

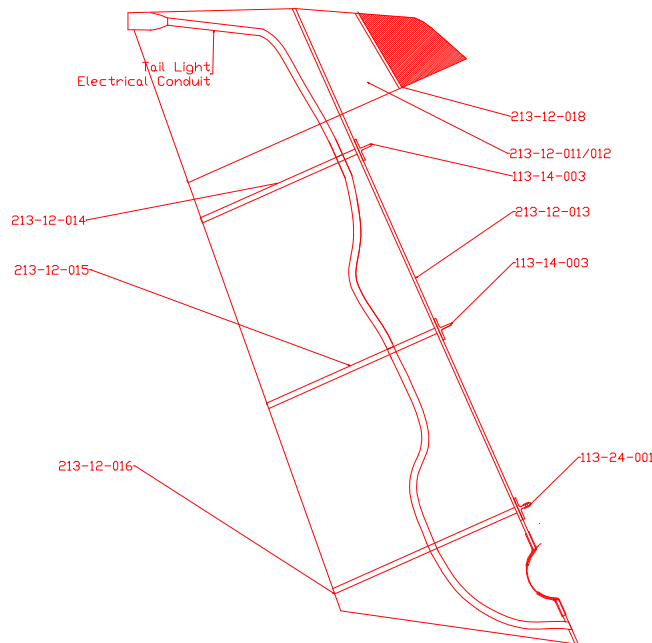
**PROCEDURE 5.040  
RUDDER CONSTRUCTION**

*In this procedure...*

The rudder will be constructed and fitted to the vertical stabilizer; the rudder trim tab will be constructed and fitted to the rudder.

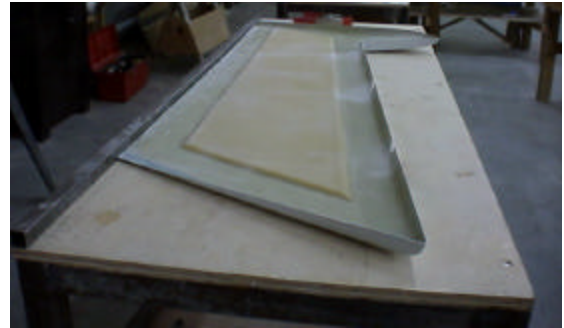
**For this procedure the following parts will be required:**

<u>Part Number.</u>	<u>Qty.</u>	<u>Description</u>
213-12-011	1	Rudder Skin Left
213-12-012	1	Rudder Skin Right
213-12-014	1	Rib, Rudder Hinge Top
213-12-015	1	Rib, Rudder Hinge Middle
213-12-016	1	Rib, Rudder Hinge Bottom
213-12-018	1	Counter Weight Dam
213-12-013	1	Spar, Rudder
113-14-003	2	Hinge, T
113-24-001	1	Hinge, Horn Assembly
AN3-7A	12	Bolt
AN960-10	12	Washer
K2000-3	12	Anchor Nut
113-14-016	6	Backing Plate
BSC-43	24	Rivets
213-12-019	1	Electrical Conduit
213-12-020	1	Tail Light Mount
AN426AD3-5	24	Rivet

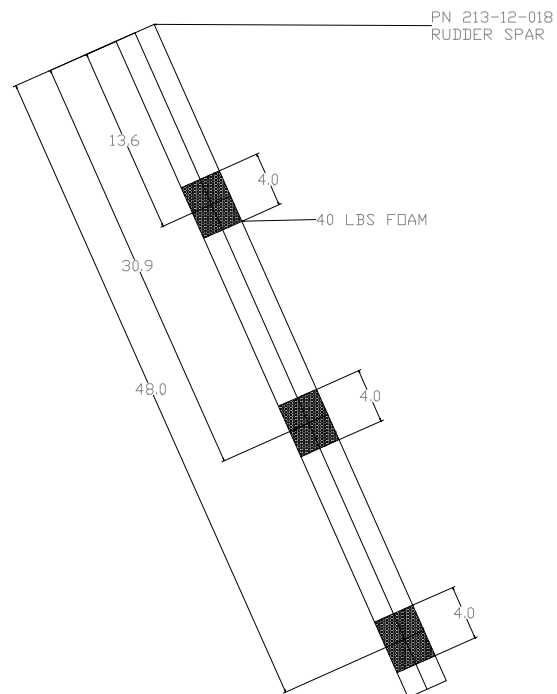


**Step 1 Prepare a building table.**

Use a flat level table; large enough to be able to lay the rudder skin out with at least 3" of space on all sides. Trim the trailing edge of the left rudder skin to its EOP, and lay the rudder on the table with the trailing edge flush with the edge of the table.

