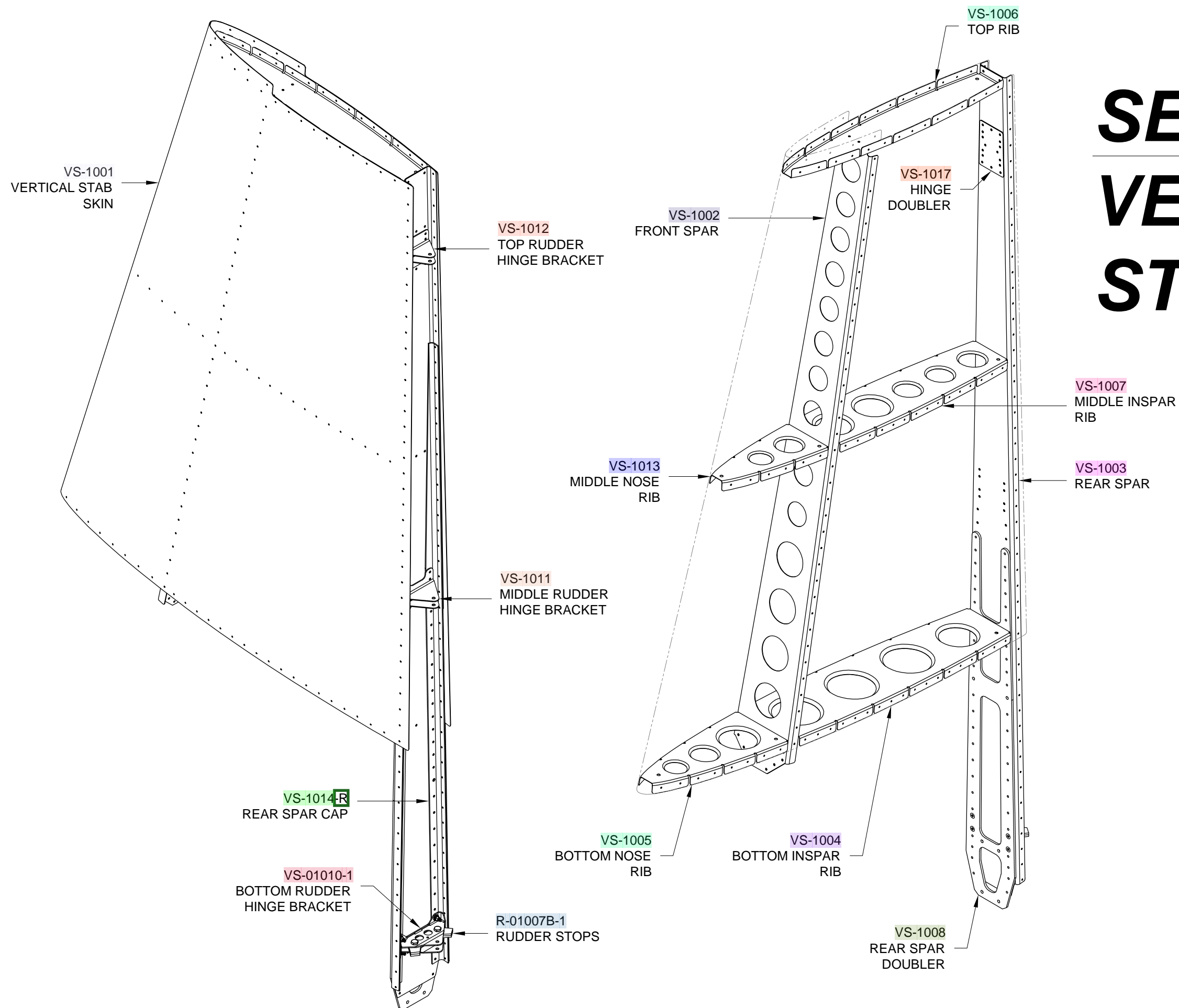


# SECTION 6: VERTICAL STABILIZER





Step 1: Trim flange material (shaded areas) from opposite ends of the two VS-1014 Rear Spar Caps using the dimensions (which apply to both spar caps) in Figure 1. Make sure to trim the material from the longer of the two flanges. (When marking the parts for trimming, clamp them to a table or back to back to remove the bow in the parts.) Once trimmed the spar caps become dedicated left and right parts (VS-1014-L and VS-1014-R respectively) as labeled in the figure. Deburr (Section 5B) the edges of both spar caps to prevent them from scratching mating parts.

