

## **ZODIAC CH 601 Series Kit Aircraft**

### **THE FOLLOWING IS A DRAFT MANUAL**

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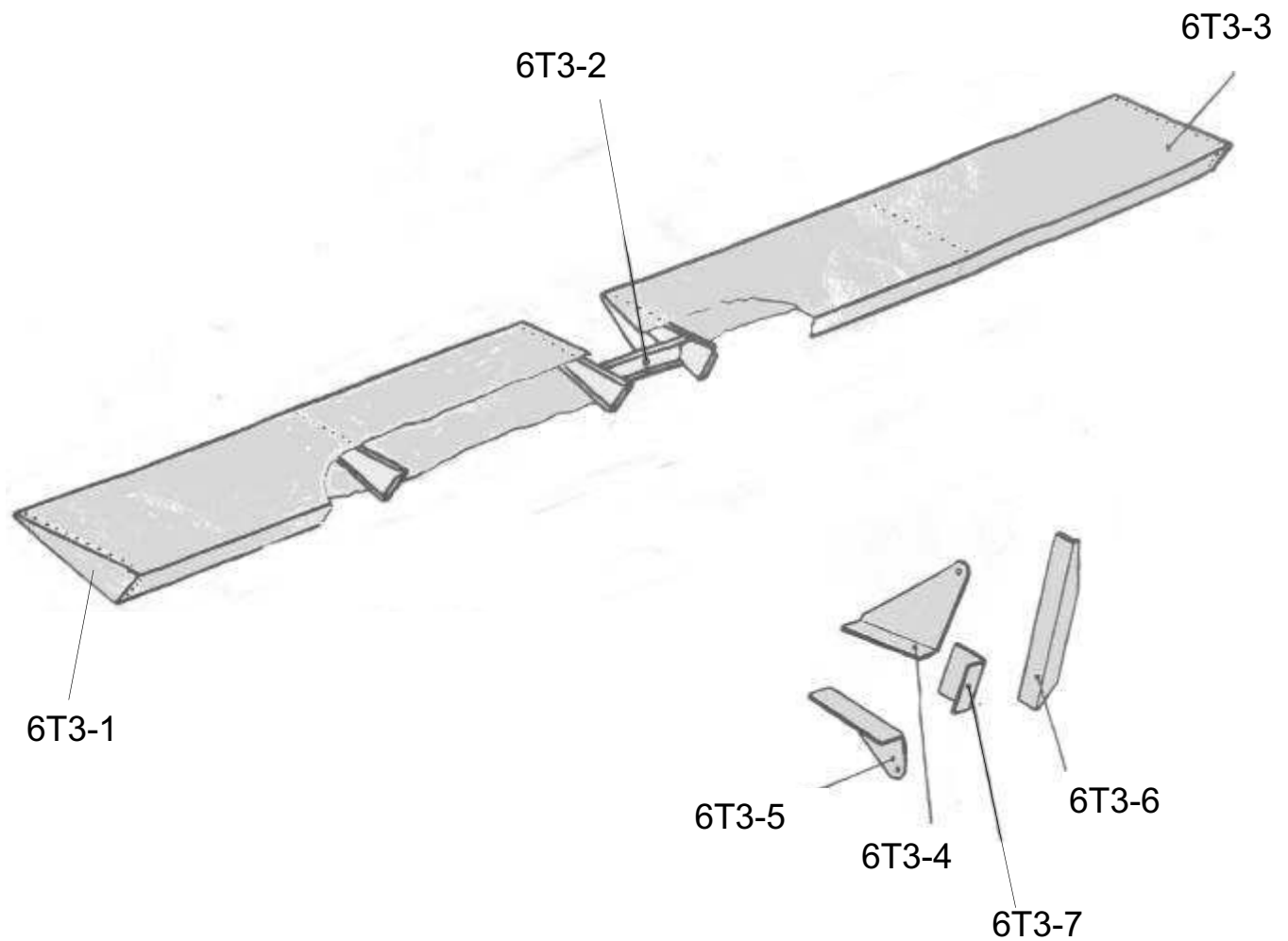
## ELEVATOR ASSEMBLY WORK REPORT

T-15

| <b>Step</b>     |              |                                      | <b>Drawing Page</b> |                  |
|-----------------|--------------|--------------------------------------|---------------------|------------------|
| <b>Sequence</b> | <b>Check</b> | <b>Part number &amp; Description</b> | <b>Qty</b>          | <b>Reference</b> |
| 1               | [ ]          | L Angle                              |                     | 6T3              |
| 1               | [ ]          | 6T3-1 Elevator Ribs                  | 1                   | 6T3              |
| 2               | [ ]          | 6T3-2 Elevator Center Channel        | 1                   | 6T3              |
| 2               | [ ]          | 6T3-3 Elevator Skin                  | 1                   | 6T3              |
| 6               | [ ]          | 6T2-5 Piano Hinge                    | 1                   | 6T2, 6T3         |
| 7               | [ ]          | 6T3-6 Elevator Horn Doubler          | 1                   | 6T3              |
| 8               | [ ]          | 6T3-7 Angle                          | 1                   | 6T3              |
| 9               | [ ]          | 6T3-4 Upper Elevator Horn            | 1                   | 6T3              |
| 9               | [ ]          | 6T3-5 Lower Elevator Horn            | 1                   | 6T3              |

**SIGNATURES:** Builder \_\_\_\_\_ Date \_\_\_\_\_

Inspector \_\_\_\_\_ Date \_\_\_\_\_



ZODIAC  
CH 601

Drawing Rev.  
1st Edition: 3/00

Description:  
**ELEVATOR EXPLODED VIEW**

**T-16**

## ELEVATOR RIBS

T-17

The Elevator Center Channel attaches to the two middle Elevator Ribs with a short length of L Angle. First Cleco the L Angle to the Rib then cut the length of the Angle to match the width of the Rib. The Channel is Clecoed on the front side of the L Angle with 2 #30 Clecos in each Angle.

Layout the rib station along the front side of the Elevator Skin, then with a large carpenter square extend the rib center line to the trailing edge.

1. Cleco the Short L Angle to the side of one left and one right Elevator Rib 6T3-1

**LAYOUT** Clamp a reference edge (or a piece of extrusion such as 6T3-6) on the front flange of an Elevator Rib 6T3-1. Lay a thin ruler on the top flange of the Rib zeroed at the reference edge to layout a mark at **110mm**. Along the bottom flange layout a mark at **85mm** from the reference line. Connect the 110 and 85 marks with a straight line on the side of the Rib. The L Angle is positioned behind the line (the line marks the front of the L Angle).

**STANDARD L ANGLE:** 6061-T6 alloy thickness .025 bent at 90 degree, flanges 18mm x 18mm. Supplied length of 4 feet. Cut 2 pieces approximately 90mm long, they will be cut to the exact length after they are Clecoed to the Rib.

**DRILL/CLECO:** Position the L Angle on the side of the Rib with the front edge on the line. Drill the first end hole at approximately 10mm from the top of the Rib and Cleco. The second hole is at 10mm from the bottom flange of the Rib. Total of 2 #30 in the flange and Rib.

**TRIM:** Cut the length of the L Angle the same width as the Rib, with a marker trace the top and bottom rib flange on the L Angle, remove L Angle from the Rib and trim with the snips.

