Spar over the shim. Install using (4X) NAS1149F0363P washers and (4X) AN3-11A Fasteners torqued to 20-25 in-lbs

28. Install the rudder (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 55-40).

29. Verify that the shimmed rudder meets the Wiping Gap Clearance requirements (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 27-00).

NOTE: For regions with wiping gaps under the clearance requirements of SK05000000, chapter 27-00, complete steps 30 – 31, and Counterweight Span Gap Regions with wiping gaps exceeding the requirements of SK05000000, chapter 27-00, are acceptable up to 0.796" as demonstrated in CK27000005.

30. Trim Fuselage skin trailing edge to meet wiping gap requirements. Do not reduce the distance between end of the fuselage skin and core bevel to below 0.72". Ensure smooth transition between trimmed and untrimmed regions.

31. Prep, prime and paint the repair region as needed (refer to Epic E1000 Aircraft Maintenance Manual, PN SK05000000, chapter 51-20).

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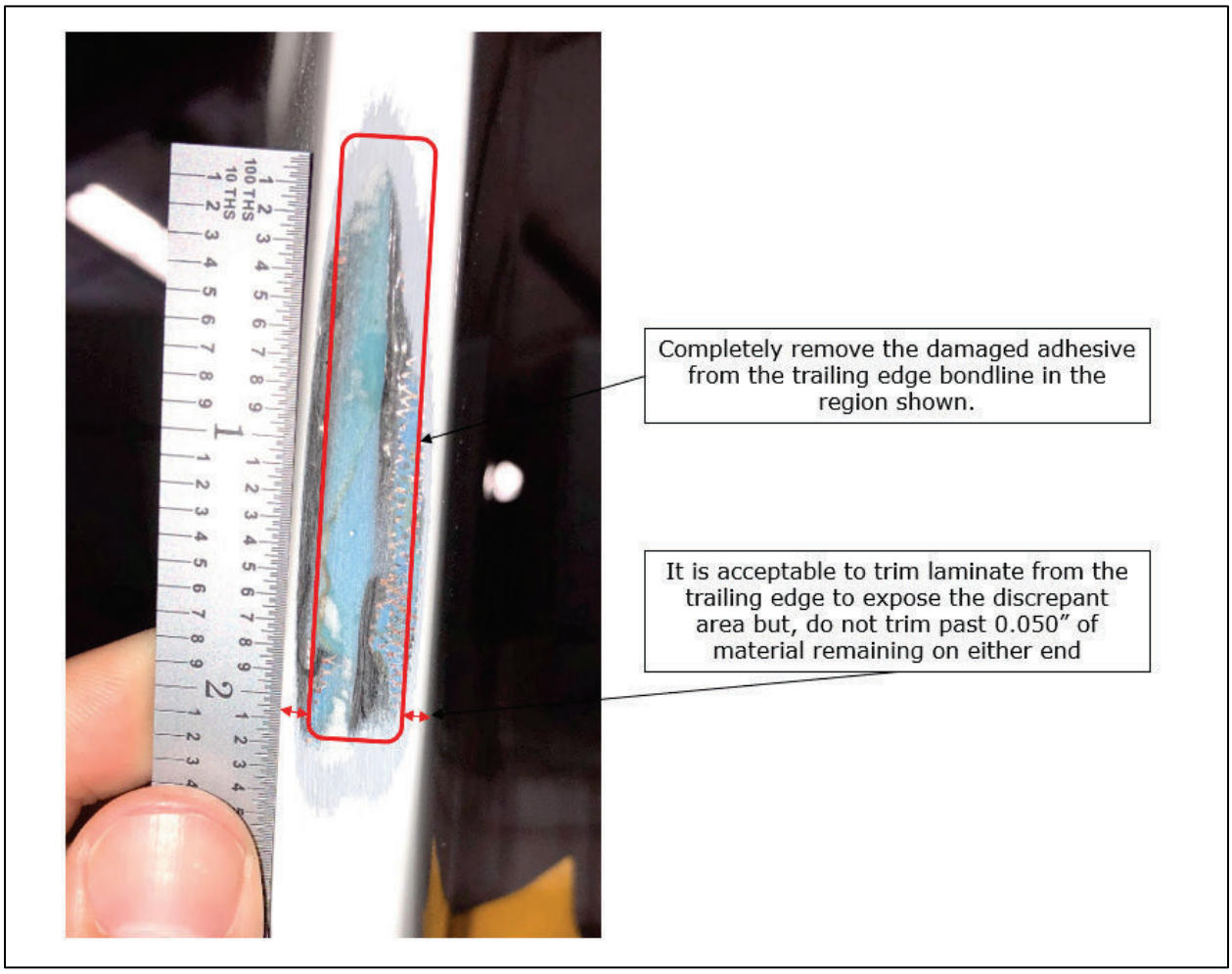