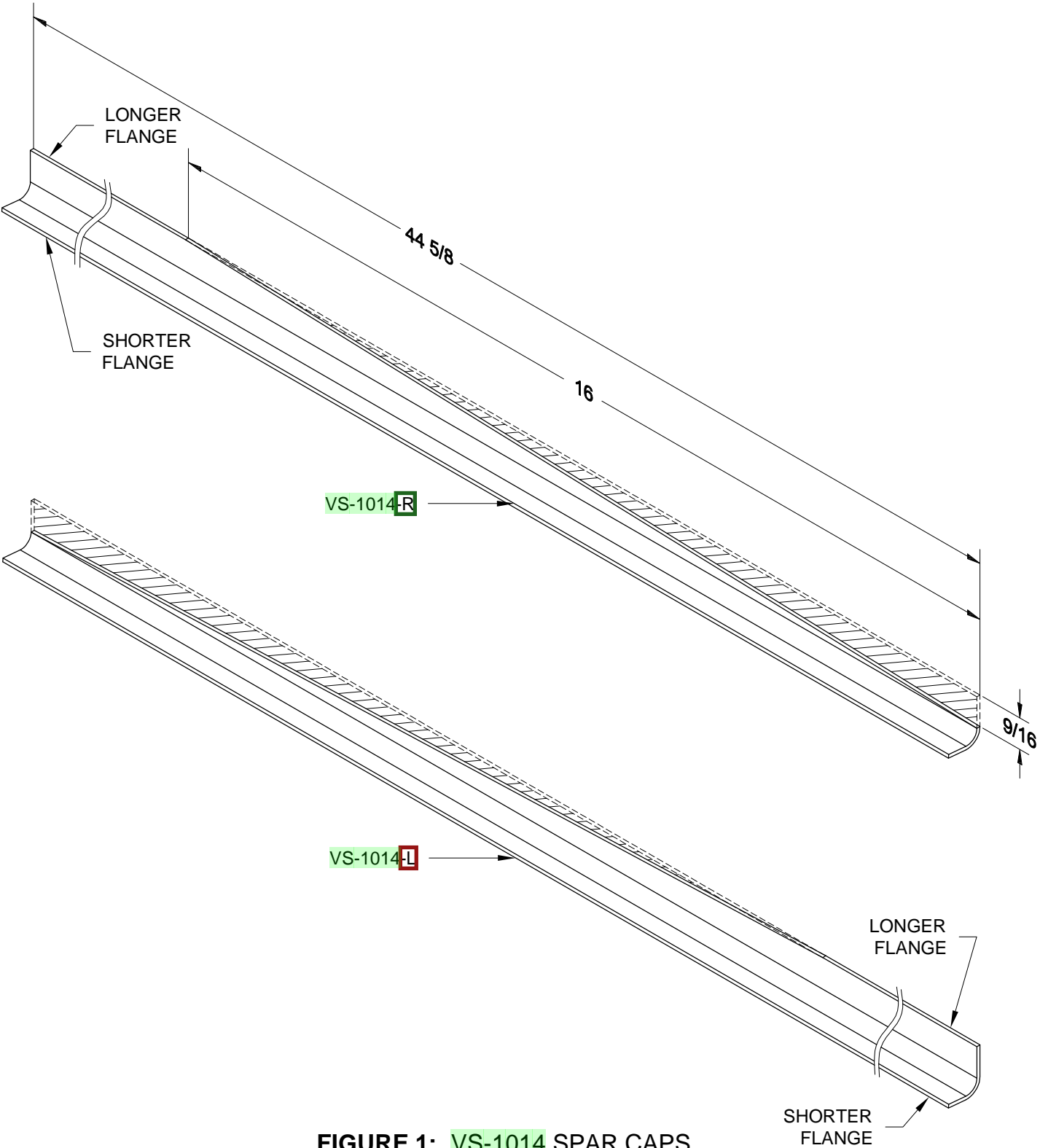


FIGURE 1: VS-1014 SPAR CAPS

Step 2: Nest the VS-1014-L & -R Rear Spar Caps into the corners of the VS-1003 Rear Spar as shown in Figure 2. Note that the trimmed flange of the rear spar caps fits against the web of the rear spar. Flush the bottom of the rear spar caps with the bottom edge of the spar flanges then clamp them in place along the spar flange.

Starting from the bottom of the spar, match-drill about every fourth hole of the rear spar web into the spar caps using a 1/8" drill (ignore the 3/16" upper attach bolt holes; these holes are drilled in Step 6). Cleco each hole as you drill and be sure to drill perpendicular to the spar web, particularly any holes common to the VS-01010-1 and VS-1011 Bottom and Middle Rudder Hinge Brackets. After reaching the top of the spar caps, go back with the same drill and match-drill the remaining 1/8" holes of the rear spar web into the spar caps.

Remove the spar caps and deburr the holes. Clear away any chips, then cleco the rear spar caps back in place.

Step 3: Match-Drill the flange holes of the VS-1003 Rear Spar into the VS-1014-L and -R Rear Spar Caps using a #40 drill, cleco as you go.

Once again, remove the spar caps and deburr the holes. Clear away any chips, then cleco the rear spar caps back in place.

Step 4: Deburr the edges of the VS-1008 Rear Spar Doubler. Cleco the doubler, the VS-1014-L and -R Spar Caps, the VS-01010-1 Bottom Rudder Hinge Brackets, and the VS-1011 Middle Rudder Hinge Brackets to the VS-1003 Rear Spar as shown in Figure 2. Cleco the VS-1012 Top Rudder Hinge Brackets and the VS-1017 Hinge Doubler in place.

With all the parts clecoed together, final-drill #30 the holes of the top and middle rudder hinge brackets, the hinge doubler, and all the 1/8" holes of the spar doubler and spar caps.

Step 5: Final-Drill #19 the four holes common to the VS-01010-1 Bottom Rudder Hinge Bracket. Drill from the bottom hinge bracket (aft side of the spar) forward into the aluminum parts and be careful to keep the drill bit perpendicular to the spar web. To maintain part alignment, temporarily insert a #8 screw into each hole when drilled. After drilling, the bracket can be set aside.

Step 6: Match-Drill the upper attach bolt holes of the VS-1003 Rear Spar and VS-1008 Rear Spar Doubler into the VS-1014-L and -R Spar Caps using a 3/16" drill. Don't final-drill these holes to size (#12) yet; this is done when the vertical stabilizer is fitted to the tailcone.

UPPER ATTACH BOLT HOLES:  
MACH CSK ALL #30 HOLES  
BELOW THESE TWO HOLES  
FLUSH ON THIS (FORWARD) SIDE.

Step 7: Machine countersink (Section 5E) all of the #30 holes in the VS-1008 Spar Doubler below the upper attach bolt holes; machine countersink flush on the forward side for AN426AD4 rivets. Do not, however, machine countersink the two holes directly above the VS-01010-1 Bottom Rudder Hinge Bracket.

Step 8: Machine countersink the four #19 holes in the VS-1008 Spar Doubler that are common to the VS-01010-1 Bottom Rudder Hinge Bracket. Machine countersink the holes flush on the forward side for AN509 screws (see Page 6-5).

