

SECTION/OPERATION

6

TAIL BOOM

<u>COMPONENT</u>	<u>PROCEDURE</u>	<u>PRINT #</u>	<u>TEMPLATE</u>
TAIL BOOM (E09-2000)	Tail boom fixture Bulkhead skeleton Roll tail boom Mount tail boom	E09-2000	
TRIM FINS	Horizontal trim fins Vertical trim fin	E09-2001	E09-1 E09-2 E09-3 E09-4
TAIL ROTOR (E17-2000)	Tail rotor assembly Install tail rotor sliders	E17-2000 E17-2001	E17-1 E17-2 E17-3 E17-4

NOTES

ROLL TAIL BOOM: After rolling tail boom, check for straightness before drilling and riveting.

MOUNTING BOOM TO AIRFRAME:

When mounting the tail boom to the airframe, be sure to hold the measurement to the square drive tube and also hold the correct tail boom angle. Try to use the same level for all the angles that are to be checked. The quality of level or protractor used during the construction process can greatly affect the results of the project. Care should be taken to utilize the most accurate tools available for positioning.

TIP

Before final installing the tail rotor shaft, belts and pulleys, attach the tail rotor control cable to the cable mount bracket and install it in the tail boom. (If you do not have the Quick Kit, first weld the bracket to the cable mount tube.) It is much less frustrating to mount the cable to the bracket when you do not have to reach into such a tight spot. After installing, secure the cable away from all rotating parts. It should be secured to the horizontal trim fin spar and routed on the lower passenger side after the 3rd bulkhead. (See Section 13.)

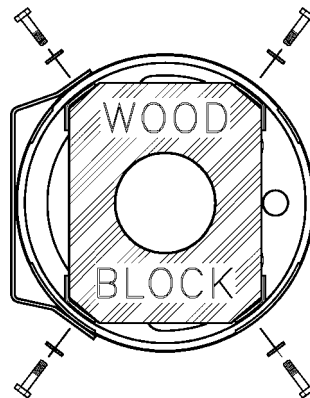
ROTORWAY

TIP Drawing a straight line on tubing: Whenever you need to draw a straight line on a tube (such as the vertical trim fin spar or any other tubing that requires a measurement), a simple method of marking the tube is to lay it next to another tube of the same diameter. Then, place a file or a steel edge on top of the two tubes and slide it down the length of them, leaving a straight mark down the entire tube.

TIP When building the tail boom it is important to avoid a twist, something which is not easy to do when rolling the skin onto the bulkheads. Try using vaseline petroleum jelly on the bulkheads where they contact the skin. This makes it much easier to align the bulkheads correctly.

TIP Prior to painting the surface of the tail boom, a light sanding is required for good paint adhesion. To make it easier when sanding an entire surface, sand the area around the rivet holes before installing the rivets.

TIP When mounting the slider rails in the tail boom, the use of a simple wood fixture can make the task much easier. Mount the bearing plates in the slider rails as far forward as they will go. Temporarily install the assembly into the #4 bulkhead, ensuring the rails are pushed tight against the inside. Measure the inside diameter of the bulkhead and fabricate a fixture from a block of wood to fit as shown in the drawing below. (Drill a large hole in the wood to help make removal easier.) This will hold the rails in correct alignment and tight against the bulkhead while the 3/16" holes for the mounting bolts are being drilled. Make sure that the bearing plates fit snug against the rails, and slide them forwards and backwards to ensure that the rails are parallel.



PREFACE The construction begins by attaching the four bulkheads (held in place by six stringers) to the .025" skin, then rolling the skin into a cone. The most critical step in construction is rolling the skin for the first time. Be very careful not to kink the skin, and progressively roll it into its final shape by using at least three pairs of hands and four tensioning straps. Once the desired shape is attained, the skin is held in place primarily with cleco until the rivets are installed.

ROTORWAY

TOOLS REQUIRED FOR OPERATION 6:

Band saw	
"C" clamps	
Chalk line	
Cleco	
Cleco pliers	
Countersink	
Drift punch	
Drill bits of the following sizes:	1/8"
	1/4"
	3/16"
	1/2"
	#40
	#79
	Letter "D"
Dzus tool	
File	
Framing square	
Grease pencil	
Grinder	
Hammer	
Hand drill (air or electric)	
Mallet	
Metal cutting snips	
Plum bob	
Pop rivet gun	
Protractor level	
Ratchet with sockets of the following sizes:	3/8"
	7/16"
	1/2"
	9/16"
Ratchet straps	
Ruler	
Screwdriver	
Snap ring pliers	
Straight edge	
String or twine	
Tape measure	
Vise	
Wrenches of the following sizes:	3/8"
	7/16"
	9/16"
	1/2"
90 degree drill or equivalent	

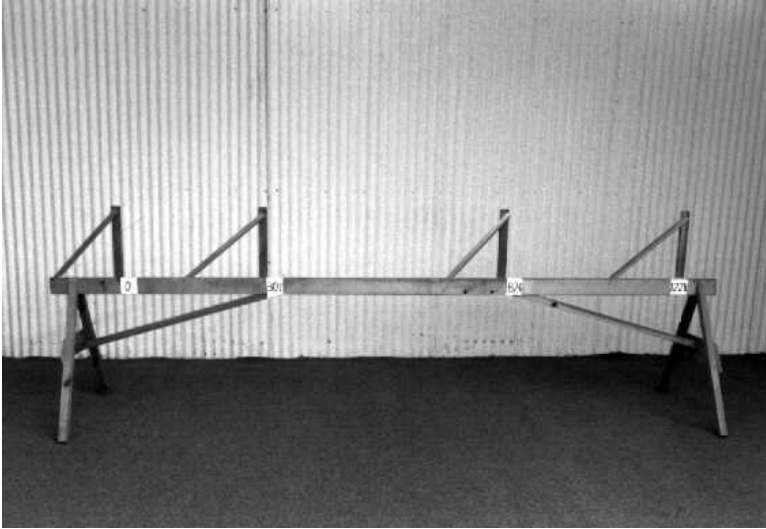


Photo #1

Fabricate a 2 x 4 saw horse as pictured and locate 4 upright 1 x 2s at the proper bulkhead spacing distances (see print). Nail each bulkhead casting to the correct 1 x 2, taking care to insure that they are all located on a telescoping center line. A string is shown here anchored at each end which will aid in providing the correct centerline reference.

