

Service Bulletin No. SB-AG-37
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 Page 1 of 12

Approval: FAA Approved

CRACKS IN HORIZONTAL STABILIZER SPAR

MODELS AFFECTED:

All models of the S2R with the Ayres metal tail using the 40087 Horizontal stabilizer assembly.

All models listed, including any serial number listed ending in D.C. (dual cockpit)

<u>MODEL</u>	<u>SERIAL NUMBERS</u>
S2R	1416R thru 2583R 5000R thru 5100R
S2R-R3S	R3S-001 thru R3S-011
S2R-R1340	R1340-001 thru R1340-032
S2R-R1820	R0820-001 thru R1820-036
S2R-T11	T11-001 thru T11-005
S2T15	T15/27-001 thru T15/27-029, -031
S2R-T34	T34/41-001 thru T34/41-204 -6000 thru -6049
S2R-T45	T45-001 thru T45-005
S2R-T65	T65-001 thru T65-017
S2RHG-T65	T65-002 thru T65-009
S2R-G5	G5-101 and G5-103
S2R-G6	G6-101 thru G6-119
S2R-G10	G10-101 thru G10-106

REASON FOR PUBLICATION:

Operators in the field have reported finding cracks in the front spar assembly while complying with a previous service bulletin concerning the vertical fin. (SB-AG-32)

The cracks originate near one or more of the holes for attaching the vertical fin attach fitting, or the fuselage attach fitting. The crack(s) initially appear as a "smile" in the lower nesting angle P/N 40354-1 in the center of the spar. If left unattached, the crack will propagate through the material stack-up, affecting the next angle/doubler P/N 40094-1, the spar web itself, and the doubler plate P/N 40200-1 on the front face of the spar. There

have been no failures reported. The metal tail installation has been continuously upgraded with a number of improvements recently. These improvements assure a longer service life. The horizontal stabilizer improvements are included in this bulletin.

COMPLIANCE: Inspection by flashlight and mirror within the next 10 hours of flight time. If no cracks are detected visually, operation may be permitted with repeat inspections at 25-hour intervals until the coming annual inspection, where teardown inspection and compliance is mandatory.

BY WHOM WORK WILL BE ACCOMPLISHED: A & P mechanic or equivalent

ESTIMATED MAN HOURS FOR COMPLIANCE: 48 hours

INSPECTION INSTRUCTION: Remove the inspection covers from the bottom center of the stabilizer. With a flashlight and mirror, inspect the front and rear stabilizer-to-fuselage attach fittings for cracks. Have a helper move the tips of the stabilizer fore and aft, as you watch the fittings for relative movement. Inspect the from spar splice doubler for visible cracks. Pay particular attention to the 6 nuts and washers along the bottom of the aft face, front spar. The most likely place to crack is just under the washer edge, at the bottom. The crack may appear as a "smile", in the aluminum nesting angle 40354-1.

If no cracks are detected, make an appropriate entry in the aircraft log book, and return the airplane to service.

ACCOMPLISHMENT INSTRUCTIONS PREFACE: Depending upon which dash number stabilizer assembly is installed, modification may be relatively easy, or somewhat more involved.

For example, stabilizer assy's 40087-60 and 40087-80 already have a steel spar splice doubler and steel nesting angles. These assemblies

are not susceptible to cracking. The aluminum parts in stabilizers with lower dash numbers, however, are more susceptible to cracking.

It is known, however, that the holes in the spar webs of the -1, -58, and -60 assy's are unlikely to exactly match the holes in the new aluminum attach fittings. Also, the -80 assy's may have oversized holes in the aluminum vertical fin fitting. See the chart on page 9 of this bulletin for rework required.

Repair parts are available to correct the discrepancies between the existing hole size, spacing and location.

The repair parts have critical hole locations predrilled. The holes are slightly undersized. When the steel doublers are clamped into place and properly centered, the fitting attach hole location is established. By drilling to the final size of .189, the aluminum web holes will be cleared out, and their proper location is established.

The aluminum vertical fin attach fittings with holes over .191 are repaired with NAS 6203 oversized bolts.

Any stabilizer assembly with a dash number of -80, -60, or -58 will have an aluminum machined fitting for the vertical stabilizer attach. The holes in the fitting may be oversized.

Any stabilizer assembly with a dash number under -80 will have fuselage attach fittings of welded steel on the front spar and the rear spar. These welded steel fittings are replaced with machined aluminum fittings.