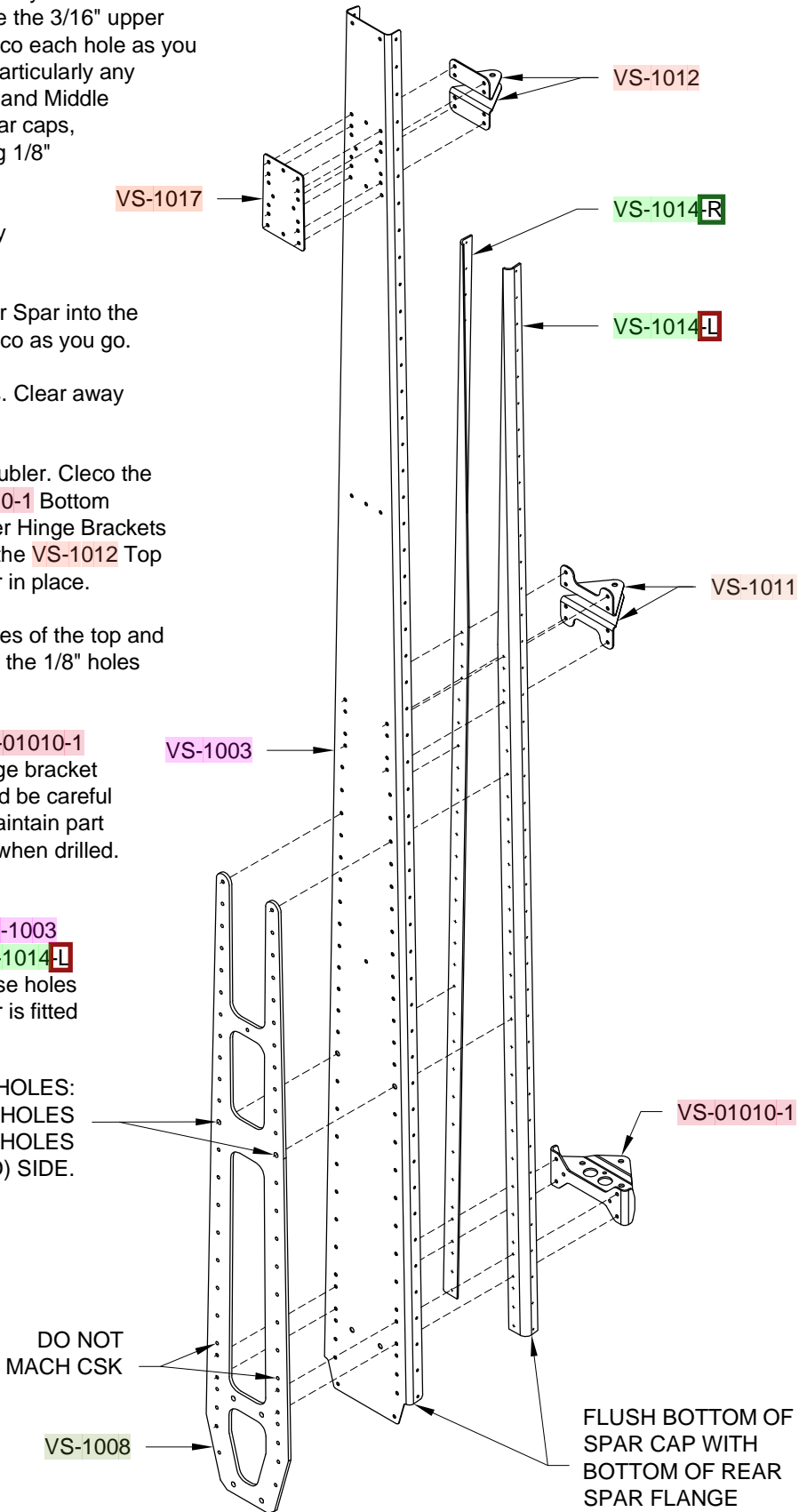
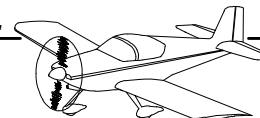


FIGURE 2: REAR SPAR ASSEMBLY

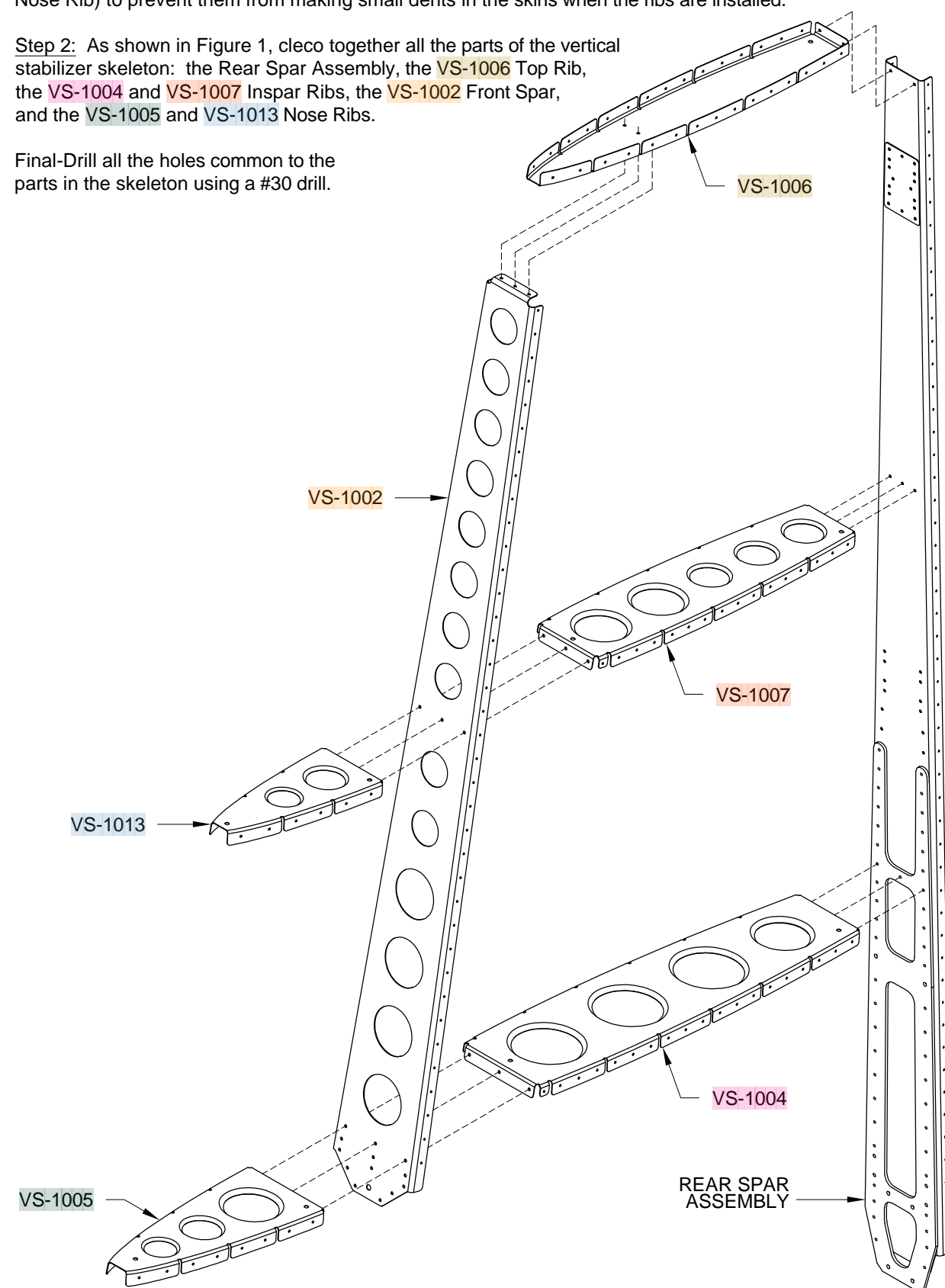


Step 1: Deburr the edges of all remaining parts to prevent scratching during fitting.