Figure 1: Step 6, Material Removal Region

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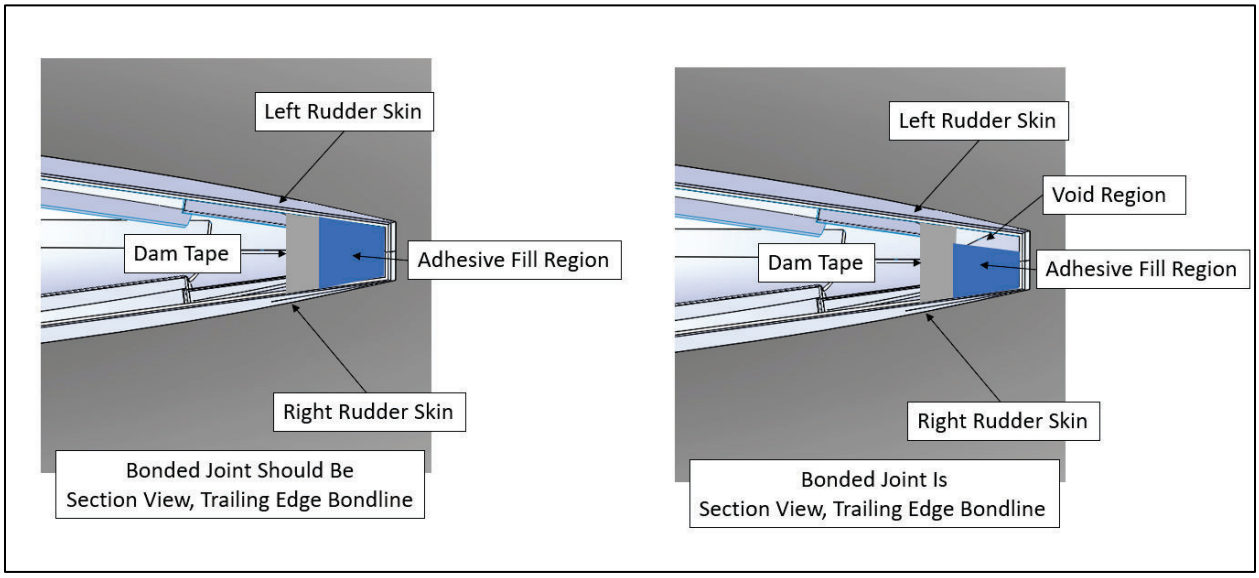