The dash 80 stabilizer assembly already has machined aluminum fittings throughout, but the fittings may have oversized attach bolt holes.

The rear spar of all stabilizer assemblies with a dash number below -90 has an aluminum splice doubler which is replaced with a steel part.

All stabilizer assemblies except the dash 90 require the front and rear spars and all fittings to have the attach bolt holes checked for size. The holes should be .189 to .191. Any fittings with .192 or greater is to be replaced or repaired with NAS 6203 oversized bolts. Spars with oversized holes are to be repaired with new steel doublers and angles per this bulletin.

ACCOMPLISHMENTS
INSTRUCTIONS:

Remove the rudder and the vertical fin. Remove the elevators and the horizontal stabilizer. Place the horizontal stabilizer on a suitable working place, bottom side up.

Drill off the center skin panel to gain access to the front and rear spars.

For the -80 stabilizer assembly, no further teardown of the front spar will be required if the holes in the steel 40200-3 doubler are not over .191.

For the -80, check the aluminum fittings 40208-3 and 40301-7 for hole size. A hole diameter of .189 to .191 is required. If the holes are .192 or greater, the fittings and the spar must be drilled for NAS 6203 oversized bolts. The bolts are available in 1/64 and 1/32 oversizes.

The rear spar of the -80 has aluminum attach fittings, but it also has an aluminum spar splice doubler in the center. The aluminum spar doubler is to be replaced with the 40200-7 steel doubler, and the aluminum fuselage attach fittings must be checked for oversized holes.

All stabilizers assy's are to be checked very closely for installed washers to be well clear of any flange radius. Any washer close to a flange radius must be contoured to match the radius. Angular contact is not permitted.

All stabilizer assy's with a dash number under -80 require replacement of the welded steel fuselage attach fittings. The new aluminum attach fittings are manufactured by automated CNC machinery. They are held to extraordinarily close tolerances.

The welded steel fuselage attach fittings and the vertical fin attach fittings are not as precisely made. The likelihood of the new fittings precisely matching the holes where the welded steel fitting was removed, is not guaranteed.

New steel doublers, front and rear, are to be installed on the spars. These doublers are predrilled to match the aluminum fittings.

Front Spar Rework Ref View A & B, Pages 10 & 11

For unrestricted access to the front spar, drill off the leading edge center skin completely. Remove the two center leading edge ribs. Also remove the two center ribs between the front and rear spars. Remove the vertical fin attach fittings and the horizontal stabilizer attach fittings.

Drill off the 40200-1 aluminum spar doubler from the front face of the spar. Remove the two (upper and lower) 40354-1 nesting angles from the aft side of the spar. Drill out the rivets from the spar, for a distance sufficient to install the new nesting angles P.N. 40354-7.

If a crack is found in the spar web, stopdrill it with a 3/32 or 1/8 drill, if it is less than 1.5 inches long. If the crack is longer than 1.5 inches, take a picture of this area and contact the Ayres factory.

Drill the left and right skin panels loose from the front and rear spars, for a distance of 8" to 10".

Punch out all rivet remnants and clean the front and rear face of the spar.

Mark the exact center of the new steel 40200-9 doubler. The mark should exactly correspond with the main spar splice point.

The first few stabilizer assy's has the vertical fin attach fitting offset .62 inches to the right of the aircraft centerline. The fitting is to be relocated to the center, leaving 6 each open holes in the spar web. This is acceptable.

Clamp the 40200-9 doubler to the front of the spar, being sure it is centered vertically and horizontally. The center attach holes (3/16) should be in the exact vertical center of the spar web. The height of the spar web should be $3.92 \pm .03$. The dimension from either edge will be 1.96 to the center. Clamp the 40354-7 angles in place, top and bottom. The angles must be nested firmly to the spar face and flanges.

Match drill the spar webs and the nesting angles' 3/16 holes, 18 places where the fittings attach bolts go through. Use a 3/16 diameter drill, then ream the four corner holes of the pattern to .189 and bolt the doubler down and the angles temporarily.

Drill the remaining number 30 diameter holes in the doubler and the angles. Remove the parts and debur all holes.

Ream the four corner holes of the 40200-13 aft doubler to .189. Bolt it and the angles together in a stack. With the filler 40203-3, shim the top and bottom .040 full length, to account for the other angle on the spar assy. Match drill all remaining number 30 holes. Ream all remaining .189 diameter holes. Add a number 30 diameter hole at midspace between top and bottom, where the angles attach to the spar web. Disassemble and debur all holes.