Radius the corners at the forward end of the nose rib flanges (VS-1006 Top Rib, VS-1013 Nose Rib, and VS-1005 Nose Rib) to prevent them from making small dents in the skins when the ribs are installed.

Step 2: As shown in Figure 1, cleco together all the parts of the vertical stabilizer skeleton: the Rear Spar Assembly, the VS-1006 Top Rib, the VS-1004 and VS-1007 Inspar Ribs, the VS-1002 Front Spar, and the VS-1005 and VS-1013 Nose Ribs.

Final-Drill all the holes common to the parts in the skeleton using a #30 drill.



**FIGURE 1: SKELETON ASSEMBLY**

Step 3: Remove the vinyl from the inside surface of the VS-1001 Vertical Stab Skin then cleco it to the skeleton as shown in Figure 2.

Step 4: Final-Drill all the holes common to the skin and skeleton with a #40 drill, then remove the skin from the skeleton and deburr the holes.

Step 5: Empennage fairing screw holes are indicated on Page 6-6, Figure 1, along the bottom edge of the depicted skin. Mark the corresponding holes in the VS-1001 Vertical Stab Skin, and in the flanges of the VS-1005 Bottom Nose Rib, the VS-1004 Bottom Inspar Rib, and the VS-1003 Rear Spar.

Step 6: Dimple all the holes of the VS-1001 Vertical Stab Skin except for the following: the eight vertical stab tip fairing attachment holes at the top of the skin (see Page 6-6, Figure 1) and the holes just marked in Step 5. Depending on the vintage of your "C" frame tool, you may not be able to reach all of the holes to dimple. The unreachable holes can be dimpled with a pop rivet dimple die set available from tool suppliers.

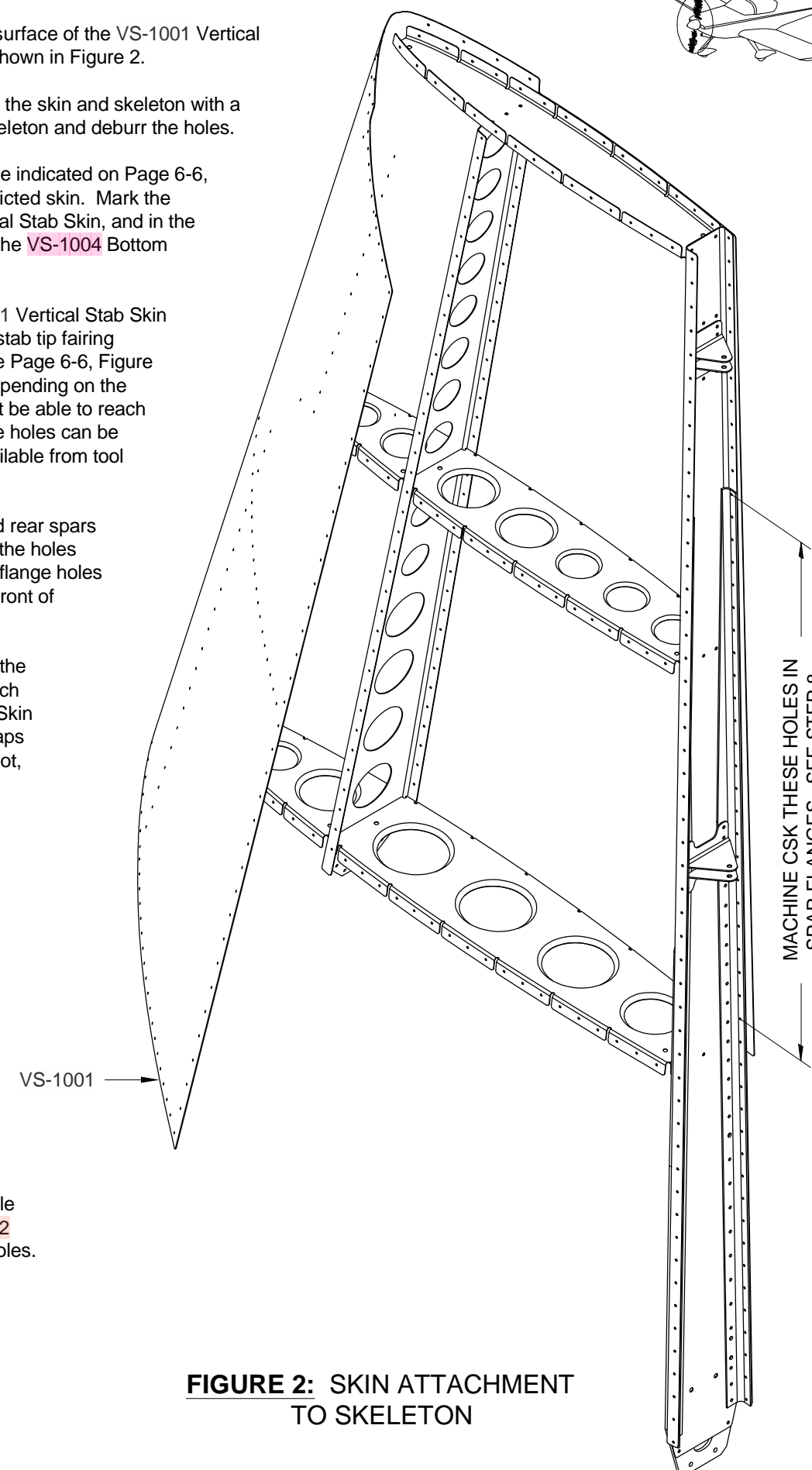
Step 7: Remove the ribs from the front and rear spars then deburr all of the rib holes. Except for the holes marked in Step 5, dimple all of the rib side flange holes (including the hole in the small tabs at the front of the VS-1004 & -1007 Inspar ribs).

Step 8: Machine countersink (Section 5E) the flange holes in the VS-1003 Rear Spar which are common to the VS-1001 Vertical Stab Skin and to the VS-1014 L and R Rear Spar Caps (see note along the side of Figure 2). Do not, however, countersink the holes in the spar (located at the bottom of the skin) which were marked in Step 5. The countersink should be deep enough to accept the dimple of the skin. Leave the spar caps clecoed in place during this operation.

Step 9: Disassemble the rear spar assembly and deburr all holes. Be sure to mark (Section 5C) the top and middle rudder hinge brackets as they are removed so they can be reinstalled in the same position as drilled.

Step 10: Dimple the flange holes of the VS-1003 Rear Spar above the machine countersunk holes.

