

# SECTION : 6 THE EMPENNAGE

## **BUILDING THE HORIZONTAL STABILIZER**

The assembly of the horizontal stab and following references are shown on DWG 3.

### **REAR SPAR ASSEMBLY**

- ❑ Use a file or Scotchbrite wheel to "break" the edges of the HS-609PP (See Sec E-E). Lay the HS-609PP rear spar reinforcement bars inside the HS-603PP spar channels and check to see that the faces rest against one another when the holes are aligned. If the bend of the channel tends to lift the edge of the bar, use a coarse Vixen file to round the edge of HS-609PP to fit. Round the ends of the HS-609PP bars as shown in Rear View.
- ❑ Smooth the edges and surfaces of the HS-609PPs to a satin finish equivalent to that left by 400 grit wet/dry sandpaper, removing all the milling and file marks (See "Edge Finishing", Section 5B).
- ❑ The pre-punched holes used to attach HS-603PP to HS-609PP are slightly undersized, and must be "final drilled" to the correct size. Cleco and drill every second or third hole, drill #30, then move the clecoes and drill #30 all the remaining holes.
- ❑ Carefully locate the holes that attach HS-708 to the rear spar assembly (it is the eighth hole from the end of HS-609PP) and enlarge it to #19 (See Rear View).
- ❑ Cleco the HS-412PP and HS-413PP elevator hinge brackets to the rear spar assembly and run a #30 drill through all the holes.
- ❑ There are two HS-411PP brackets, but only HS-411BPP is pre-punched for the VA-146 attach holes (See Exploded Isometric View). Clamp HS-411APP and HS-411BPP around the VA-146 bearing and cleco the assembly to the spar.
- ❑ Using HS-411BPP as a drill guide match drill and cleco the aft four VA-146 attach holes.
- ❑ Remove the assembly from the spar and match drill the forward two VA-146 attach holes.
- ❑ Deburr the parts, prime VA-146 if desired, then rivet them together. This sort of one at a time priming makes having a spray can of Zinc Chromate or Mar-Hyde nice.
- ❑ Cleco the HS-411 assembly back to the spar. Drill/enlarge the bolt holes that will attach the HS-411 assembly to the spar to #12.
- ❑ Mark all the parts in the rear spar assembly so they can be returned to their previous positions. Use a "Sharpie" pen or equivalent for all marks on aluminum, but in this case the ink will be lost if you clean the parts for priming. Despite earlier admonitions about scribing or scratching aluminum, it is permissible to use a vibrating pencil or a system of light punch marks to make identifying marks that will be visible after priming.

### **FRONT SPAR ASSEMBLY**

- ❑ Place the two HS-702 front spar channels on a work table, end to end, with the flanges facing down. Cleco HS-810-1 reinforcement angle and HS-814-1 splice angle to the two HS-702 spar channels.
- ❑ Drill/match drill all the holes inboard of the HS-404/HS-405 rib attach points (See View A-A). DO NOT drill the holes that will attach the HS-404 and HS-405 ribs or the holes outboard of the bend line. The holes outboard of the bends will be drilled later, after the bends are made.

- ❑ Remove HS-810-1 and HS-814-1 from the two HS-702 spar channels. Taper the ends of HS-810-1 and HS-814-1 (See HS-810-1/HS-814-1 Taper Detail).
- ❑ Bend the outboard ends of HS-810-1 and HS-814-1 (See View B-B). Clamp the aluminum angle between wood blocks in a vise and bend with a mallet. Use a simple cardboard template to check the angle.
- ❑ Lay the spar on the workbench with the flanges facing up and mark the bend line on the spar.
- ❑ Bend the tab as shown in View B-B using a hand seamer or blocks of wood.
- ❑ Refer to View A-A for the rivet pattern at the center of the front spar. Note that the center four rivets are AN426AD4 rivets with the flush heads aft. Dimple HS-702 and countersink HS-810-1 and HS-814-1 (See "Countersinking", Section 5E).

## **PREPARING THE RIBS**

- ❑ Notch the aft end of the HS-404 ribs to fit around HS-814-1 and HS-810-1 (See HS-404 Trim Detail). Make sure to make one left and one right.
- ❑ Prepare the HS-404, HS-405, HS-706, HS-707 and HS-708 ribs (See "Fluting and Straightening Ribs and Bulkheads" and "Edge Finishing", Section 5N & 5B). Since the location of the HS-801PP attach holes on HS-404 and HS-405 are as of yet unknown; do not flute these ribs now.