**QUANTITY:** 1 left and 1 right Rib.

2. Rivet the Elevator Center Channel 6T3-2 to the two short L Angles.

**CLAMP:** Clamp the Channel to the Short L Angle centered between the top and bottom rib flange.

**DRILL/CLECO:** Drill and Cleco the first end hole. Total of 2 A4 in the Channel and Short L Angle.

**RIVET:** Rivet the Short L Angles to the Ribs and to the Channel.

3. Layout the Rib stations on the Elevator Skin 6T3-3 (the flange center line is the rivet line).

End Ribs: The rivet line for the end ribs is in 8mm from the end of the Skin.

Middle Ribs: From the rivet line of the end Ribs layout a mark at 490mm along the front edge of the Skin. Use a large carpenter square to extend the rivet line perpendicular with the trailing edge.

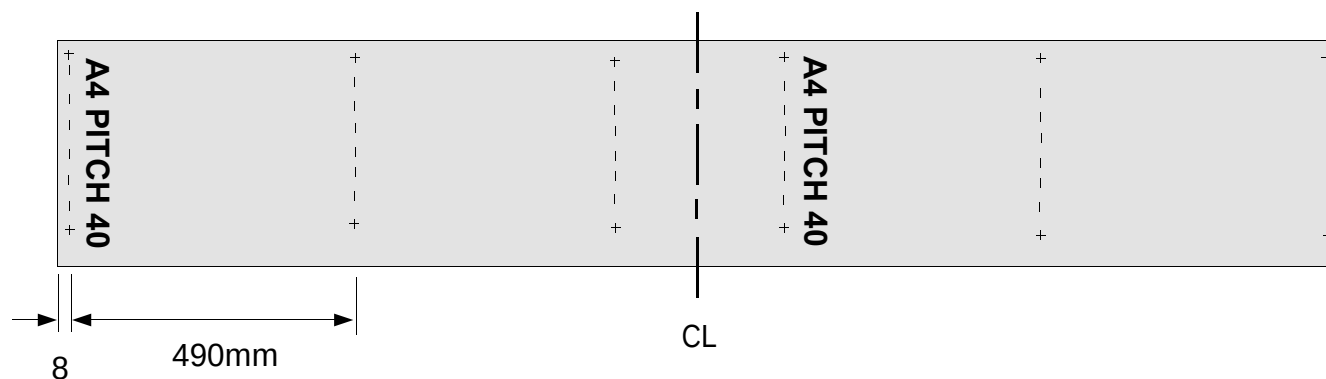
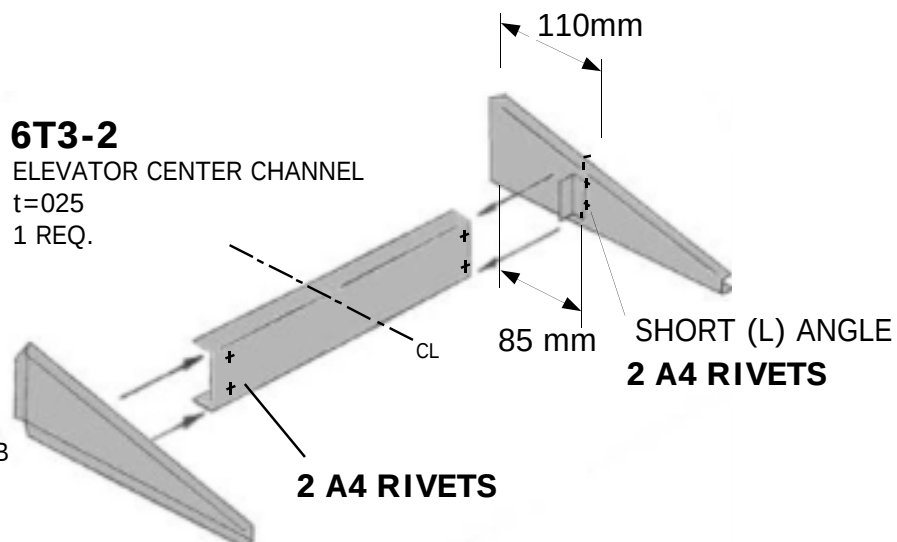
Center Ribs: To trace the separation of the two center Ribs position the Rib and Channel assembly on top of the Skin: align the assembly on the aircraft center line. Locate the rib center line as the middle of the flange (trace both sides of the flange and split in half) The Rib is also 90 degrees to the trailing edge.

**PITCH:** Continue on next page T-19 step #4

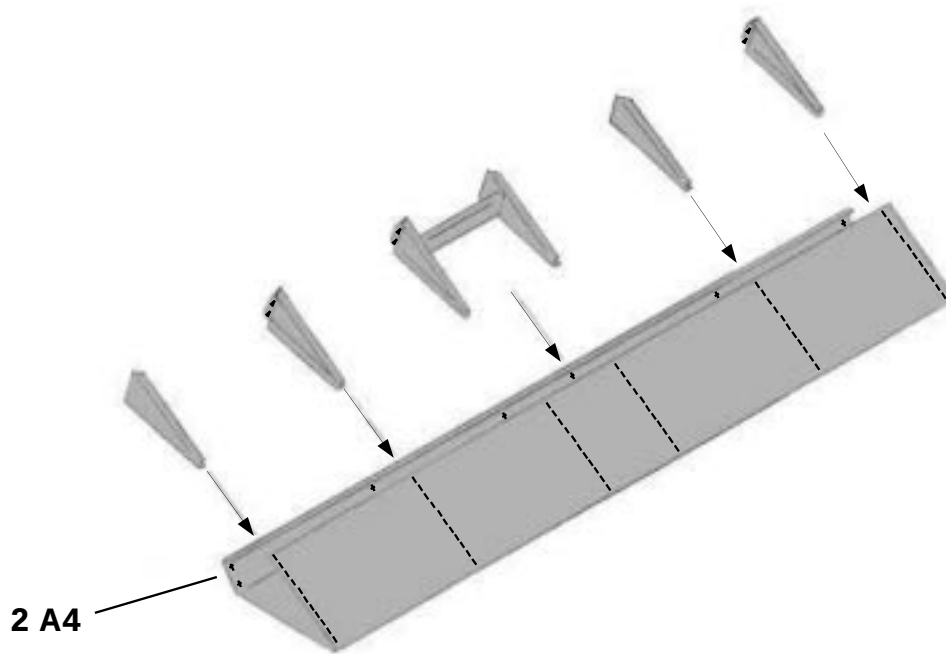


**6T3-1**  
ELEVATOR RIB  
t=016  
3L & 3R REQ.

**6T3-2**  
ELEVATOR CENTER CHANNEL  
t=025  
1 REQ.



**6T3-3**  
ELEVATOR SKIN  
t=016  
l=2200  
1 REQ.



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Description:

**ELEVATOR CENTER SECTION**

**T-18**

**ELEVATOR HORN DOUBLER****T-19**

The Elevator Horn Doubler is installed through the Elevator Skin to connect the Upper Elevator Horn to the Lower Elevator Horn. The cutout in the top and bottom side of the Elevator Skin is to insert the Doubler through the Elevator.

4. Layout the rivet pitch between the end holes along each flange, then pre-drill with pilot holes. Start positioning the Ribs inside the Skin; the Skin is flat on the workbench top side up position. Back drill and Cleco through the front flange first, then turn the assembly over to back drill and Cleco the bottom flange.