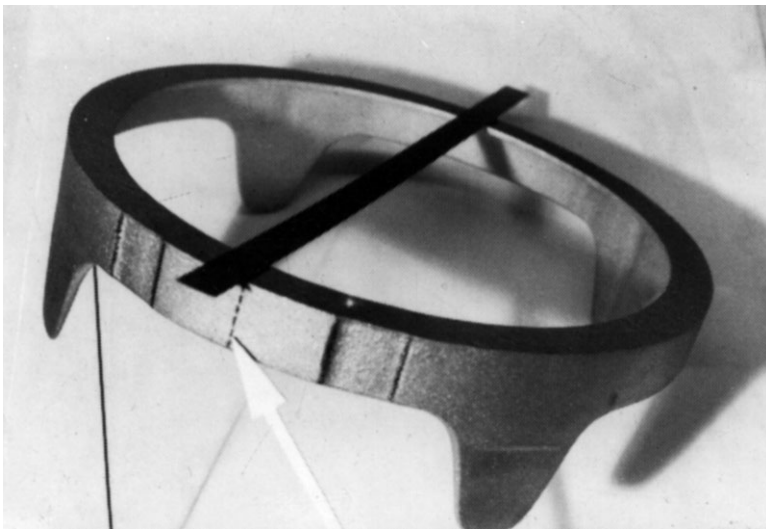


Photo #2

Locate the vertical centerline on all 4 tail boom castings. Each casting is marked top for easy reference. All 4 castings are recessed at the bottom where the two tunnel stringers fit. Mark the centerline halfway between these recesses on each casting; this will maintain a uniform relationship between them. Check the recess in the casting for stringer clearance and file if necessary.

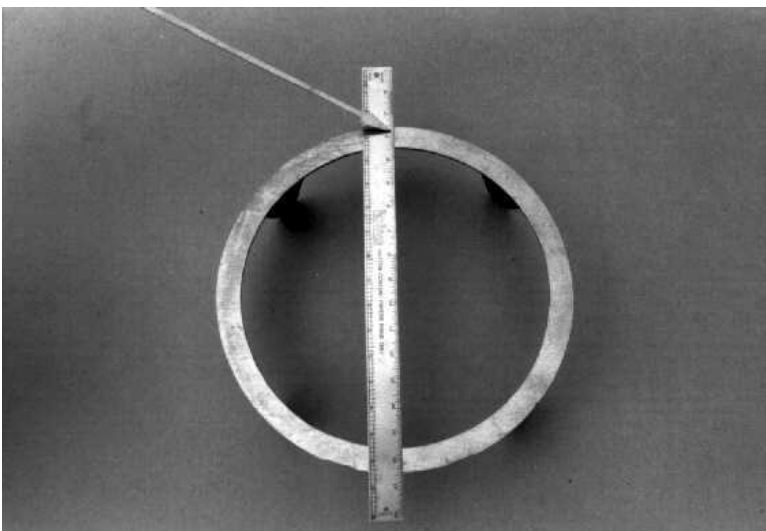


Photo #3

Locate and mark a hole on the centerline to hold the casting on the fixture.

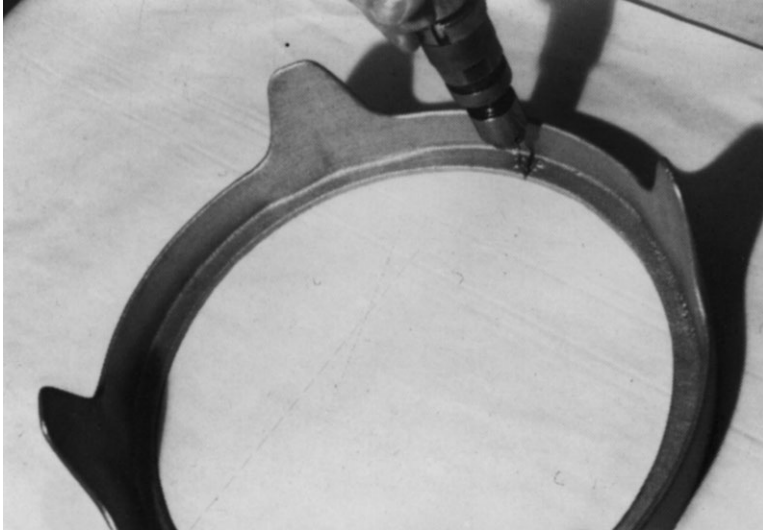


Photo #4

Drill a hole located on this centerline in the top and bottom of each casting to have a loose fit on the nail.



Photo #5

Drill the 1/2" diameter hole in #4 bulkhead casting. See print for positioning.

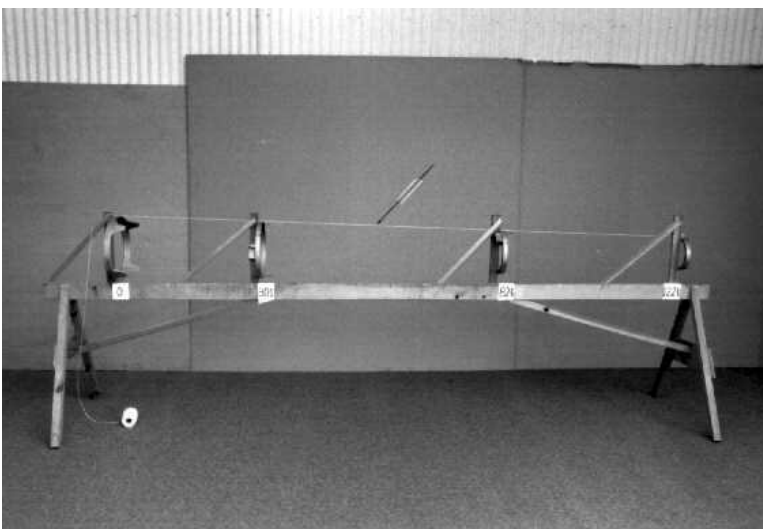


Photo #6

Mount #1 bulkhead casting and #4 bulkhead casting on the fixture. Run a string over the top of #1 and #4 bulkheads. Mount #2 and #3 bulkheads so the top touches the string.