**Step 2. Locate Rudder Hinge Mounting Points on Spar.**

Measure the width of the rudder spar at each end and determine the Spar center. Draw a line down a centerline of the rudder spar. Measure from the top end (Rounded End) down 13.6 and mark the location of the upper hinge. Measure down 30.9", and 48 and mark the center and lower hinge locations. Some spars may not have the 40lbs foam hardpoints installed. If not lay the spar on a flat table and mark 2" on each side of the hinge center marks. Lay the spar on a flat table with the marked side facing up. Cut the upper skin and remove the foam. Replace the foam with the 40 lb foam and laminate two plies of cloth over the foam and 3" onto the spar above and below the hard foam insert. Weight the spar to prevent warping. When cured remark the spar centerline and hinge locations.



## Step 2. Layout Rudder Spar Location on the left Rudder Skin PN 213-12-011.

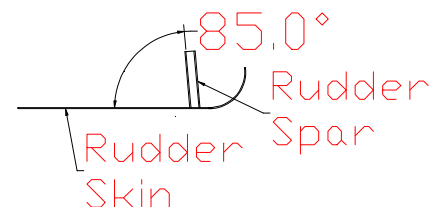
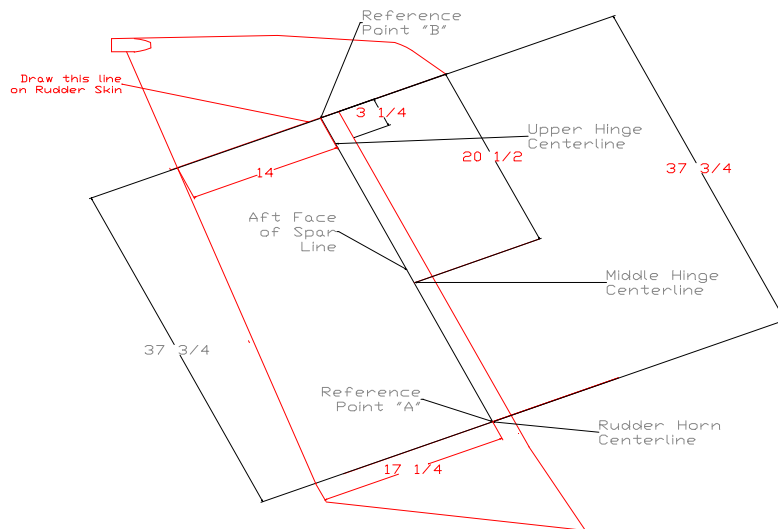
Place a straight edge against the lower edge of the rudder counter weight area and draw a line aft across the rudder skin. From the trailing edge EOP measure forward along this line 14" and make a mark. Label the mark Reference Point B.

Measure from Reference Point B down the leading edge area of the Rudder Skin  $37\frac{3}{4}$ " and make a mark.

Label this mark Reference Point A. From Reference Point A Draw a line parallel with the line drawn from Reference Point B. Measure forward along this line from the EOP to Reference Mark "A"  $17\frac{1}{4}$ ". Make a mark. Use a straight edge and draw a line from Reference Point B to this mark. This line is the location of the aft face of the Rudder Spar.

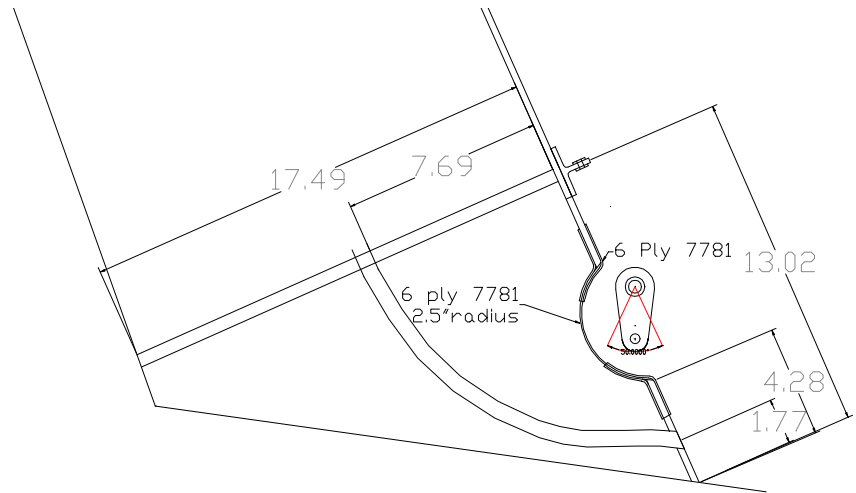
Measure from Reference Mark "B" down the Spar Aft Face Reference Line  $3\frac{1}{4}$ ",  $20\frac{1}{2}$ ", and  $37\frac{3}{4}$ " to locate the centerlines for the three rudder hinge centerlines.

Position the aft side of the rudder spar on the reference line. The top end of the rudder spar is located even with the top end of the rudder and the hinge centerlines should match the hinge lines marked on the rudder skin surface within  $\frac{1}{8}$ ". The rudder spar is tipped five degrees to the rear. Hot glue in place. Laminate the aft side of the spar to the rudder skins using 2 plies of 7781. This laminate should extend across the entire aft face of the spar and 2" onto the rudder skin.