**END HOLES:** Layout the end holes along the rivet line 10mm in from the end of the Rib Flange.

**INTERSECTION HOLES:** Treat the intersection of rivet lines as an end hole. Locate the rivet line through the top and bottom flange of the Channel 6T3-2, extend the center line to intersect with the Rib station. The end holes in the Channel are also located at 10mm from the ends of the channel.

**PITCH:** Divide the distance in between the end holes for pitch 40. On the top flange this works out to **9** holes. The bottom flange has **8** holes. In the front flange there are just the 2 end holes. Wait to set the rivet pitch for the Channel 6T3-2 until after the Horn and L Angle have been positioned.

**DRILL PILOT HOLES:** Wait to drill intersection holes of the rib station with the center line of the piano hinge, even better is to erase the upper front end hole in the top flange of the Ribs (the end holes were located to set the rivet pitch). Pre-drill the rib stations with #40 pilot holes in the three flanges.

**FLANGE CENTER LINE:** : Mark the Rib flange center lines on each rib.

**BACK-DRILL the FRONT FLANGE:** Start with the two holes in the front flange of the Ribs. Adjust the Rib position inside the Skin until the flange center line is visible through the pilot holes – for added support hold a small piece of 1x2” wood strip against the front Rib flange when drilling the #30 hole.

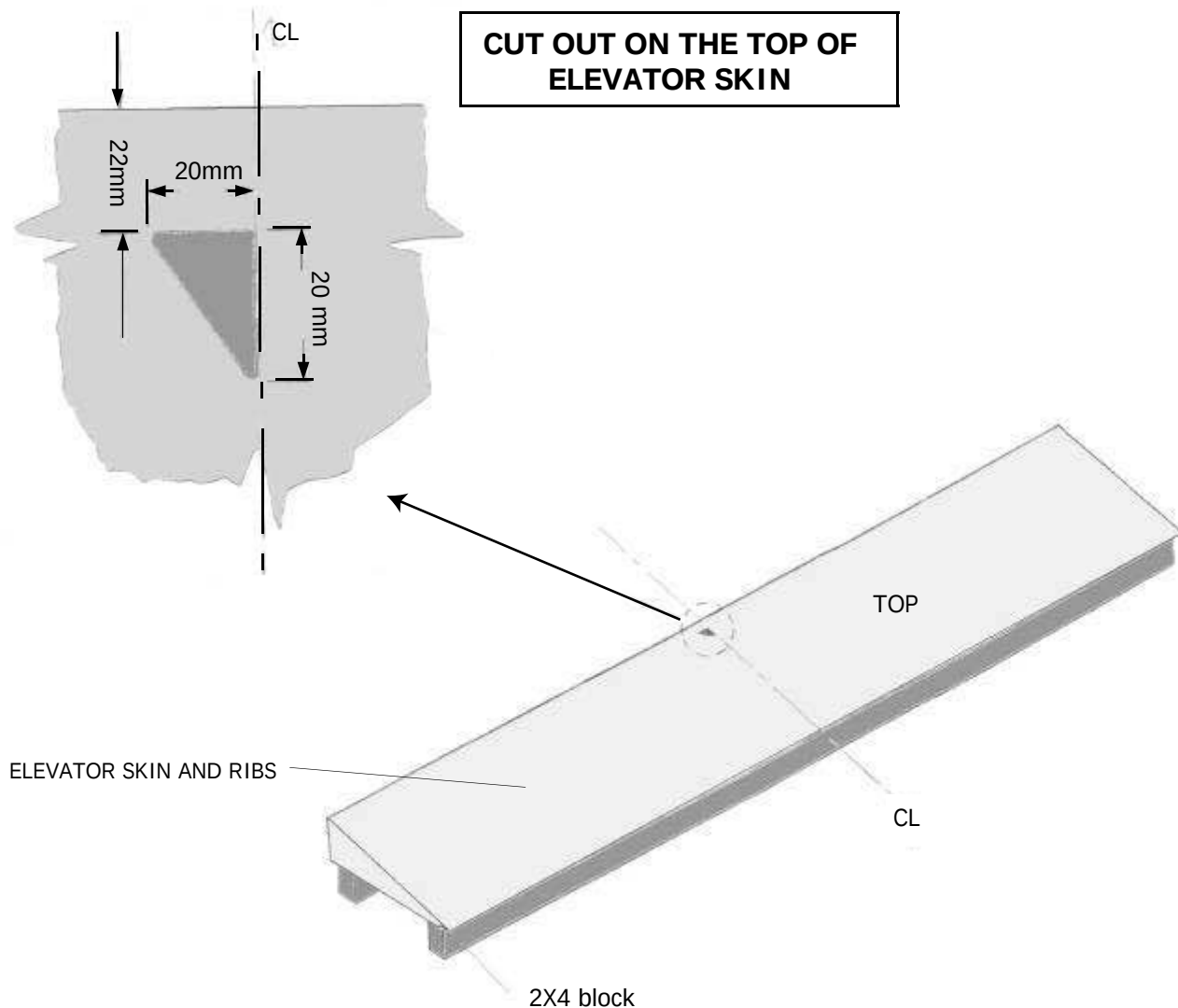
**BACK-DRILL the BOTTOM FLANGE:** Work with the Skin flat on the workbench, start at the front and drill towards the trailing edge. #30 holes, drill and Cleco every third hole, then go back and drill the remaining holes.

5. The Cutout for the Elevator Horn Doubler 6T3-6 is located on the left side of the aircraft center line as viewed from the pilot seat. To mark the cutout on the top side work facing the trailing edge of the Elevator. To mark the bottom side, rotate the assembly about the trailing edge 180degrees, the left is still on the same side of the centerline!

**SUGGESTION:** An alternative opening to the triangular holes shown on page T-20 is an L shaped slot the width of the extrusion – drill 3 corner relief holes and use a chain saw file to join them.

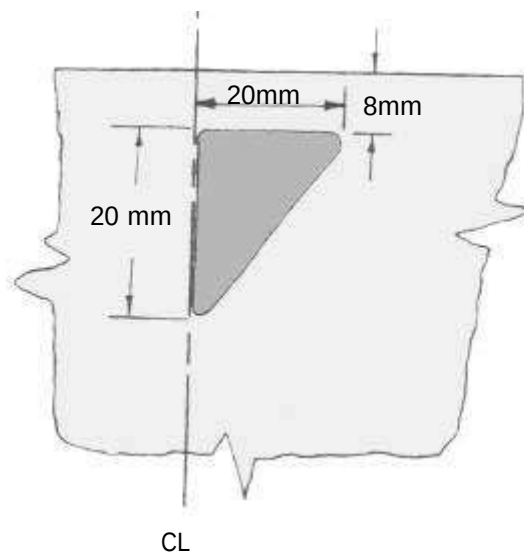
**COMMENT:** To snip the triangular cutout first drill the three ¼” relief holes. The following description is for the slot using one corner relief hole and a round file.

**LAYOUT** for the CUTOUT in the **BOTTOM SIDE** of the Skin: Mark an offset line approximately 8mm back from the front bend radius of the Skin to intersect with the aircraft center line. Hold the corner of the Doubler on the intersection point of the two lines (the side of the Doubler is on the aircraft center line) and use a marker to trace around the end of the Doubler marking the profile of the extrusion on the Skin.