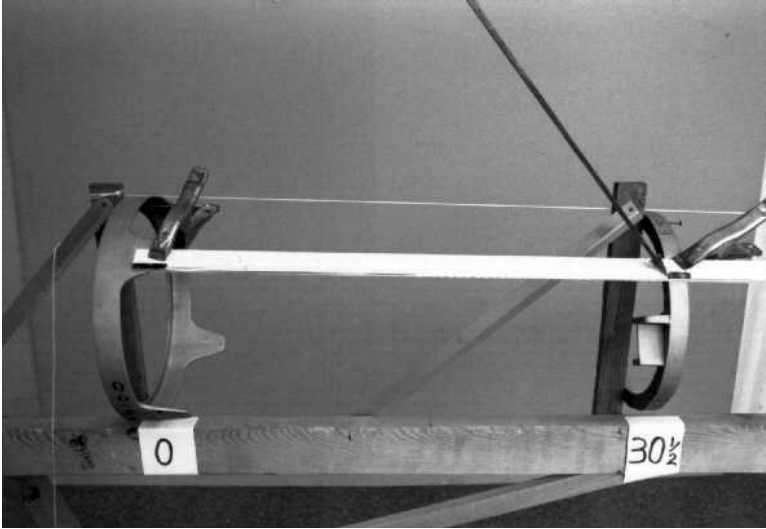


Photo #7

Clamp a stringer in position on the bulkheads and mark areas of stringer that need to be removed.

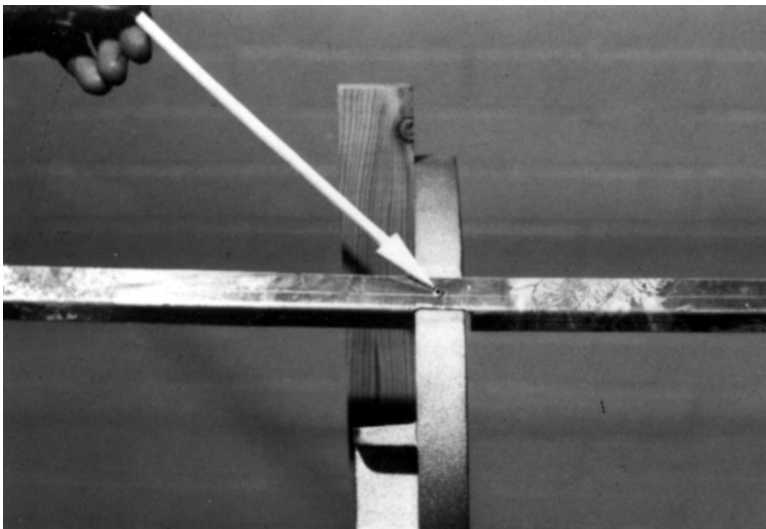


Photo #8

Remove the stringer and cut out marked areas. Clean up the mating surfaces with a file if there is any unevenness. Make sure that after drilling all chips are removed prior to installing the pop rivets. Chips left between two mating surfaces can eventually cause cracks which could cause the material to fail. Deburr holes and radius the corners.

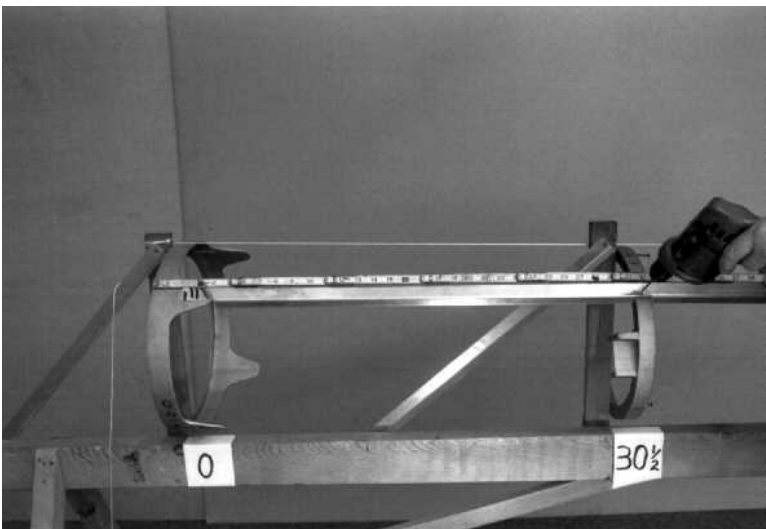


Photo #9

Using a ruler, measure from the front edge of the #1 bulkhead to the front edge of the #2 bulkhead. It should be 30-1/2". If you do this on all six stringers, the front of the bulkheads will be parallel. Drill and cleco together.

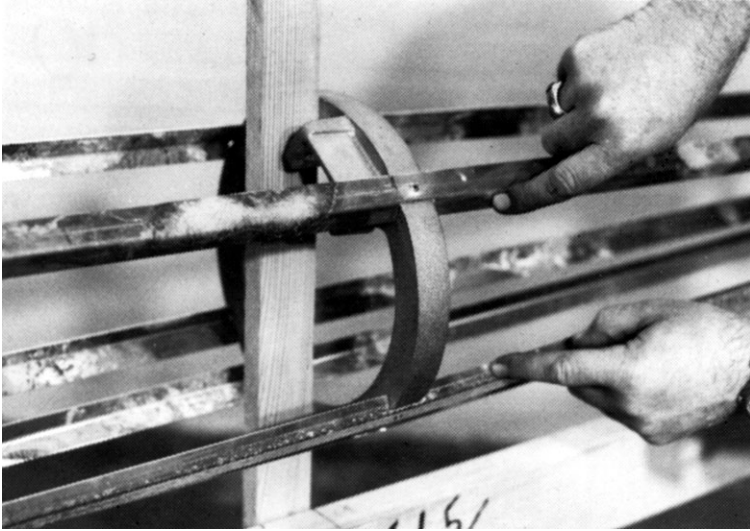


Photo #10

Proper orientation of the stringers is shown here. The short sides should face each other.



