

# GLASTAR SERVICE BULLETIN 14

## MANDATORY



**Note** This is Revision B. It supersedes Revision A of this bulletin.

**Subject:** Aft Fuselage Reinforcement and Horizontal Stabilizer Angle of Incidence


**Applicability:** All GlaStar kits shipped prior to the publication of *Assembly Manual* Revision C.

**Discussion:** Early operational experience with the first customer-built GlaStars revealed the need for additional torsional stiffness in the aft fuselage and pointed out an error in the procedures prescribed in the *Assembly Manual* for establishing the proper angle of incidence for the horizontal stabilizer. The required stiffness will be provided by reinforcing Bulkhead E and by installing an aluminum shearweb between Bulkheads D and E similar to the one already installed between Bulkheads C and D. In the course of reinforcing Bulkhead E, the aft stabilizer attach bracket will be repositioned, correcting the angle of incidence as required.

**Required Action:** Reinforcement of the bulkhead, installation of the shearweb and resetting the stabilizer angle of incidence are all essential for safe long-term operation, and thus these changes are **mandatory within the next 25 hours of operation** for GlaStars already in service and **mandatory before first flight** for those still under construction. The necessary materials for accomplishing these modifications will be provided free of charge as detailed below.

### ***Step 1: Prepare Bulkhead E for Reinforcement***

To increase the stiffness provided to the aft fuselage by Bulkhead E, the outer edges of the bulkhead where it is bonded to the fuselage shells must be changed from foam-core construction to a solid fiberglass design. In addition, the entire area in the upper half of the bulkhead where the aft stabilizer attach bracket is bolted must be changed to all-glass construction. The best method for achieving this depends on whether you have

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already installed Bulkhead E according to the instructions in the *Assembly Manual*. Follow the instructions below that are appropriate to your stage of construction. Instructions common to all GlaStars continue on Page 4.

**IF YOU HAVE ALREADY INSTALLED BULKHEAD E:**

Figure 1 shows the new bulkhead design. The required modification consists, first, of grinding away the laminates and the foam core on the **forward** side of the bulkhead, leaving a **1"**-wide band around the perimeter of the bulkhead in which only the **aft** laminates of the original bulkhead remain. Across the top of the bulkhead, this band should be extended downward a total of about **2-1/2"**, as shown. Bevel the remaining foam core to approximately **30°** all around. A rotary file in a die grinder is probably the best tool for this job, but take care not to damage the laminates on the aft face of the bulkhead.

 **Note** Do **not** remove the laminates on the forward face of the remaining foam core.

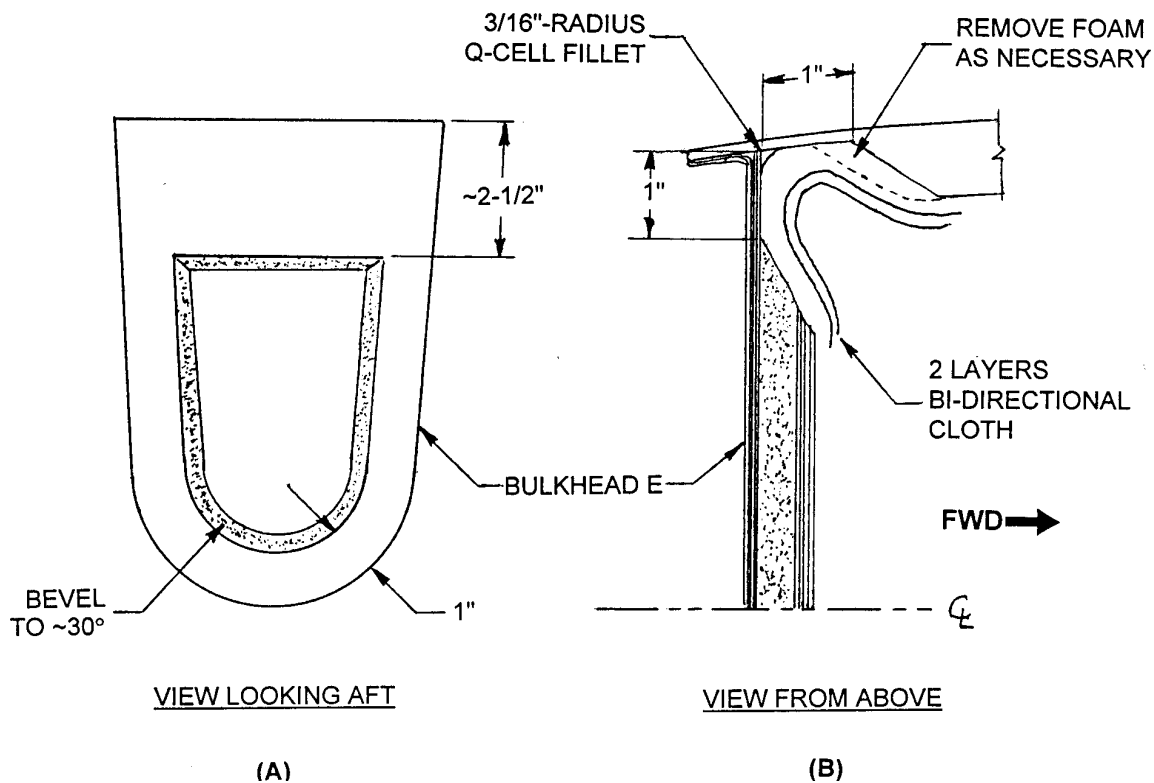


Figure 1: Bulkhead E Modification (Bulkhead Already in Place)

**IF YOU HAVE NOT YET INSTALLED BULKHEAD E:**

If you haven't yet installed Bulkhead E, you will find it easier to cut away the foam and forward laminates first and then install the bulkhead. Initially, lay up the bulkhead just as instructed in Step 37 of *Manual "SECTION VIII: FUSELAGE ASSEMBLY"*—lamine two layers of bi-directional cloth on either side of the 3/16" foam sheet and bandsaw the bulkhead to shape using the supplied template. Then, as shown in Figure 2, grind away the laminates and the foam core on one side of the bulkhead, leaving a 1"-wide band around the perimeter of the bulkhead in which only the laminates on the other side of the original bulkhead remain. Across the top of the bulkhead, this band should be extended downward a total of about 2-1/2", as shown. Bevel the remaining foam core to approximately 30° all around. A rotary file in a die grinder is probably the best tool for this job, but take care not to damage the laminates on the aft face of the bulkhead.