**Step 4. Install Elevator Torque Tube Cut Out Area.**

Laminate a half circle 5" in diameter using 6 plies of 7781. Measure up from the bottom of the rudder, at the forward face of the spar, 4 1/4" and remove a 5" section of the spar. Position the 5" Diameter half circle in this cut out area and laminate in place, using 2 plies of 7781. On final assembly the rudder skin will be removed to provide clearance for the elevator horn and push rod.

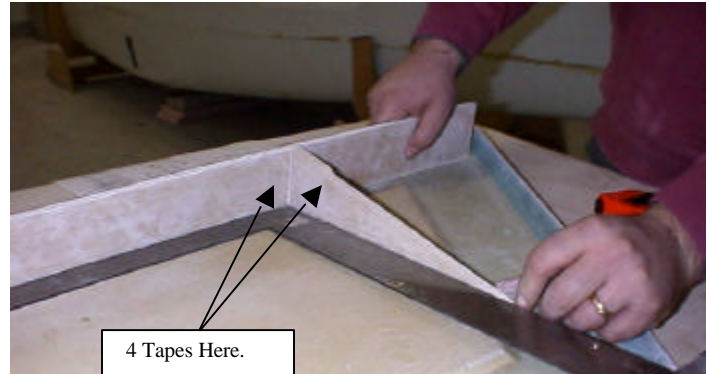
**Step 5. Position Rudder Hinges.**

Temporarily install the two rudder "T" hinges and the rudder horn on the "U" hinges installed on the vertical stabilizer. Clamp the left rudder shin and spar assembly in position on the vertical stabilizer. The lower end of the rudder should be flush with the lower end of the fuselage. The upper end of the vertical stabilizer and the lower side of the rudder counter weight area should have a 1/4" clearance. Use small C clamps to secure the rudder hinges to the rudder spar. The center of the rudder hinges should be centered on the rudder spar centerline. Once you are satisfied that the rudder is positioned properly and that it rotates freely. Mark the location of the hinges and remove the rudder and place it back on the table. **(Note: After close out 3 additional plies of cloth will be laminated on the aft side of the vertical aft shear web and the forward side of the Rudder Spar. This will provide for additional clearance between the rudder and the vertical stabilizer. The rudder should have 25° travel in each direction. This travel will be obtained by removing material from the trailing edge of the vertical stabilizer. Do not attempt to get this travel until all laminates are complete.**



**Step 6. Install Rudder Ribs.**

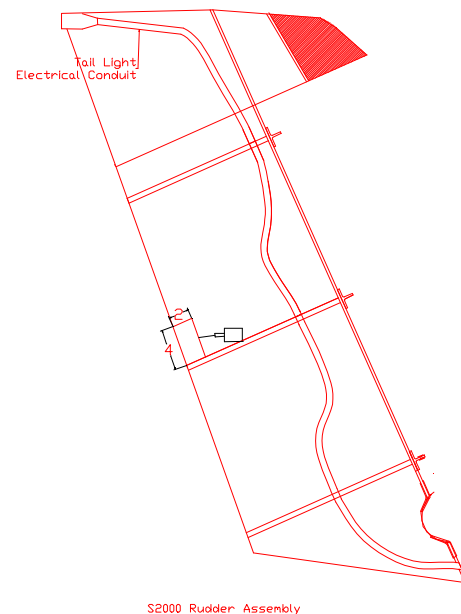
Position the Upper, Middle and Bottom Hinge Ribs in place and hot glue. These ribs are center on their respective hinge, 90 degrees to the spar. Q-cell and tape in place using 2 tapes on each side. Add two additional tapes where the rudder spar and rib attach.

**Step 6. Install Rudder Hinges.**

Install the two rudder hinges and the lower hinge/horn using the same procedure used in the elevator hinges. Orient the horn assembly on the left side of the rudder. Each hinge has two backing plates. Adjust the rudder hinges so that you have the proper clearance and fit with the left rudder skin and left vertical stabilizer. You may have to sand a small amount off the rudder spar to obtain a satisfactory fit with the right vertical stabilizer. Final fit with the right stabilizer will be accomplished simultaneously with the rudder and stabilizer.

**Step 8. Install Position Light wire conduit.**

Install the rear position light conduit in the rudder. This conduit should run from the tail light receptacle down through the rudder and exit at the bottom of the rudder spar. Positioning of the conduit is not critical but it should not have any sharp bends and should be kept clear of the rudder trim tab area.

**Step 9. Installation of Rudder Trim Tab**

The rudder trim tab installation is identical to the elevator trim tab. Approximate size and location is shown in the drawing on the right. The actuation arm and electric servo should be oriented so that the arm fairing is in line with the slipstream.

**Step 10. Close out the Rudder**

Fit the right rudder skin to the rudder. Sand the high spots off any ribs. Tape skins together and fit onto vertical stabilizer to insure proper fit. Once the vertical stabilizer is closed out, verify the fit of the rudder and complete the close out. With the hinges removed laminate 3 plies of 7781 across the forward face of the rudder spar and unto the left and right rudder skin. Also laminate 3 plies in the joggle areas on the top and bottom of the rudder skins.