Photo #11

The 2 tunnel stringers should be installed so that the short sides face upward (stringers 1 and 6).

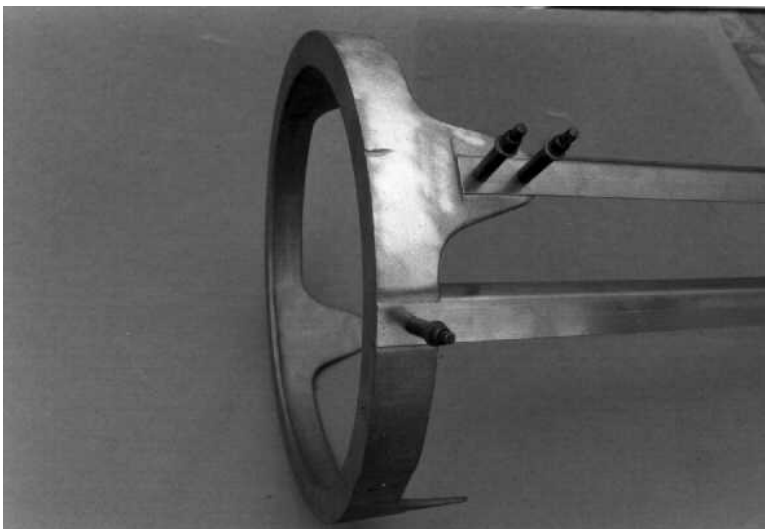


Photo #12

The four stringers on the ears of the #1 bulkhead do not go to the front edge of the bulkhead. The two tunnel stringers do go to the front edge.

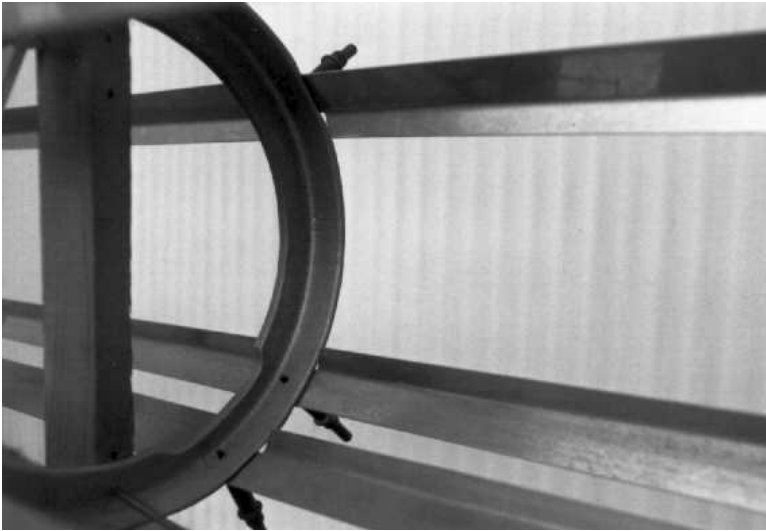


Photo #13

Another view of stringers.

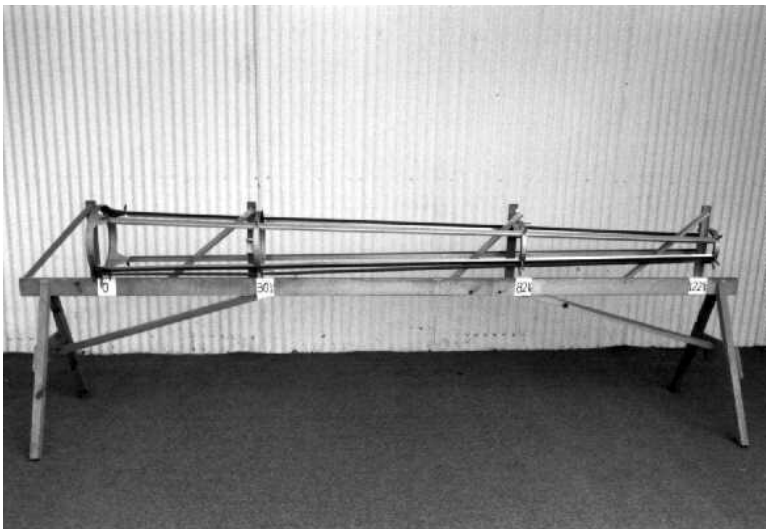


Photo #14

Bulkhead and stringers clecoed together on the fixture. Remove and deburr the stringers and the bulkheads, then pop rivet them together.



Photo #15

Use a round pipe or wooden handle to remove the covering on one side of the tail boom skin. Be careful not to kink the skin.

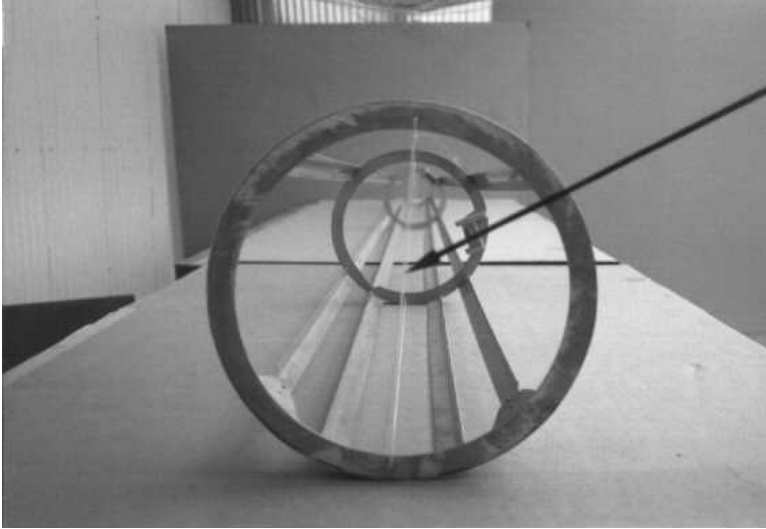


Photo #16

Tie a piece of string between the two nail holes in each of the bulkheads. This will aid in preventing a twist in the tail cone.