**CUT OUT ON THE BOTTOM OF SKIN**

**HOLE IS CUT FOR THE ELEVATOR HORN DOUBLER 6T3-6**



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Description:  
**CUTTING DOUBLER HOLES IN SKIN**

**T-20**

**PIANO HINGE****T-21**

Work with the Elevator assembly raised on 2x4's to clear the Clecos off the workbench.. The level 2x4" beams will also assure a straight and twist free Elevator.

The edge distance of the front rivet line through the Elevator flange is set in the middle of the Piano Hinge flange. The Piano Hinge is installed with the pin down, maintaining a .016" clearance between the hinge hooks and the bend radius of the top flange of the Elevator Skin. The developed length of the Elevator Skin allows the front edge of the skin to meet flush with the straight section in between the hinge hooks. To allow for some variation, Cleco the front rivet line through the Piano Hinge before back drilling the top flange of the Ribs to the Skin.

- continued from previous page:

**LAYOUT** for **CUTOUT** in the **TOP SIDE** of the Skin: Mark an offset line at 22mm from the front bend, check to make sure the line is drawn behind the aft edge of the top flange of the Elevator Skin! Position the side of the Doubler on the aircraft center line and the front corner of the Doubler on the intersection of the two lines. Also trace around the Doubler (extrusion) on the Skin.

**CHECK:** The cutout are both on the left side of the aircraft center line.

**CORNER RELIEF HOLE:** First drill a pilot hole in the Skin at the inside corner, then trace around the Doubler (inside corner of the extrusion profile as traced on the Skin). Open the pilot hole with a ¼" diameter hole, the edge of the hole extends just beyond the aircraft center line and the offset line.

**FILE:** Use a round rat tail file (7/32" chain saw file) starting at the ¼" relief hole to "saw" two slots 20mm long; one along the edge of the aircraft center line and the other along the 8mm and 22mm offset line. File until the Doubler fits loosely in the slot.

6. Position the Piano Hinge 6T2-5. Turn the Elevator Assembly right side up. To get the Clecos off the workbench, support the assembly on 2x4" boards.

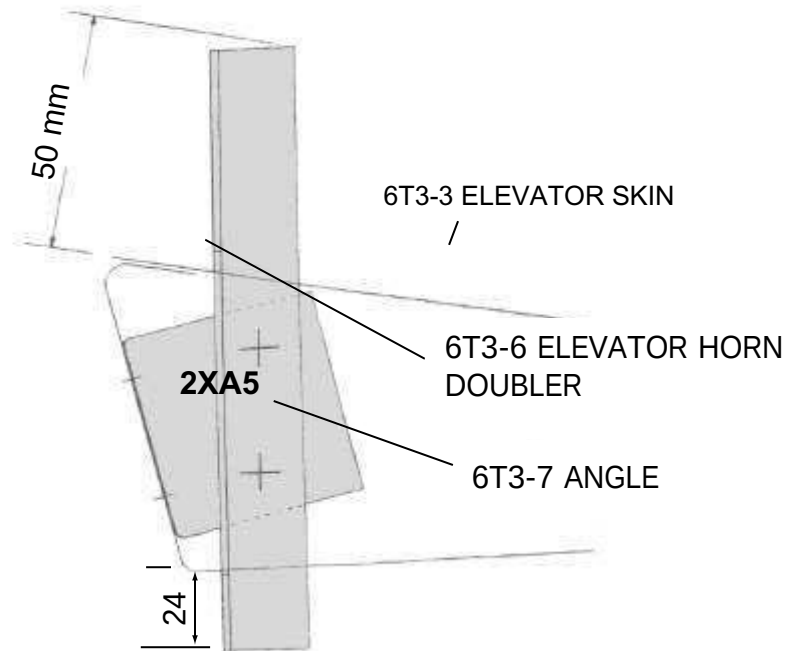
**SUGGESTION:** Use small 2x4" sections positioned parallel to the Ribs (at 90 degrees to what is shown on T-22. With a water level shim each 2x4 board as required, then position the Elevator assembly on top of the level boards. Lay a heavy 2x4 board the span of the Elevator to help weight it down.

Top rivet line: The Piano hinge 6T2-5 fits on top of the Elevator flange and is covered by the top side of the Elevator Skin. Center the 6 ft. length of Piano Hinge on the aircraft center line: the ends of the hinge are approximately 185mm in from the ends of the Skin. Use a piece of .016" sheet to set the clearance between the hinge hook (part of the piano hinge that holds the pin) and bend radius Elevator Skin. Check that the front edge of the skin overlaps flush with the straight section between the hinge hooks, if necessary bring the two together – the assembly is still quite flexible without the top flange of the Ribs drilled to the Skin.

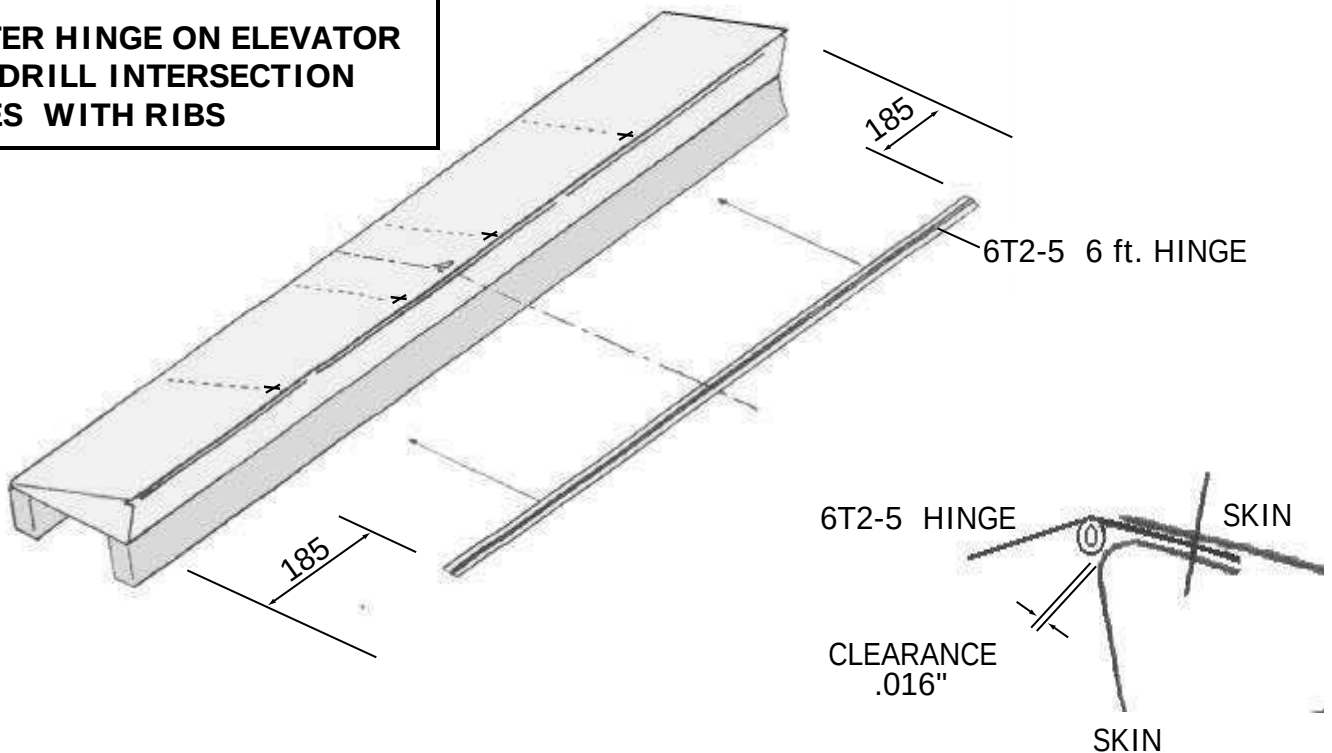
Mark the rivet line at the middle of the overlap with the skin, locate end holes and intersection holes with the ribs, and divide the in between distance for a pitch of 40. Drill and Cleco every third hole with #30. Finish by drilling the holes in between the Clecos.