Ream all the fittings 3/16 diameter holes to .189 for standard sized holes. If the fittings are over .191, ream for the next usable NAS 6203 oversized bolt. Assemble the forward doubler, angles,

filler, and aft doubler to the spar. Bolt the four corners of the stacked parts to the spar and cleco the angles in place.

Install all rivets except rib attach rivets. Use a MS 20470 AD5 if rivet holes are oversized from match drilling. Countersunk MS 20426 rivets are required eight (8) places in the center, where the vertical fin attach fitting goes.

Install the fittings on the spar. Be certain to properly orient the horizontal stabilizer fittings. The bolt head is inclined aft when the stabilizer is installed. The fitting is stamped "top" on earlier versions. Later units were symmetrical totally, and will fit either way. However, it is still possible to install with bolt hole inclination reversed. Be careful. See View B on page 11.

Rear Spar Rework Ref View C, Page 12

The rear spar rework is similar to the front spar, except there are no nesting angles to replace. The aluminum splice plate 40200-2 is replaced with a steel splice plate 40200-7.

The aft side of the spar uses a filler 40203-5 and twin doublers 40200-15 on either side of the elevator hinge bearing. Use the same procedure to locate and match drill the new parts, as was used for the front spar.

Rib Rework

The interspar ribs forward flange will have to be trimmed off to shorten the rib about $\frac{1}{4}$ ". Replace the flange with angle 52124-12.

The rib has a tooling hole that will fall in the center of the flange of the angle. Omit the center hole in the flange. Drill a hole on either side of the tooling hole, using four MS20470 AD4 rivets to attach the angle to the rib. Use the flange with no holes, on the spar.

The two center leading edge ribs will also require the spar attach flange to be cut off. Use the same angle 52124-12 to attach the rib to the spar. This is best done with the leading edge positioned back in place with clecos. The rib can then be located and the angle fitted to the rib.

Reinstall the bottom skins and leading edge skins. The vertical fin attach fitting is closed out with a new part 40309-3. Paint and touch up as required. Reinstall the horizontal stabilizer using two each bushings P/N 9040-18 at the front attach bolts, 9040-108 at the rear.

The bushings reposition the stabilizer to the proper angle of incidence without need for the original washer/bushing setup. A thin or thick (AN960-516L or -516) may be used as a shim if one of the four bushings are gapped off the fuselage attach points. This will occur occasionally if the attach points are not exactly in the same plane.

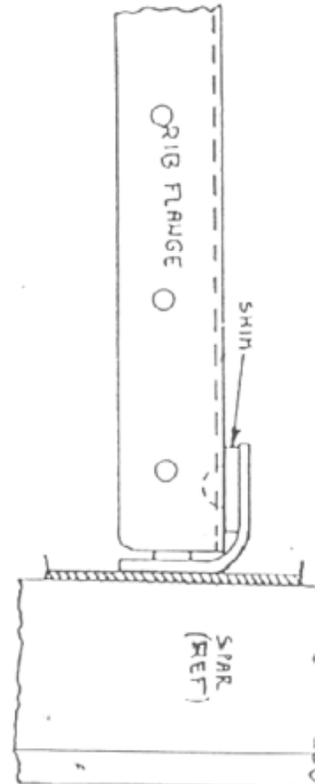
Grommet P/N MS35489-17 is used four places to seal the skin and bushings. Silicone RTV is an acceptable substitute if the holes in the skin are not concentric to the bushing.

If Service Bulletin SB-AG-32 (now AD Note No. AD-93-20-05) and SB-AG-38 have not been accomplished on the vertical fin, they should be done at this time.

RECORD COMPLIANCE:

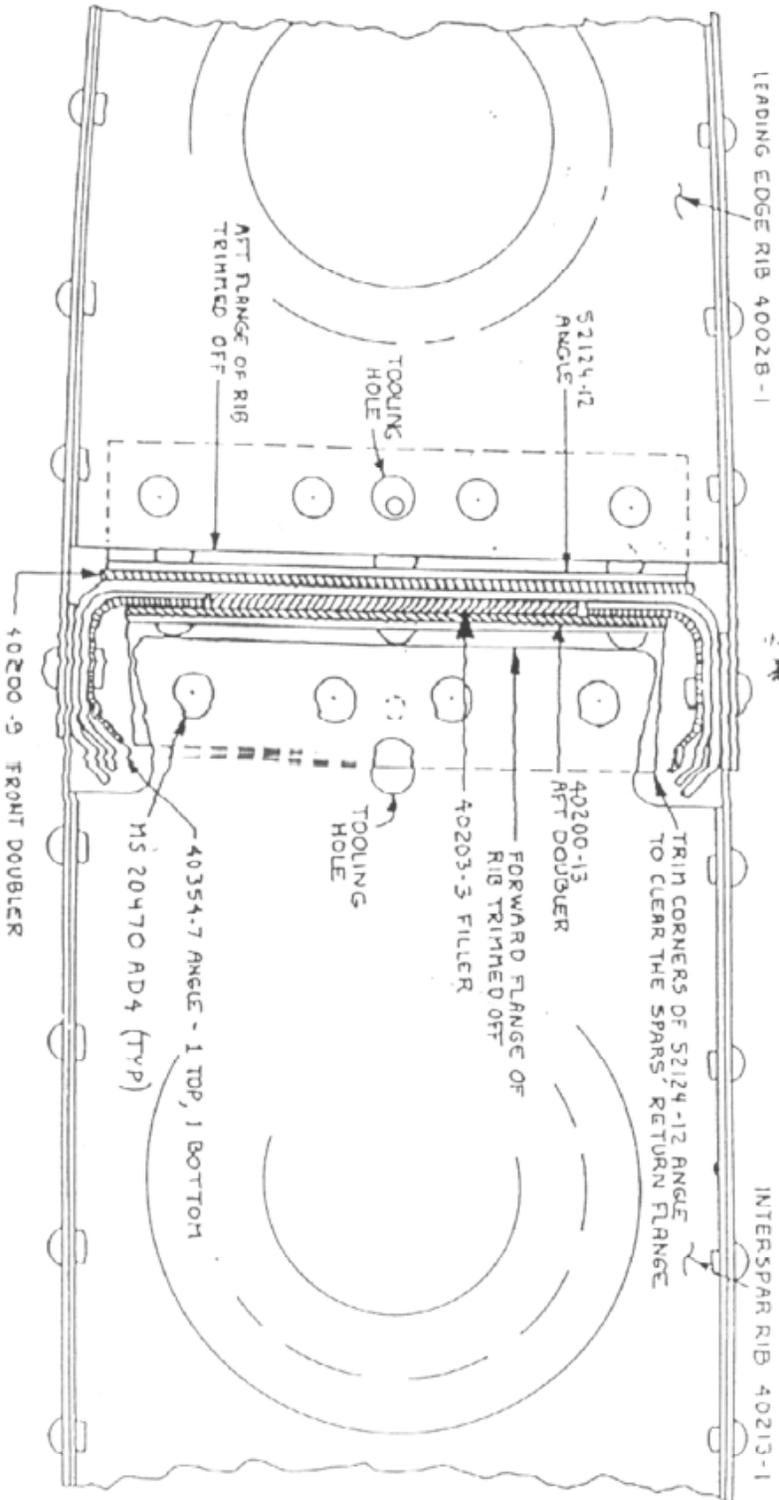
Make appropriate entry in aircraft log book.

Stabilizer Assembly Dash Number					
	-1	-58	-60	-80	-90
Front Spar Rework Required?	Yes	Yes	Yes	Yes	No
Aluminum Doubler & Angles To Be Replaced?	Front Spar Rear Spar	Front Spar Rear Spar	Rear Spar Only	Rear Spar Only	No
Steel Doubler & Angles Installed?	No	No	Front Spar Only	Front Spar Only	Yes
Aluminum Vertical Fin Attach Fitting?	No	Yes	Yes	Yes	Yes
Aluminum Fuselage Attach Fittings?	No	No	No	Yes	Yes
May Require Radius On Washers?	Yes	Yes	Yes	Yes	No
All Fittings Attach Hole Sizes To Be Checked For Oversized Condition?	Yes	Yes	Yes	Yes	No



SHIM THE S2124-12 ANGLE AS NEED TO PREVENT THE RIVETS IN THE SPAR FROM BEING IN THE FLANGE RADIUS

ATTACH FITTINGS NOT SHOWN FOR CLARITY - SEE VIEW B ON PAGE 10 FOR FITTINGS.



MODIFIED CROSS-SECTIONAL VIEW - REPAIRED FRONT SPAR VIEW A