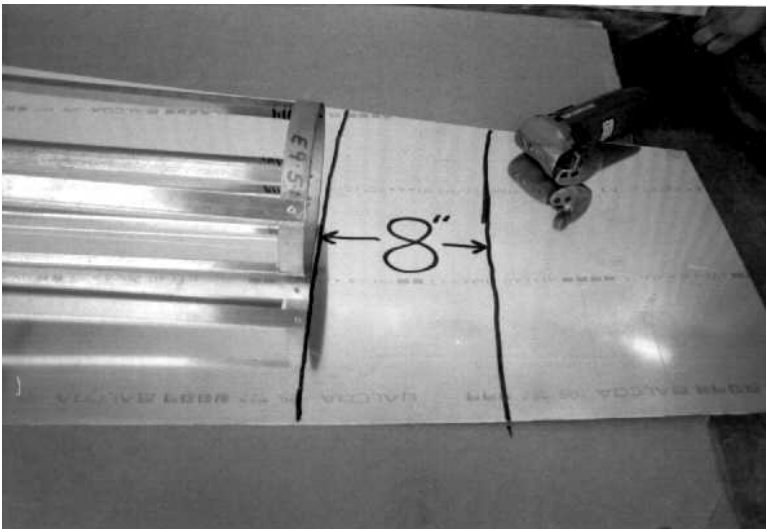


Photo #17

Place the tail cone framework on the tail boom skin and mark each end as you roll it across the skin. Add 8" from the small end, mark and cut.

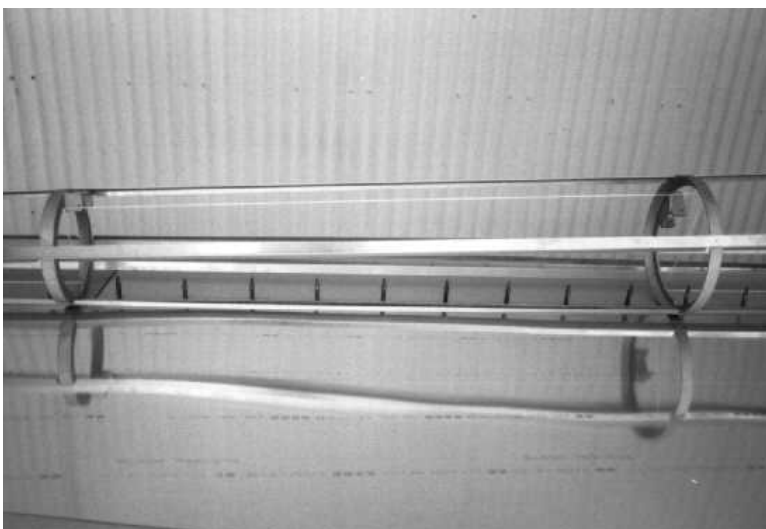


Photo #18

Align the edge of the tail boom skin with the edge of the tunnel stringer. Drill and cleco together. Pop rivet spacing on the tunnel stringers is 2-1/2". Keep them close to the edge so the tunnel covers will cover them.

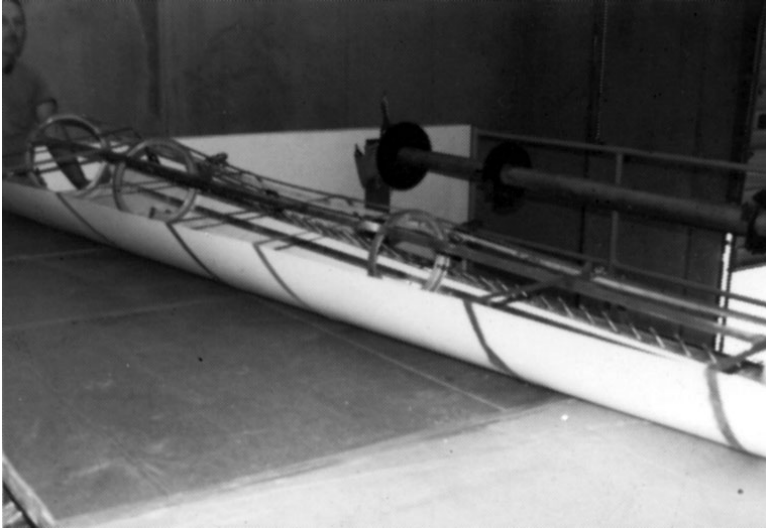


Photo #19

Once the tail boom skin has been clecoed to the tunnel stringer, begin the process of rolling the skin into a cone shape. Use ratchet straps or a heavy string or twine around each casting and between each casting as shown here. Be sure to have someone assist you to ensure that the skin is not kinked during this process. It is very important not to cause a kink in the tail cone as the skin serves as a very highly stressed member of the tail boom structure. A crack could possibly occur at the point at which the skin was kinked.

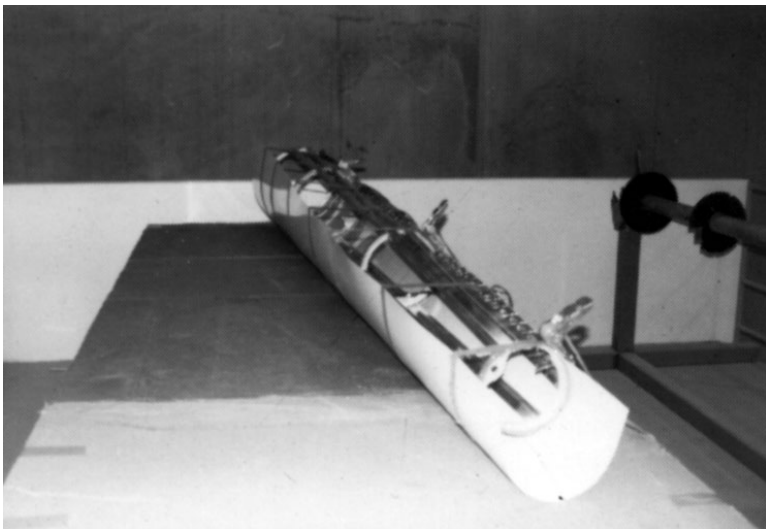


Photo #20

Now begin rolling the skin tightly around the structure. To prevent kinking, take up the tension on the retaining straps in several stages.