Step 11: Final-Drill #12 the single 3/16" hole in each of the VS-1011 Middle and VS-1012 Top Rudder Hinge Brackets. Deburr the holes.



**FIGURE 2: SKIN ATTACHMENT TO SKELETON**



**Step 1:** Cleco the **VS-1015** Front Spar Doubler to the aft side of the **VS-1002** Front Spar as shown in Figure 1. Final-Drill the holes of the doubler and spar using a #30 drill.

Remove the front spar doubler and deburr the holes.

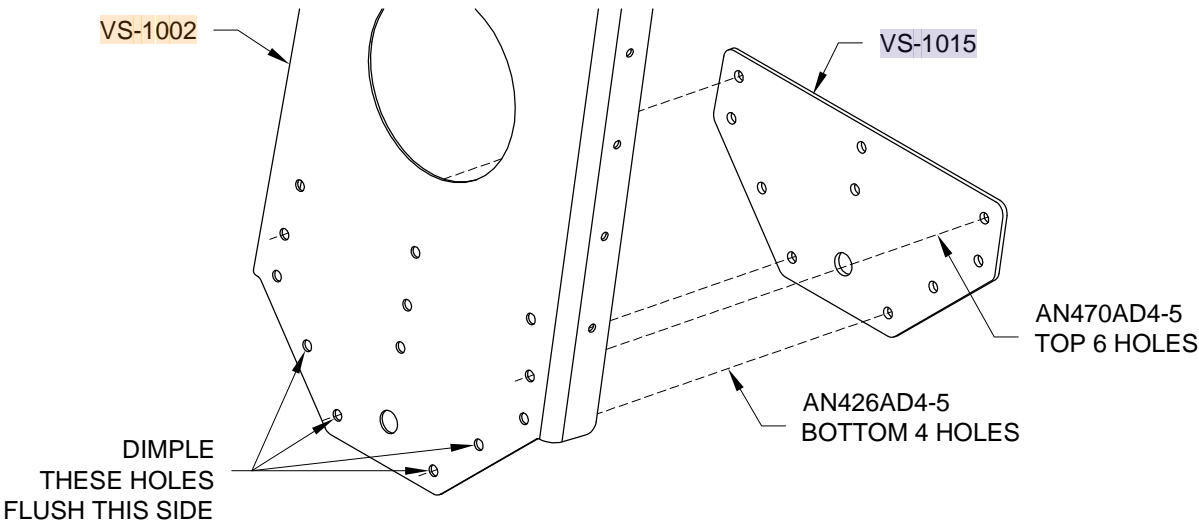
**Step 2:** Deburr all the holes in the flanges and web of the front spar.

Dimple the four bottom holes in the front spar (see Figure 1) and machine countersink (Section 5E) the corresponding holes in the front spar doubler. Dimple the flange holes of the front spar for the skin.

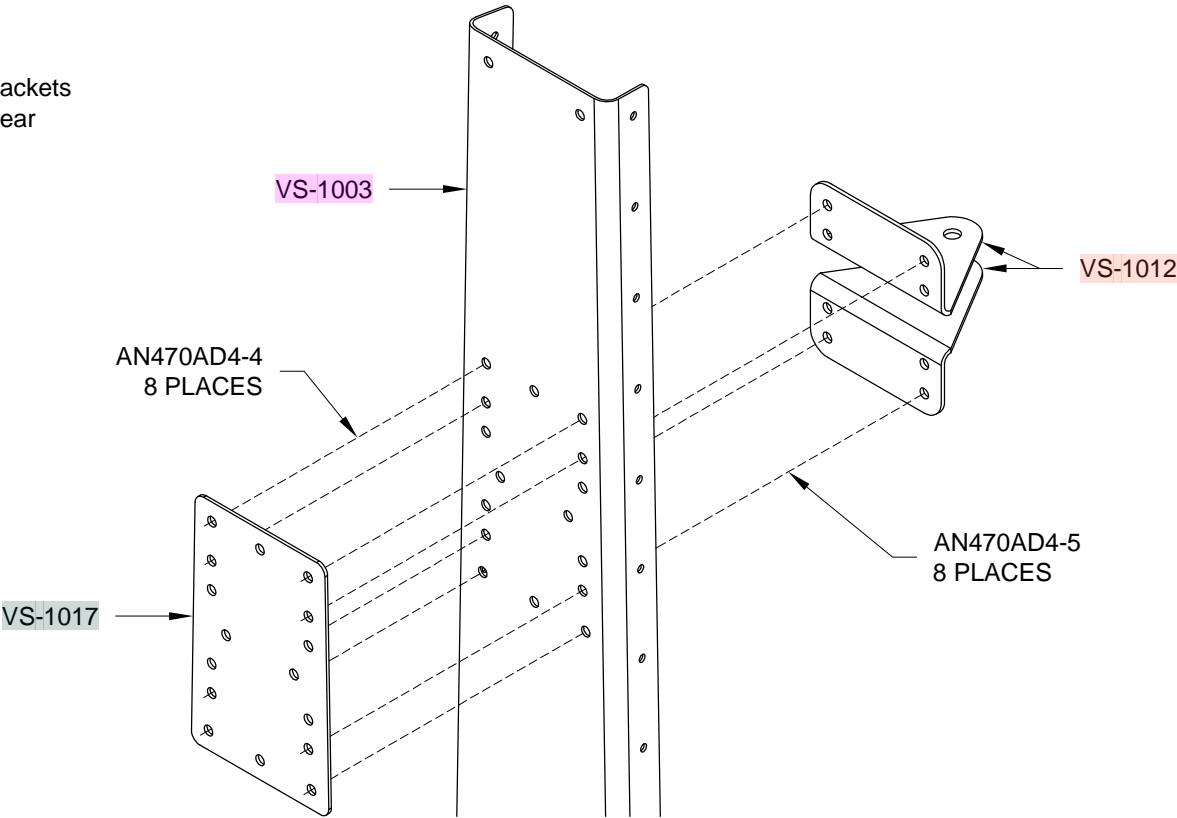
**Step 3:** Double check that all parts are properly deburred and prime the parts, if desired, in preparation for riveting. If you plan on painting the **VS-01010-1**, **VS-1011**, and **VS-1012** Rudder Hinge Brackets when the completed airplane is painted, you should first scuff the powder coat with sand paper or some other type of abrasive pad.

**Step 4:** Attach the **VS-1015** Front Spar Doubler to the **VS-1002** Front Spar using the rivets called out in Figure 1.

**Step 5:** Attach the **VS-1012** Top Rudder Hinge Brackets and the **VS-1017** Hinge Doubler to the **VS-1003** Rear Spar using the rivets called out in Figure 2.