Rib top flange: Drill and Cleco the Rib top flange with #30





**CENTER HINGE ON ELEVATOR  
AND DRILL INTERSECTION  
HOLES WITH RIBS**



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Description:  
**HINGE POSITION**

**T-22**

Taper the top and bottom flange of the Elevator Horn Doubler.

Cleco the Angle inside the Skin, the Double will rivet to the side of the Angle. Establish the position of the Angle to hold the Doubler in a vertical position through the top and bottom cutout openings in the Skin.

7. The overall length of the Elevator Horn Doubler 6T3-6 is 150mm. With the Doubler positioned as shown on page T-24 mark off 50mm from the right end and 20mm from the left end of the of the Doubler. Hold a ruler flat on the Doubler flange to draw a connecting line from the mark to the end of the Doubler.

**SAW:** Clamp the Doubler over the edge of the workbench or in a vise to saw on the outside of the line. File to remove the saw marks while the Doubler is still firmly clamped in place. At first use a coarse file to help remove material faster, then use a medium cut file and then transition to a fine double cut file to end up with a smooth finish. Remember to gently round off the sharp corners on both flanges.

**COMMENT:** When power tools are used, keep the cutting surfaces sharp to avoid excessive feed forces or pressure which has a tendency to significantly raise the temperature and alter the tempered nature of the 6061-T6 alloy.

8. Position the Angle 6T3-7 on the right side of the aircraft center line on the front side of the Elevator Skin. The Angle fits inside the Skin with 2 rivets in the front flange and 2 rivets in the Doubler.

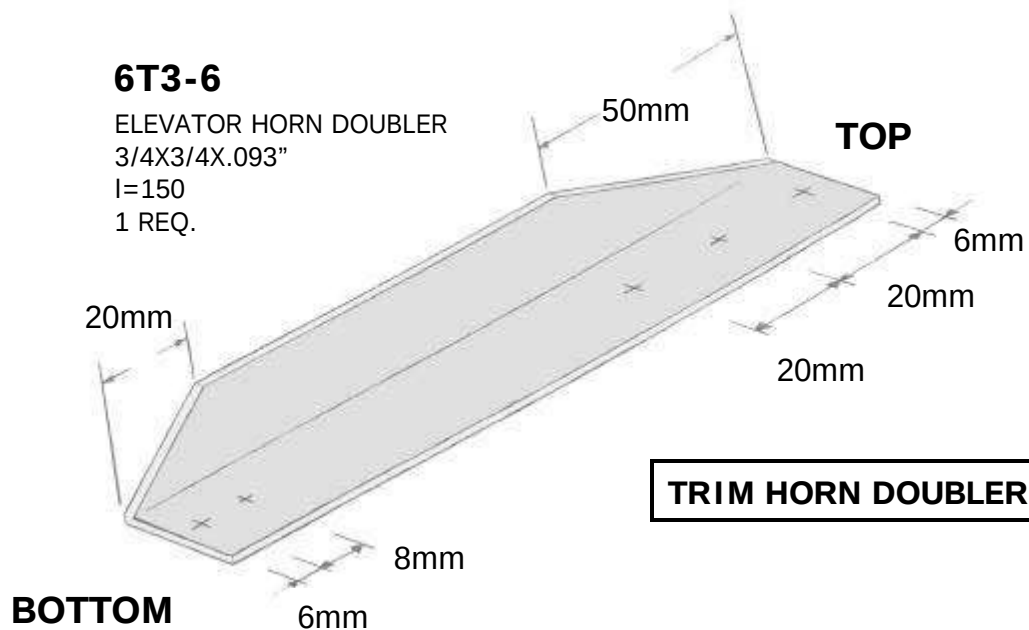
**PILOT HOLES:** Hold the Angle on the outside of the Skin on the right side the aircraft centerline, centered up and down on front of the Elevator skin (to help intersect the projection of the side flange with the aircraft center line hold a square along the side flange of the Angle). Trace around the 20mm wide flange to mark the position of the Angle on the Skin. Remove the Angle and make the rivet line in the middle of the flange on both the Skin and the Angle. Locate the end holes 10mm in from the ends of the flange on the Skin and on the Angle. Pre-drill the two holes in the Skin with a #40 drill bit. Also drill the bottom hole in the front flange of the Angle.

**FIRST HOLE:** Position the Angle inside the Skin with a Cleco through the bottom hole.

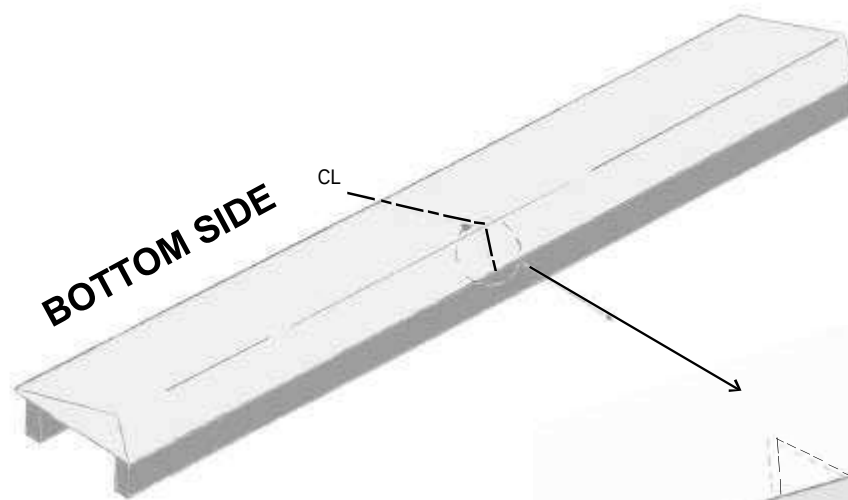
**ALIGNMENT:** Hold a square inside the Elevator Skin referenced on the bottom side, rotate the angle until square and secure with a 2" clamp from the top. Before drilling check that the flange center line is visible through the pre-drilled pilot hole.