Figure 2: Bonded Joint Visualization

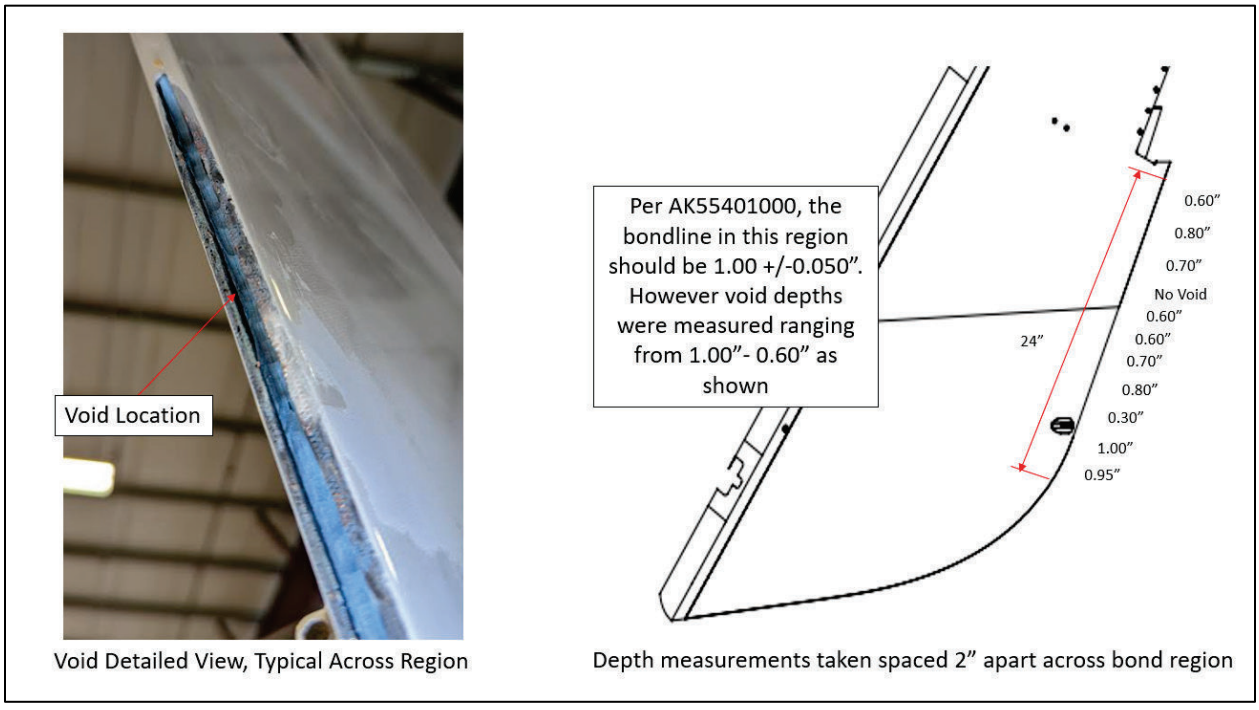

Figure 3: Void Location and Depth

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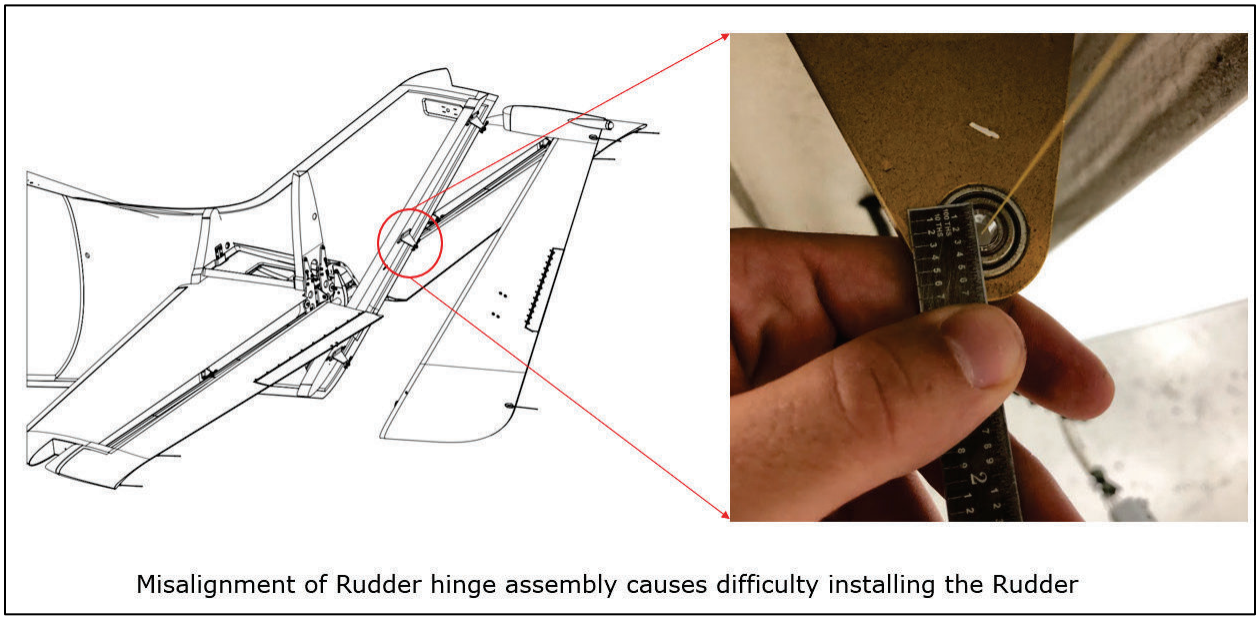
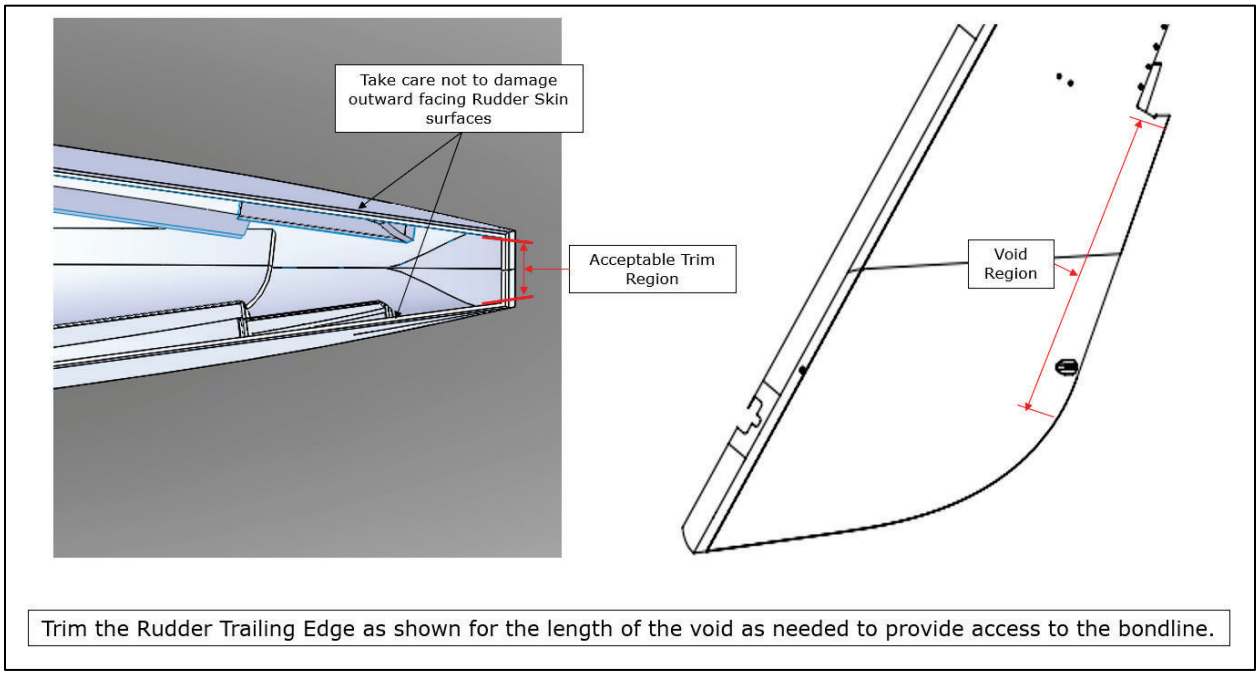


Misalignment of Rudder hinge assembly causes difficulty installing the Rudder

Figure 4: Rudder Hinge Misalignment



Trim the Rudder Trailing Edge as shown for the length of the void as needed to provide access to the bondline.

Figure 5: Step 7 Trim Region

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7 WEIGHT AND BALANCE:

Negligible

8 PUBLICATIONS AFFECTED:

N/A

9 RECORD COMPLIANCE:

Make appropriate entry in airplane maintenance records.

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Appendix A: Compliance Letter

Please complete and mail this form to Customersupport@epicaircraft.com

This is to certify that I have completed the work in accordance with the Epic Aircraft, LLC Service Instruction.

Aircraft Owner Information:
Date: _____ Aircraft Serial Number: _____ Aircraft Reg. Number: _____ Owner's Name: _____
Maintenance Entity Information
Name of Shop Performing the work: _____ Name of Person(s) Performing inspection and/or work: _____ Phone Number: _____ Email: _____