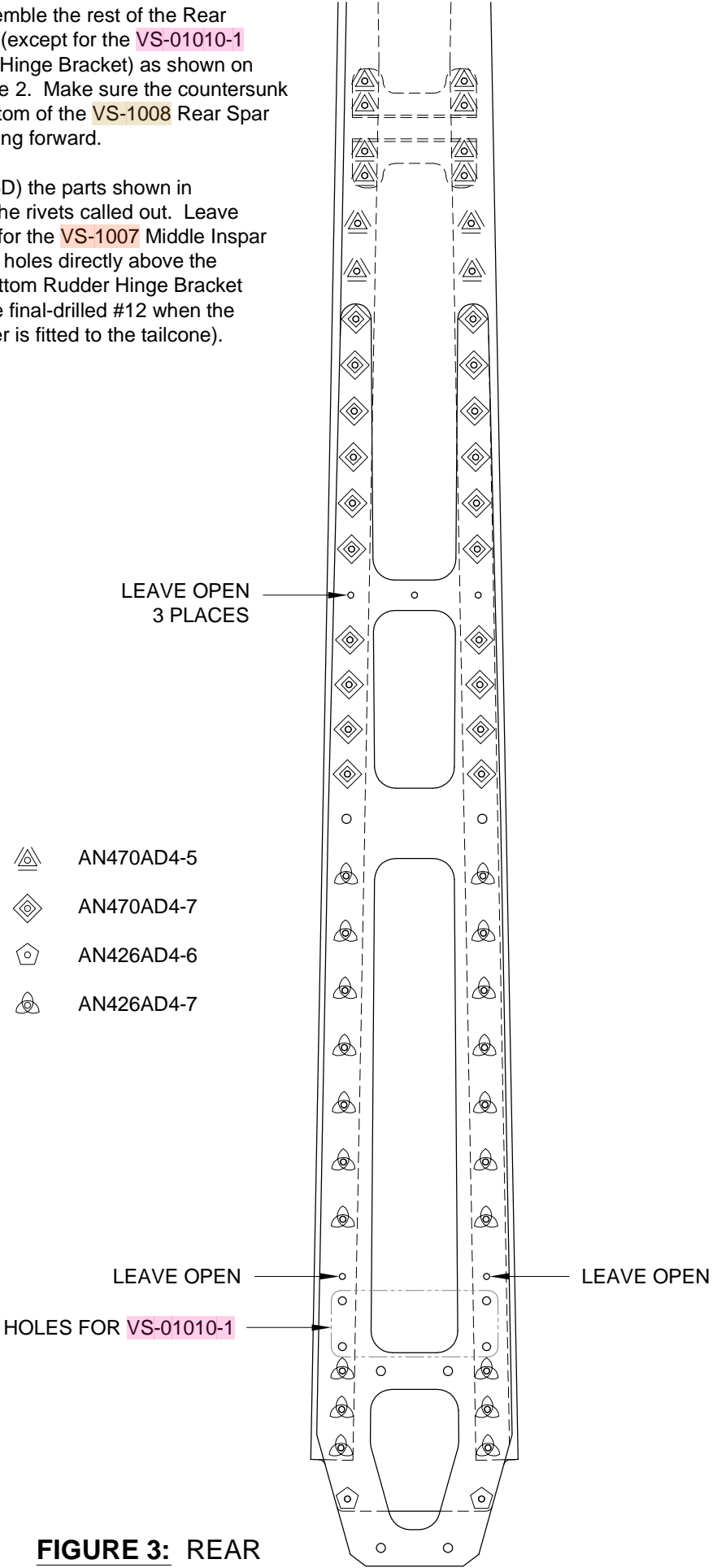
**FIGURE 1: FRONT SPAR DOUBLER ATTACHMENT**



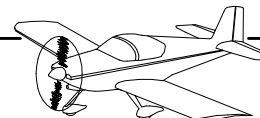
**FIGURE 2: TOP RUDDER HINGE BRACKET AND HINGE DOUBLER RIVETS**

**Step 6:** Reassemble the rest of the Rear Spar Assembly (except for the **VS-01010-1** Bottom Rudder Hinge Bracket) as shown on Page 6-2, Figure 2. Make sure the countersunk holes at the bottom of the **VS-1008** Rear Spar Doubler are facing forward.

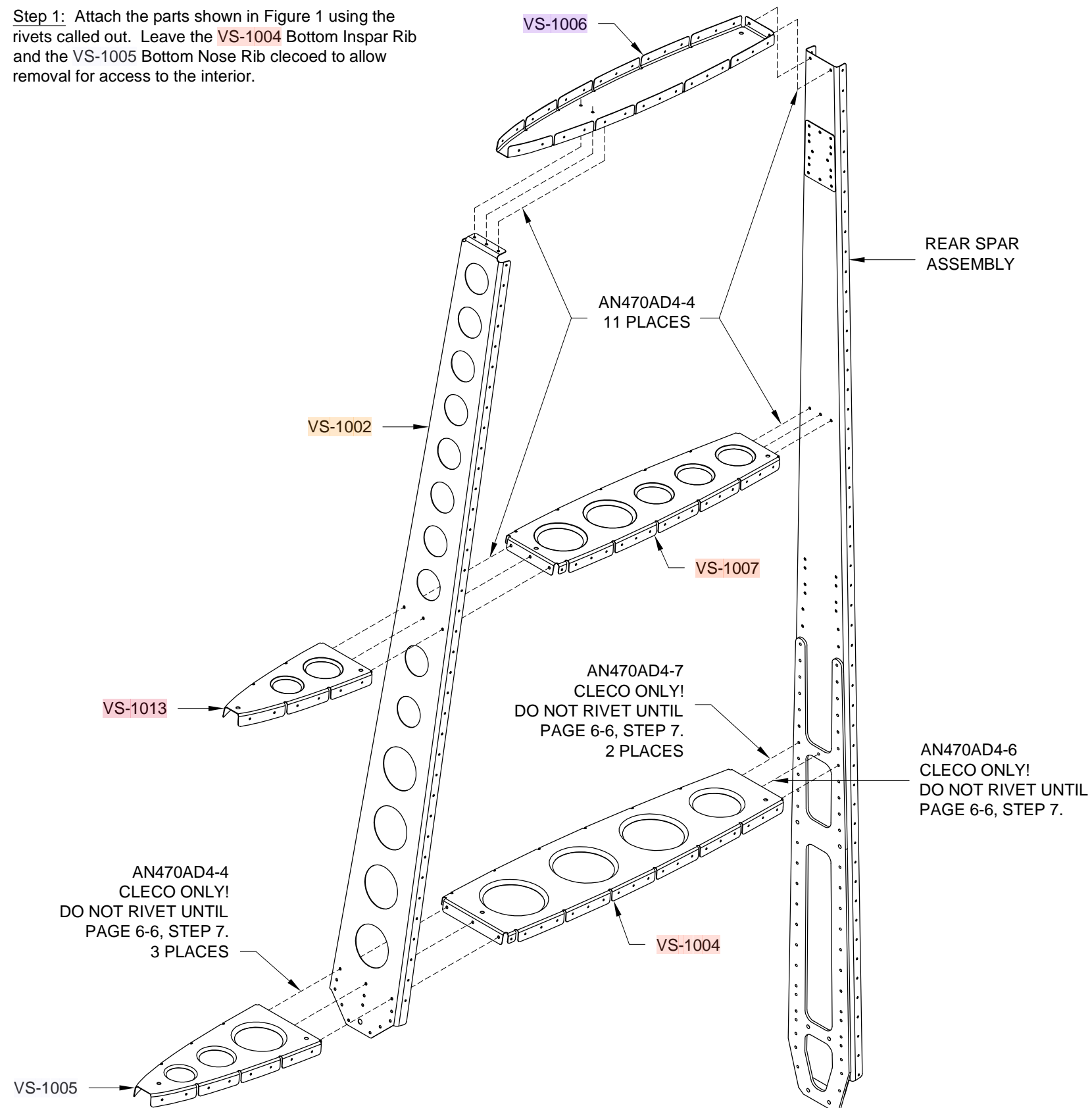
Rivet (Section 5D) the parts shown in Figure 3 using the rivets called out. Leave open the holes for the **VS-1007** Middle Inspar Rib and the two holes directly above the **VS-01010-1** Bottom Rudder Hinge Bracket (these holes are final-drilled #12 when the vertical stabilizer is fitted to the tailcone).