**6T3-6**

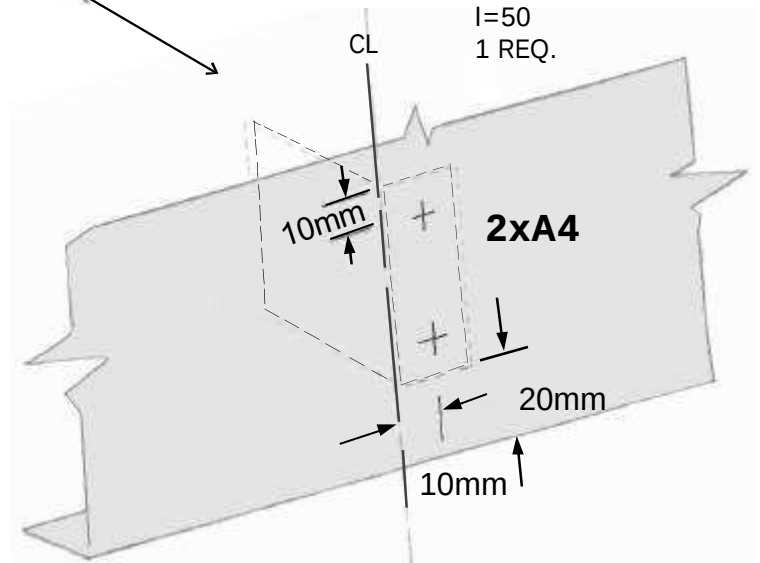
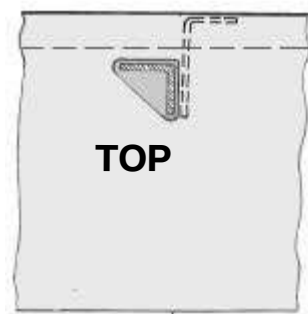
ELEVATOR HORN DOUBLER  
 3/4X3/4X.093"  
 l=150  
 1 REQ.



**POSITION ANGLE  
 ON INSIDE OF SKIN**

**6T3-7**

ANGLE  
 t=.025  
 l=50  
 1 REQ.



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 (3/00)

Description:  
**DOUBLER ANGLE POSITION**

**T-24**

## UPPER & LOWER ELEVATOR HORNS

T-25

The center of the 3/16" hole for the cable attachment in both the Upper and the Lower Elevator Horn are on a 100mm radius centered on the Piano Hinge pin (the 100mm measurements sets the up and down position of the hole). For the Upper Horn the center of the hole is on the extension of the front angle of the Elevator Skin: locate the position of the hole simply by holding a straight edge along the front of the Skin and measuring up 100mm from the center of the piano hinge along the edge of the straight edge. The center of the bottom hole is 10mm forward of the center of the piano hinge pin (the center of the piano hinge pin is taken to be inline with the front of the Elevator Skin).

9. Position the Doubler through the Skin to temporarily clamp the Upper Elevator Horn 6T3-4 and Lower Elevator Horn 6T3-5 to the Doubler.

Center of the Piano Hinge pin: Pull out the pin from the Piano hinge to better locate the center of the 100mm radius.

3/16" hole in the **Upper** Elevator Horn: Hold a straight edge along the front of the Skin to overlap on top of the Upper Elevator Horn. Reference the ruler on the center of the Piano Hinge and measure up 100mm along the front edge of the straight edge. Keep adjusting the fore and aft position of the Upper Elevator Horn until there is at least a 10mm edge distance from the center of the upper 3/16" cable attachment to the front, top and aft edge of the Horn.

3/16" hole in the **Lower** Elevator Horn: On the straight edge, draw a 10mm offset line from the side in contact with the front of the Skin. Once again, allow the straight edge to overlap the Horn, keep adjusting the fore and aft position of the Lower Elevator Horn until there is at least 10mm edge distance from the center of the 3/16" hole to the front, bottom, and rear edge of the Horn.

**CHECK:** The aft end of the Upper and Lower Horns are flush with the end of the Channel 6T3-2. The front end of the Upper Horn is flush with the front edge of the Skin – trim the front edge if necessary.

**DRILL:** For better accuracy center punch the center of the 3/16" hole, drill first with a pilot size hole, then open up with a 3/16" diameter drill bit.

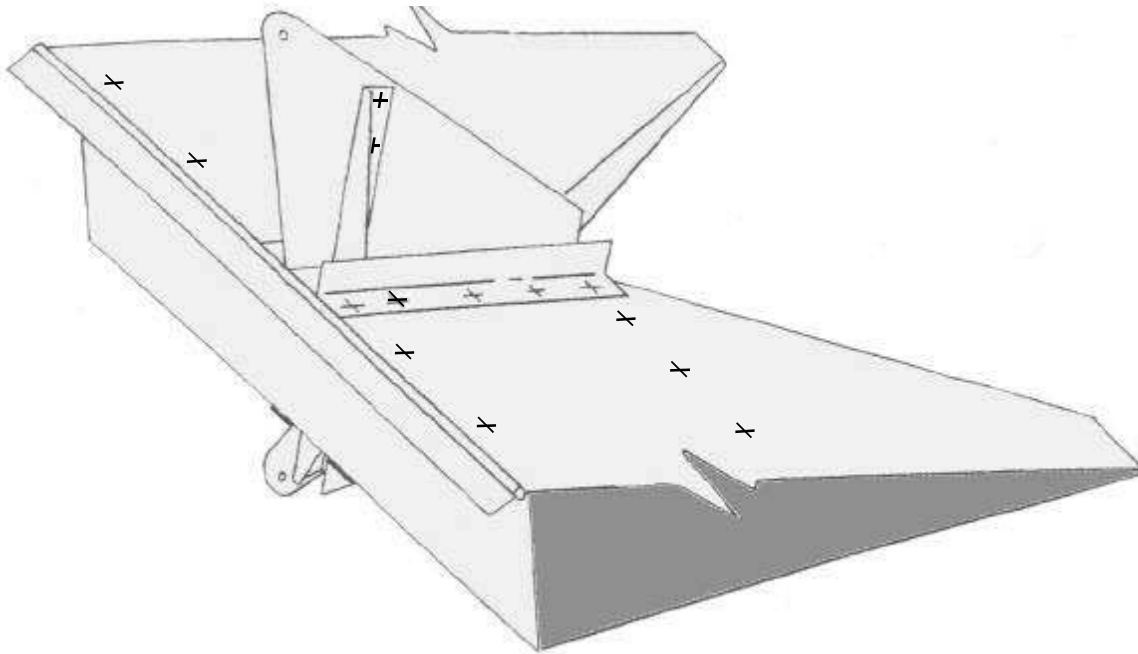
10. Cleco the Upper and Lower Elevator Horn to the Elevator flange (Skin) and to the Channel 6T3-2 with one rivet at the rear.

**POSITION:** Hold the corner of a carpenter square on the aircraft center line, slide the Horn until it touches the side of the square. Check the 100mm radius from the center of the piano hinge and the fore and aft alignment.