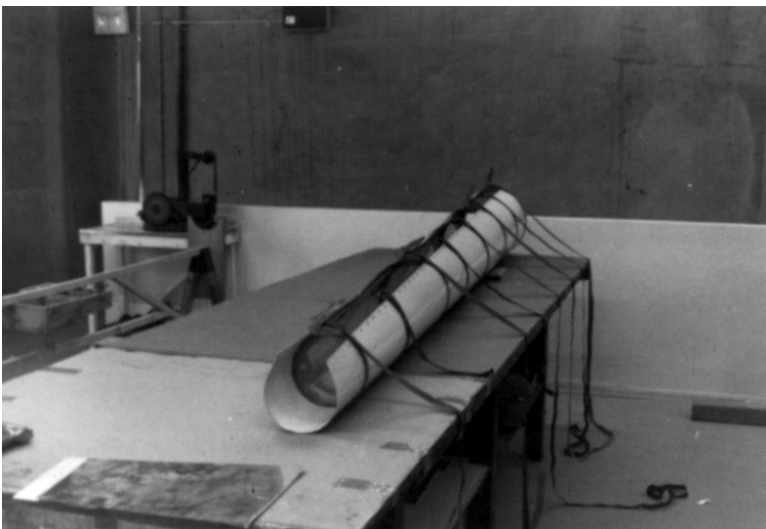


Photo #21

Tighten the straps equally until skin is tight to the framework. It is best to involve some extra hands during this process to ensure success.

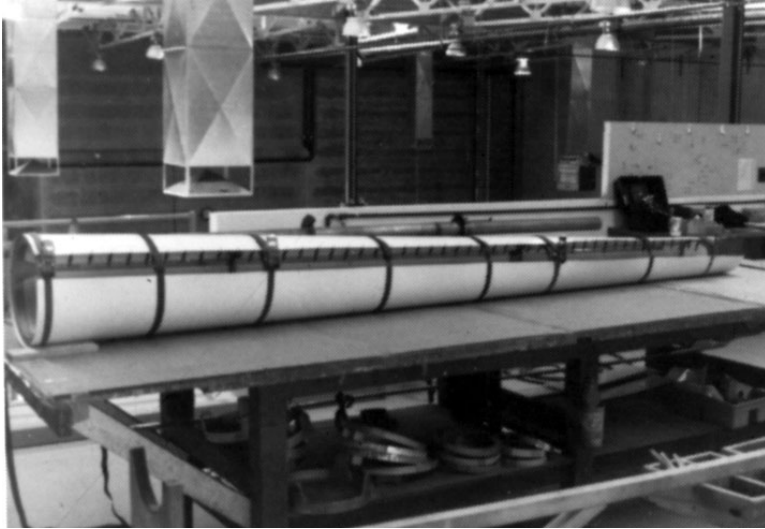


Photo #22

Make sure the skin fits tightly around each bulkhead. There should not be any excess space between the bulkhead and the skin, since after pop riveting a gap would show up as a buckle. A very slight buckle is not critical, but a large buckle such as a 1/16" to 3/32" distance between the skin and the casting would potentially weaken the tail cone structure in that area.

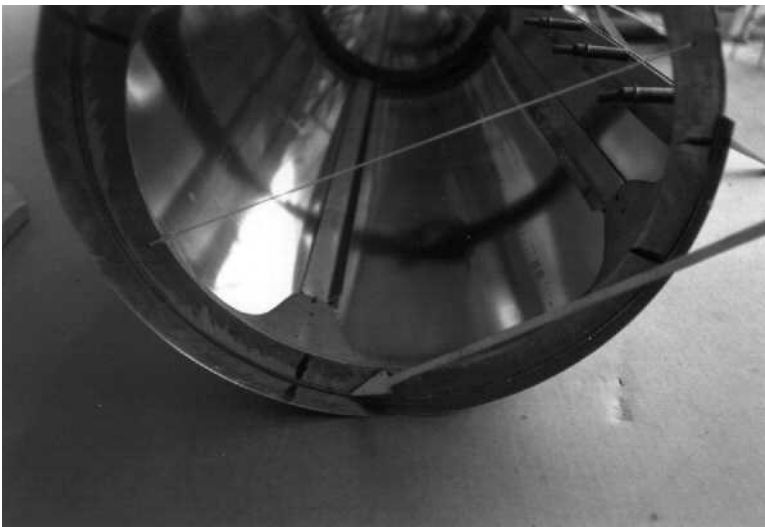


Photo #23

Check for gaps or fit around all bulkheads and for twist of cone. When all strings in the bulkheads are parallel there is no twist. If there is a twist, loosen clamps, rotate the bulkhead and re-tighten clamps.