**FIGURE 3: REAR SPAR ASSEMBLY RIVETS**



Step 1: Attach the parts shown in Figure 1 using the rivets called out. Leave the VS-1004 Bottom Inspar Rib and the VS-1005 Bottom Nose Rib clecoed to allow removal for access to the interior.

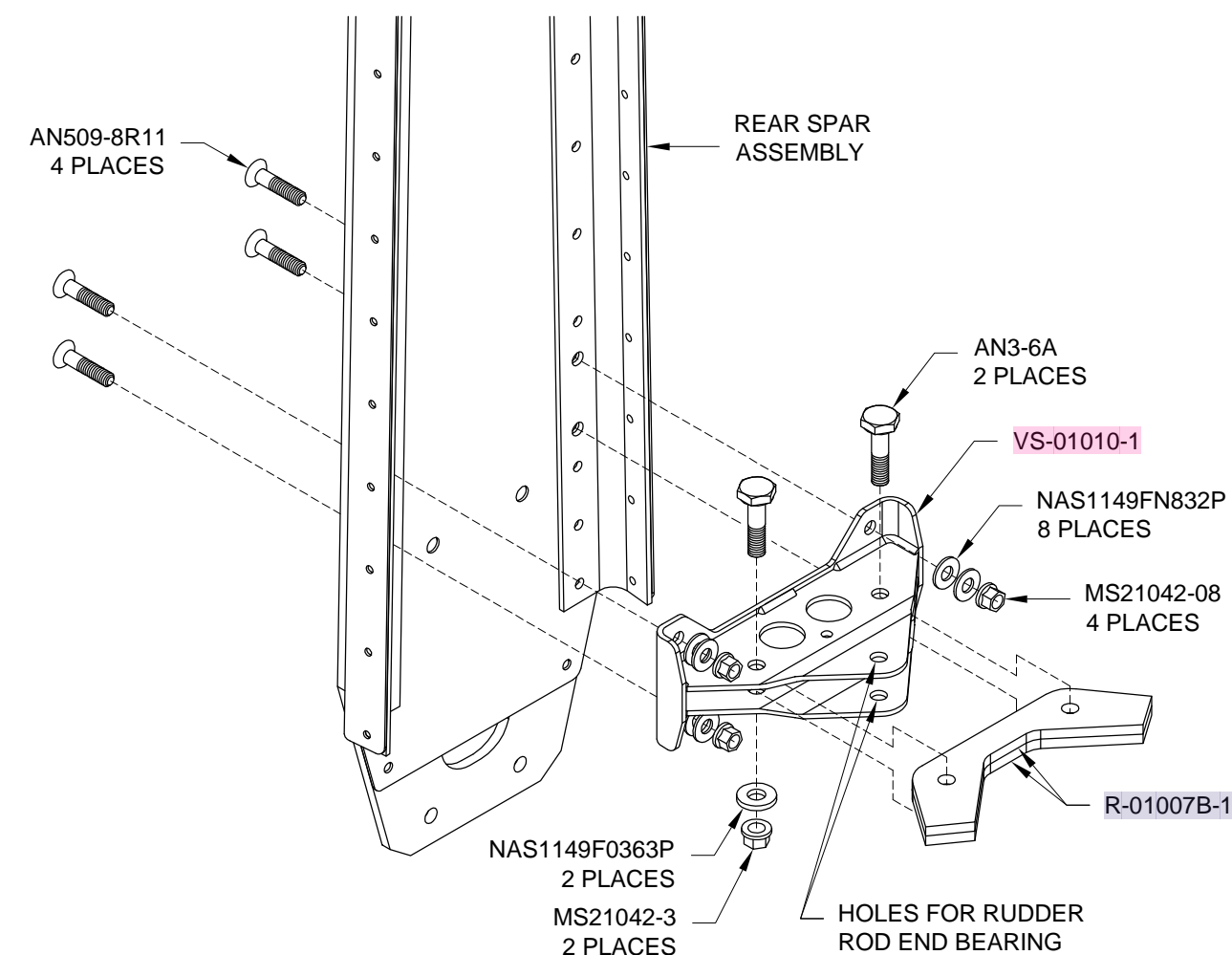


**FIGURE 1: RIB RIVETS**

Step 2: Use a #12 drill bit to clean the powder coating from the three sets of #12 holes in the VS-01010-1 Bottom Rudder Hinge Bracket. These holes are used to bolt on the R-01007B-1 Rudder Stops and the bottom rod end bearing of the rudder. See Figure 2.

Step 3: Heavily deburr (and straighten if necessary) the two R-01007B-1 Rudder Stops, then bolt them in the VS-01010-1 Bottom Rudder Hinge Bracket as shown in Figure 2.