**DRILL/CLECO:** Drill 5 #20 holes evenly spaced in the top Horn and 4 #20 holes (evenly spaced) in the bottom Horn.



# FINISHED ELEVATOR

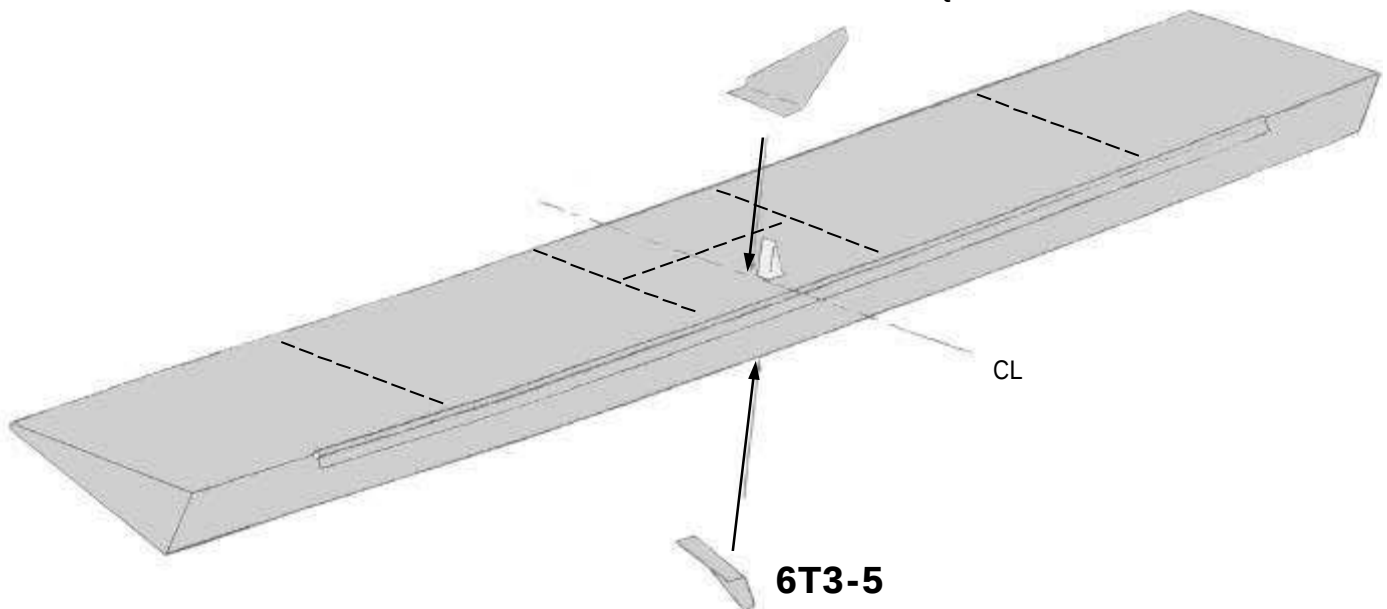


## 6T3-4

UPPER ELEVATOR HORN

t=063

1 REQ.



## 6T3-5

LOWER ELEVATOR HORN

t=063

1 REQ.

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Drawing Rev.  
1st Edition:  
3/00

Description:

**HORN LOCATIONS**

**T-26**

**L Angles****T-27**

Cleco the Elevator Horn Doubler to the side of the Angle 6T3-7: set the top 55mm above the Skin and check that the bottom extends approximately 25mm below the Skin.

Cleco a length of L Angle from the front flange of the Elevator Skin to the Channel 6T3-2 on the top and bottom side of the Elevator. The L Angles are positioned on the outboard side of the Doubler. (see page T-30)

11. Layout the 3 rivets in the upper portion of the Doubler (to rivet into the side of the Upper Horn) and the 2 rivets in the lower portion of the Doubler (to rivet into the side of the Lower Horn) as shown on drawing 6T3-6

**POSITION:** Clamp the Doubler to the Horn. Check and adjust the position of the Doubler for equal distance between the Skin on the top and bottom side with the first hole in the Doubler.

**DRILL/CLECO:** Drill with a #20 and Cleco the Doubler to the side of the Horns.

12. Cleco the Elevator Horn Doubler to the side of the Angle 6T3-7

**POSITION:** Remove the Doubler and Upper Horn to open the top side of the Elevator Skin. Holding the Skin open, Cleco the Doubler to the Bottom Horn. Clamp the Doubler to the Angle 6T3-7 (the Angle can also be installed at this stage).

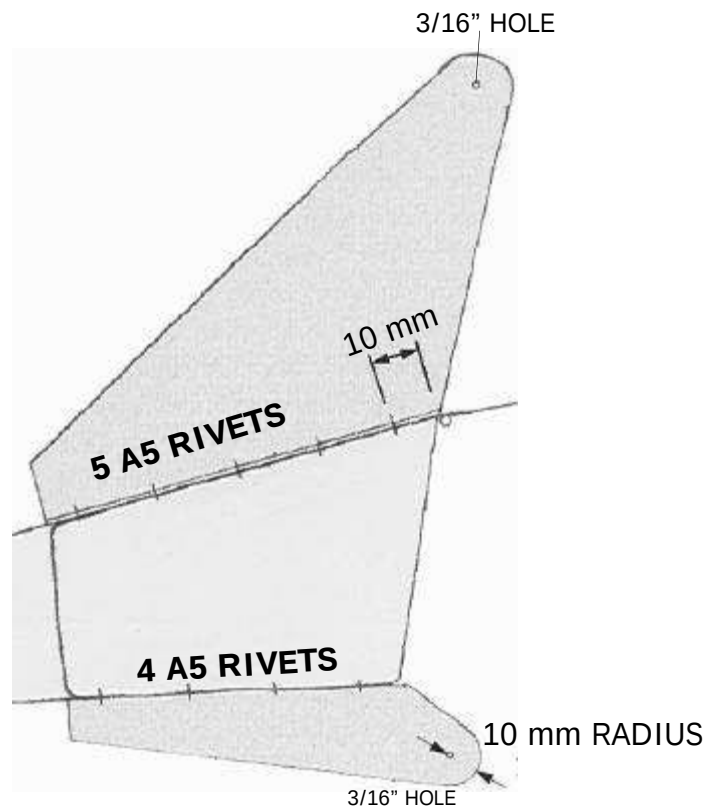
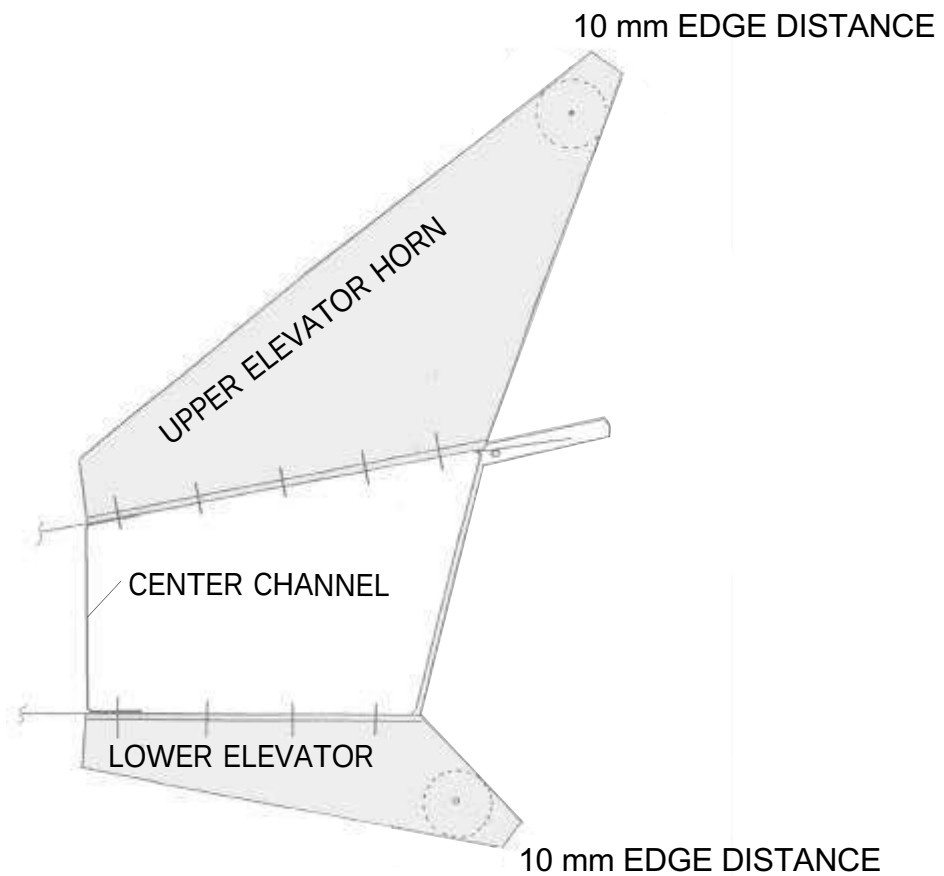
**DRILL/CLECO:** 2 #20 holes.