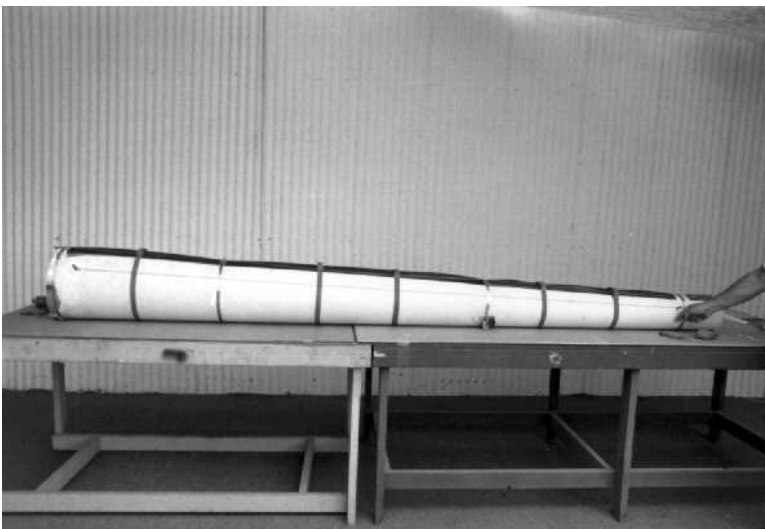
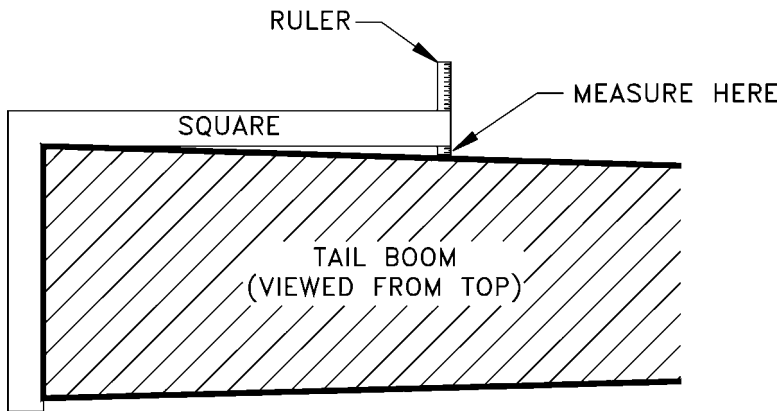
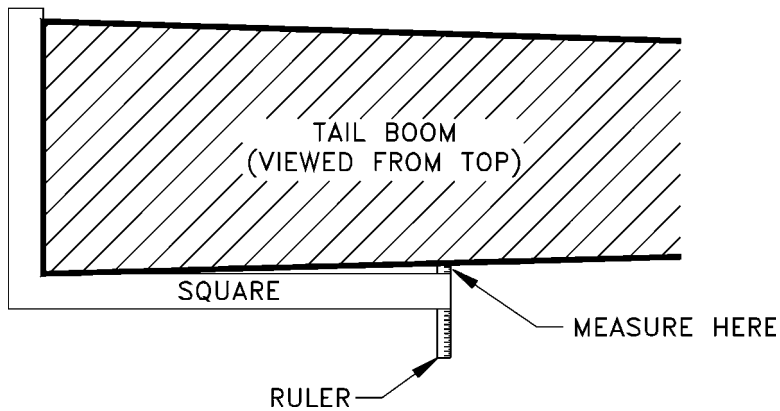


Photo #24

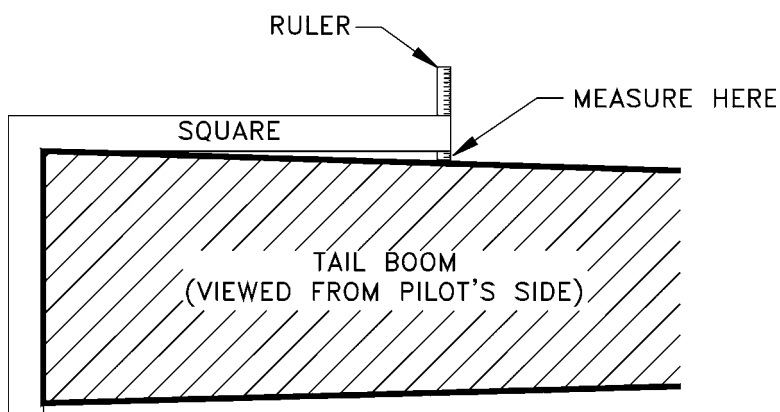
Trim excess tail boom skin at the #1 bulkhead. It should be flush with the front edge. (Note: this photo shows clecos installed along the stringers as in photos 26 and 27; disregard these. The alignment check on the next page must be performed satisfactorily before this is done.)



To ensure that the tail boom has been rolled correctly, hold a large framing square at the first bulkhead, level horizontally. Measure the distance from the end of the square to the passenger side of the tail boom as shown in the illustration.



Next, hold the square to the pilot's side of the tail boom and measure the distance again. Compare this distance to the first measurement. They should be the same within 1/16".



Measure once again, this time holding the square vertically and measuring to the top of the tail boom. This measurement should be within 1/16" of the other two. This procedure will ensure that the centerline of the tail boom is 90 degrees to the face of the bulkheads. If the measurements are not within 1/16", loosen the straps and shift the bulkheads backwards or forwards as necessary to achieve squareness.

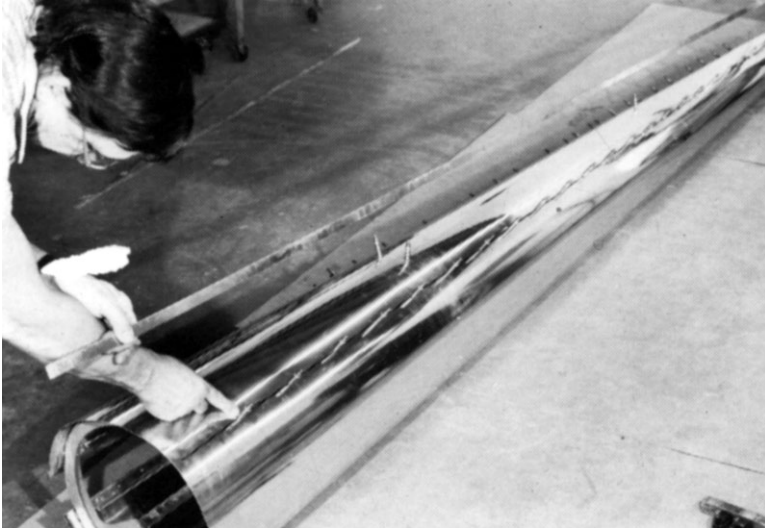


Photo #25

Locate, drill, and install a cleco in each end of the stringers.