## **DRILLING THE HORIZONTAL STABILIZER**

- ❑ Choose which ribs will be used on the right and which will be used on the left then mark them.
- ❑ Using the dimensions given in SEC D-D, mark the hole locations on the forward side of the forward flange of HS-405. These holes attach HS-405 to the forward spar assembly and HS-404. Make a light mark with a center punch to keep the drill bit from wandering then pilot drill the holes to #40. Note that the upper most attach hole is not centered on HS-710. Position this hole as shown to ensure proper edge distance on HS-405.
- ❑ Select the left side HS-702, HS-603PP, HS-706, HS-707 and HS-708 and cleco together (See Plan View and Exploded Isometric View).
- ❑ Drill all rib to spar attach holes to #30 (except the HS-708 to HS-603PP holes).
- ❑ Un-cleco, deburr holes, clean out chips and re-cleco.
- ❑ Cleco on the HS-801PP skin.
- ❑ Enlarge the HS-708 to HS-603PP holes to #19.
- ❑ Slip the HS-404 and 405 ribs in to place and mark the approximate hole locations with a pen using the holes in the skin as a guide.
- ❑ Remove HS-404 and 405 and prepare (See "Fluting and Straightening Ribs and Bulkheads", Section 5N ). Center the flutes approximately between the pen marks.
- ❑ Mark a centerline on the HS-404 and HS-405 flanges.
- ❑ Align the marked flange centerline of HS-404 and HS-405 with the holes in the skin then clamp them in place.
- ❑ Drill and cleco the aft flange of HS-405 to HS-603, using the holes in HS-603 as a drill guide. Remove HS-405, clean out any chips. Reinstall HS-405 by first clecoing the aft flange, then clamping the top and bottom flanges to HS-801PP.

- ❑ Beginning at the rear spar and working forward drill HS-601PP to HS-405 attach holes, using HS-801PP as a drill guide.
- ❑ Be sure that HS-702 fits tightly to the front flange of HS-405. Using HS-801PP as a drill guide, drill HS-801PP to HS-702. Work from outboard to inboard.
- ❑ Cleco HS-710 and HS-814-1 to HS-702.
- ❑ Be sure that the front flange of HS-405, HS-702, HS-810-1, HS-814-1 and the aft flange of HS-404 are pulled up tight. Re-clamp the upper and lower flanges of HS-404 to HS-801PP. Drill the HS-405 to HS-702 to HS-810-1 or HS-814-1 to HS-404 inboard rib attach holes. Use the holes previously pilot drilled to #40 in the forward flange of HS-405 as a drill guide (See SEC D-D). It is best to use an angle drill for this step, but a long drill bit will also work.
- ❑ Drill to final size or matchdrill all the remaining holes attaching the HS-801PP skin. The suggested drilling sequence starts at the intersection of the HS-708 center rib and the rear spar and proceeds both up along the rib and outward toward the tip. Put clecoes in every second or third hole as you drill them.
- ❑ Remove the skin and drill the outboard most holes on HS-814-1 and HS-810-1. Remove HS-810-1 and HS-814-1.
- ❑ Repeat the above steps for the right side.

## **PREPARING THE HORIZONTAL STABILIZER PARTS FOR ASSEMBLY**

- ❑ Mark and disassemble all parts.
- ❑ Deburr all the holes in both the skin and the skeleton (See "Hole Deburring", Section 5B).
- ❑ Dimple the understructure using a pneumatic or hand squeezer. Dimple the rivet holes in the skins using a C-frame dimpling tool (See Section 3).
- ❑ Smooth the edges of the parts (See "Edge Finishing", Section 5B).
- ❑ Prime all parts as required (See "Priming", Section 5A). The HS-609PP rear spar reinforcement bars, HS-810-1 reinforcement angle and HS-814-1 splice angle are not made of Alclad material, so before riveting, they must be primed.

## **RIVETING THE HORIZONTAL STABILIZER**

- ❑ Locate the rivet holes in the rear spar that will attach the HS-706, HS-708 and HS-405 ribs and the HS-412PP hinge brackets. Put tape over them to prevent accidentally riveting these holes before the ribs are attached.
- ❑ Rivet the HS-609PP bars to the HS-603PP spar channels. This can be accomplished with either a gun, pneumatic or hand squeezer. You may find it takes a bit of "grunt" to set -4 rivets with a hand squeezer.
- ❑ Rivet the HS-412PP and HS-413PP hinge brackets to the spar.
- ❑ Bolt the HS-411PP center bearing to the spar (See Torque Value Chart, Section 5).
- ❑ Rivet HS-810-1 and HS-814-1 to the HS-702 front spars. Remember the flush rivets in the center of the assembly (See View A-A).
- ❑ Rivet HS-404 and HS-405 to the front spar assembly. The ribs may be gently flexed out of the way to allow better access during riveting.
- ❑ Lay the HS-801PP skin marked for the left side down on a clean surface. Use foam padding if desired.