13. Reinstall the Upper Horn and Doubler. Position a length of L Angle with the flange up against the Doubler to span from the front of the skin to the aft edge of the Channel 6T3-2.

**POSITION:** One L Angle on the top side and one on the bottom side.

**DRILL/CLECO:** 4 #20 holes.

14. Finish drilling the rivet line through the Channel 6T3-2 and the Elevator Skin with Pitch 40 and using #30 drill.



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Description:  
**ELEVATOR HORN POSITION**

**T-28**

**RUDDER CUTOUT****T-29**

Make the cutout while the Elevator assembly is Clecoed together.

15. Mark the cutout from the aircraft center line.

**LAYOUT:** 290mm is the overall width of the cutout at the trailing edge.

100mm is the overall width at the Channel

**CORNER RELIEF HOLES:** Find the center of the ¼” corner relief holes to position the edge of the hole tangent with the cutout lines.

**SNIP:** First do a rough cut then a final cut on the line.

**FILE:** File the rough edges including any slivers left behind from the snips.

16. Disassemble the Elevator assembly to deburr the holes and to apply the corrosion protection if desired. Reassemble with Clecos and rivet.

10/24/01: ZAC Engineering/601 manual/ELEVATOR.doc





UPPER HORN

3XA5

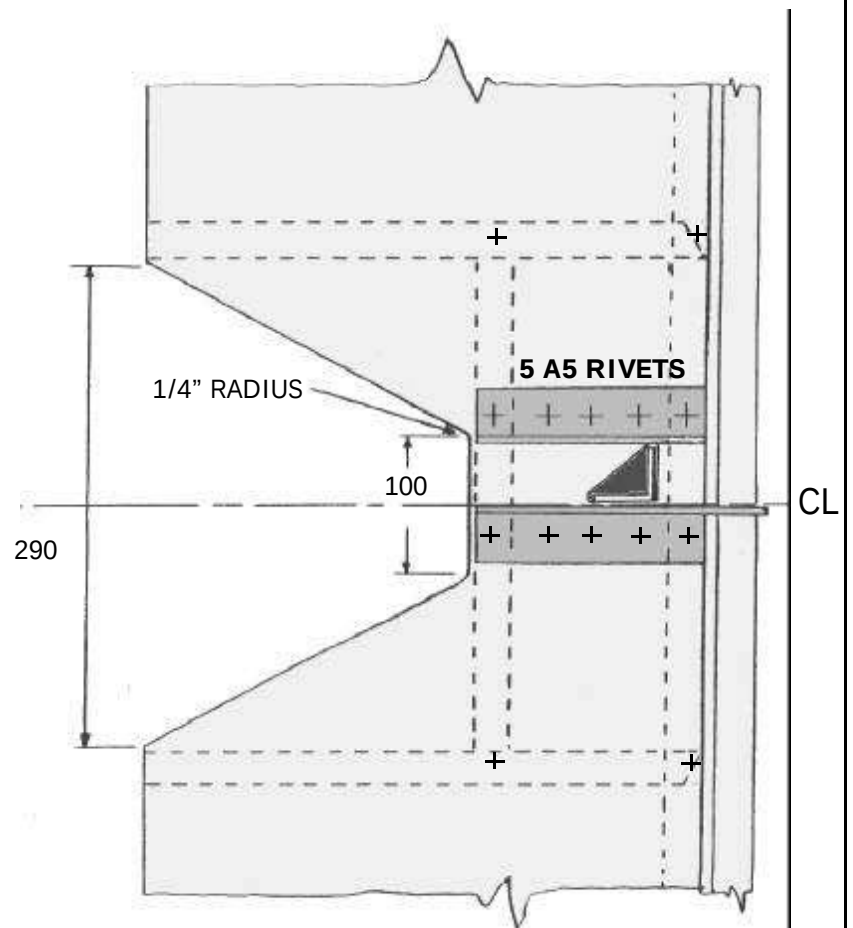
DOUBLER

(L) ANGLE

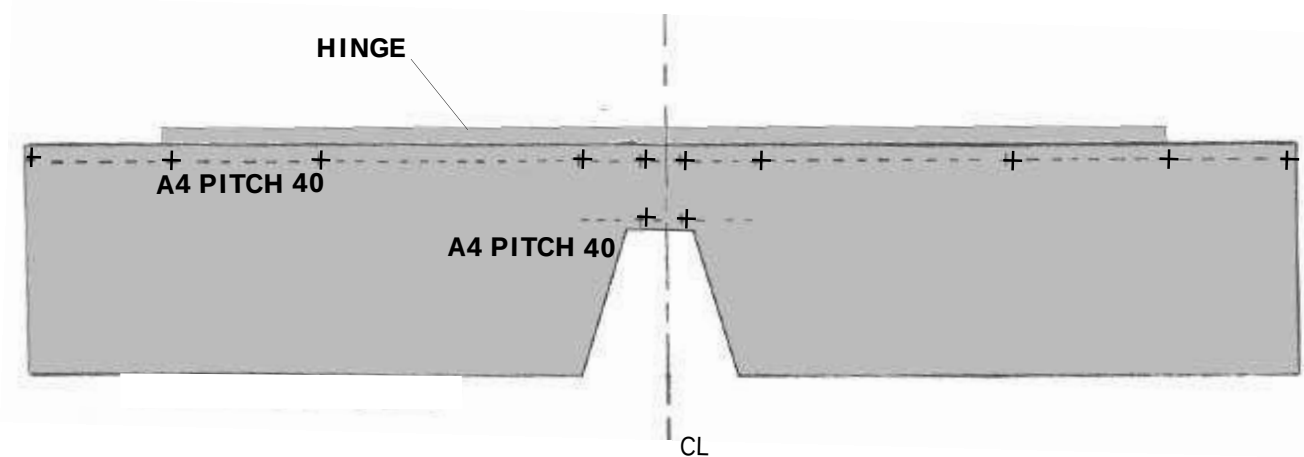
LOWER HORN

(L) ANGLE

FRONT VIEW OF ELEVATOR



TOP VIEW OF ELEVATOR

ZODIAC  
CH 601Drawing Rev.  
1st Edition: 3/00Description:  
(L) ANGLE AND RUDDER CUT OUT

T-30