To maintain access for riveting the rear spar flanges, do not attach the bottom rudder hinge bracket to the rear spar until the end of the next page.



**FIGURE 2: ATTACHING THE BOTTOM HINGE BRACKET AND RUDDER STOPS**



Step 1: Cleco the VS-1001 Vertical Stab Skin to the skeleton. Use plenty of clecos to keep the parts aligned while riveting. Figure 1 provides rivet sizes for the vertical stab skin.

Step 2: Remove the VS-1005 Bottom Nose Rib to gain access to the VS-1013 Middle Nose Rib. Rivet the skin to the middle nose rib starting at the VS-1002 Front Spar and moving forward on both sides.

Step 3: Rivet the VS-1006 Top Rib to the skin forward of the front spar only.

Step 4: Cleco the bottom nose rib back in place and rivet it to the skin only, not to the front spar. Do not install rivets into the holes which will be used to attach the empennage fairing.

Step 5: Rivet the skin to the front spar on both sides. The portion of the spar below the VS-1007 Middle Inspar Rib can be reached by removing the VS-1004 Bottom Inspar Rib. Make sure to capture the holes in the tabs of the middle inspar rib which are common to the front spar flanges. Since the bottom inspar rib is removed, do not rivet the bottom hole in the front spar flange. Access to the upper portion of the spar requires removing some of the clecos in the skin along the top rib and rear spar. Remove as few as possible to insure that the parts remain aligned and only uncleco one side at a time.

Step 6: Replace any clecos previously removed for access, then rivet the skin to the middle inspar rib and to the remainder of the top rib.

Step 7: Cleco the bottom inspar rib in place. Rivet the spar flanges of the bottom ribs to the spars using the rivets called out on Page 6-5, Figure 1. With the exception of the empennage fairing screw holes, rivet the skin to the bottom inspar rib.

Step 8: Rivet the skin to the rear spar leaving the bottom hole open for the empennage fairing.

Step 9: Finish riveting the VS-1014-L and -R Rear Spar Caps to the rear spar, below the skin, with AN470AD3-4 rivets.

Step 10: Attach the VS-01010-1 Bottom Rudder Hinge Bracket to the rear spar as shown on Page 6-5, Figure 2.

NOTE: The VS-1009 Vertical Stabilizer Tip Fairing is installed, along with the other empennage tip fairings, in section 12.

VERTICAL STAB TIP FAIRING ATTACHMENT HOLES  
LEAVE OPEN  
8 PLACES

- △ AN426AD3-3.5
- ◇ AN426AD3-4
- ◇ AN426AD3-4.5

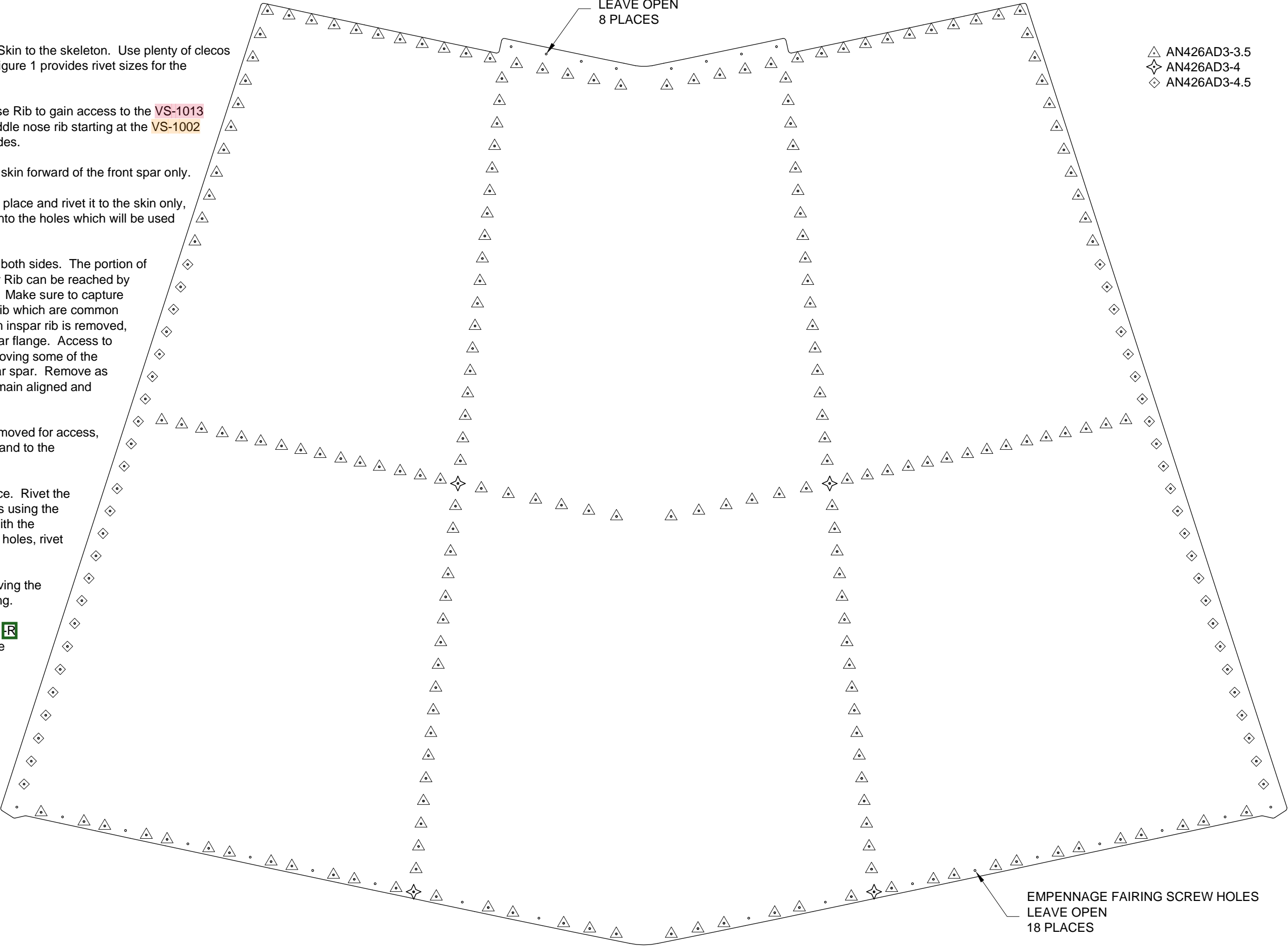


FIGURE 1: VERTICAL STABILIZER SKIN RIVETS