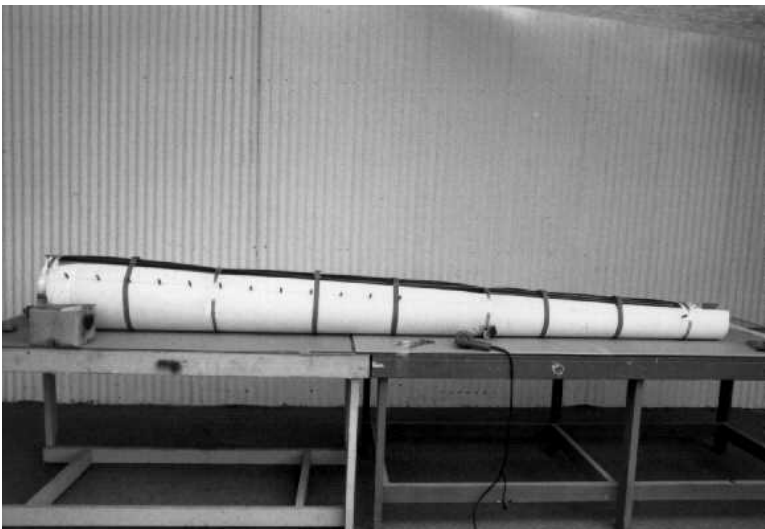


Photo #26



Photo #27

Use a straight edge and a grease pencil or a chalk line to mark the stringer positioning prior to drilling the holes for stringers 2, 3, and 4. It will be necessary to hold the stringer against the skin from the inside while drilling to prevent pushing the stringer away from the drill after the drill penetrates through the skin.

Locate, drill and install cleco on the chalk line spaced per print E09-2000. (2-1/2" apart on tunnel stringers and 5" on all other stringers.)



Photo #28

Continue drilling and clecoing the remaining holes for the rivets which fasten the skin to the bulkheads. (Refer to print E09-2000 for the rivet pattern for the first bulkhead.) Drill and cleco in the same direction around each ring. This will keep gaps between the skin and bulkheads to a minimum. As each hole is drilled, install a cleco (from the inside) to secure it.

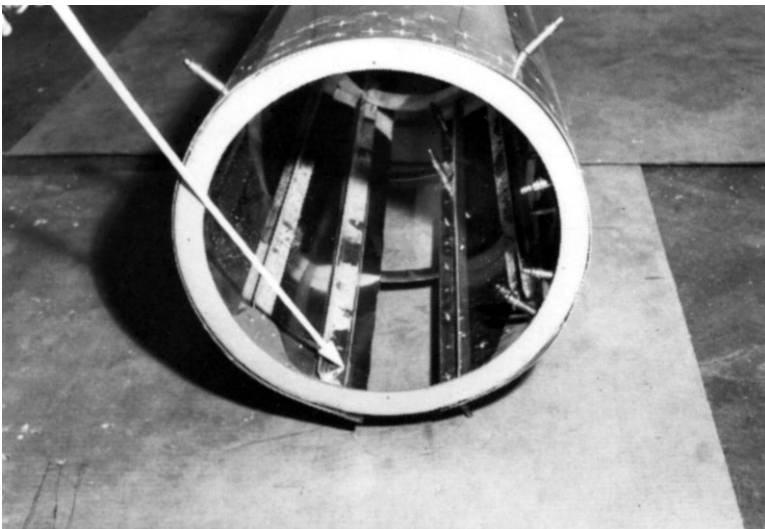


Photo #29

Use a felt pen or grease pencil and mark the skin inside even with the tunnel stringer. The excess is to be trimmed off when the skin is removed.



Photo #30

When all of the pop rivet holes have been drilled in the bulkhead stringers, remove the cleco and the skin. Be careful not to cause a kink, just as on assembly. Brush away all chips and deburr all of the pop rivet holes with a deburring tool or a 1/4" drill bit. Deburr by hand only, do not use an electric drill. Be careful not to chamfer the holes, merely remove the burrs. After deburring, reassemble the skin to the structure using a cleco in every other hole to hold alignment. Again, use caution when coiling the skin over the structure to prevent it from kinking. Final pop rivet in place, installing pop rivets in the empty holes. Then remove the cleco and install the remaining rivets. Perform this operation on a cloth or a clean sheet of cardboard to keep from scratching the tail cone skin exterior.



Photo #31

Correct location of the different lengths of pop rivets used to attach the skin to the stringers and bulkheads:
 1/8" x 1/2" in #1 bulkhead,
 1/8" x 1/4" in #2, #3, #4 bulkheads,
 1/8" x 1/8" in stringers.



Photo #32

Using a large diameter pipe, curve the tunnel covers to fit the tail boom.

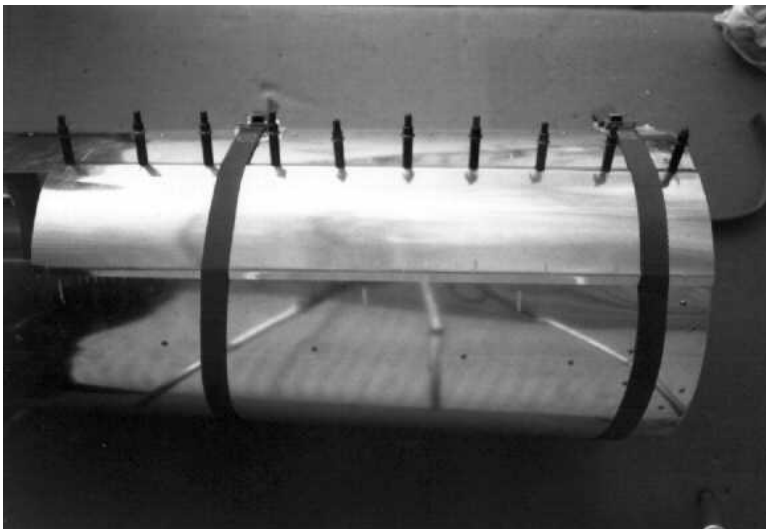


Photo #33

Locate, drill, and install cleco on one edge of the tunnel cover to the tunnel stringer. These rivets should offset the rivets in the tunnel stringers.



Photo #34

Locate, drill and install cleco on the other edge of the tunnel cover. Check the distance between the tunnel stringers. It must remain the same from the #1 bulkhead to the #4 bulkhead.