**Note** Do **not** remove the laminates on the forward face of the remaining foam core.

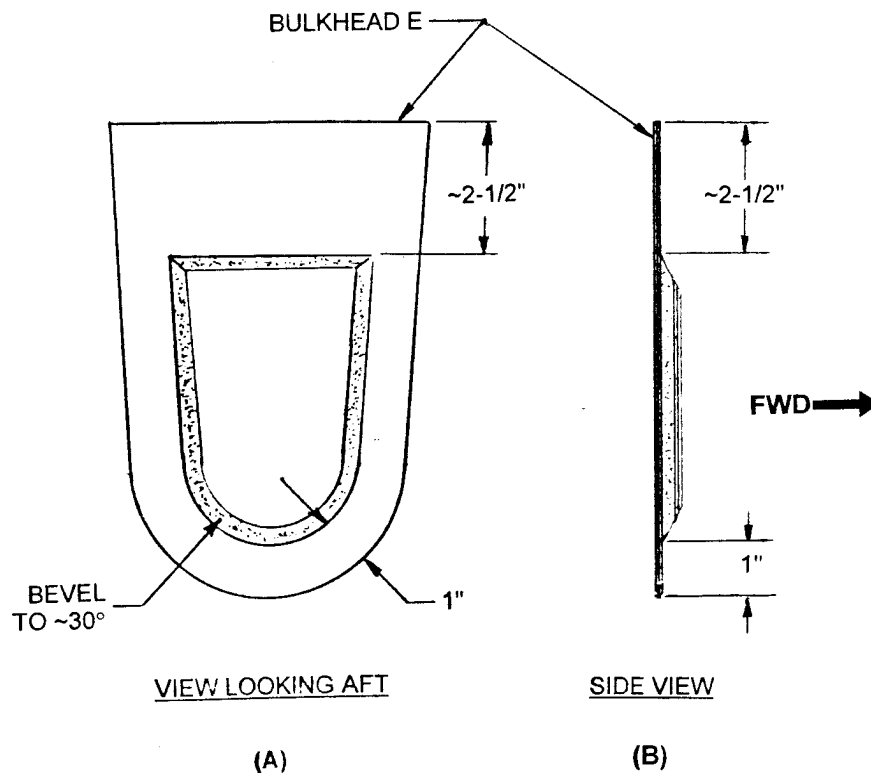


Figure 2: Bulkhead E Modification (Bulkhead Not in Place)

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When it comes time to install Bulkhead E in the fuselage, note that the face of the bulkhead with the foam core is the **forward** face. To install the bulkhead, follow the instructions given in Steps 79 and 80 of *Manual "SECTION VIII: FUSELAGE ASSEMBLY,"* with the following exceptions:

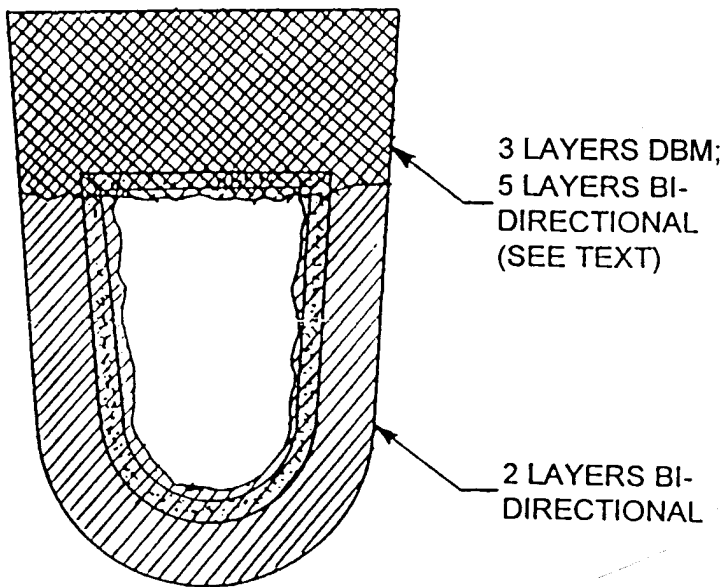
- A) In Step 79 and in Figure 106, the **3.6"** dimension should be **3.45"**.
- B) In Step 80, apply the Q-cell fillet and the two layers of bi-directional cloth **only** to the **aft** face of the bulkhead



**Note** The following instructions apply to all GlaStars, regardless of whether Bulkhead E had already been installed or has just been installed.

The next step is to bond the forward face of the bulkhead to the fuselage shells. The goal here, as shown in Figure 1b, is to have a **1"**-wide foam-less band on the fuselage as well as on Bulkhead E so that the bonding laminates go from solid glass to solid glass. It may be necessary to grind away a bit of the foam core on the sides of the fuselage shells in order to achieve this, but this depends on precisely where your Bulkhead E is located. Check this out and, if necessary, grind away and bevel the fuselage foam core as shown in Figure 1b.

Next, as shown in Figure 1b, apply a **3/16"**-radius Q-cell fillet around the perimeter of the bulkhead on the forward side. Then cut **3"**-wide strips of bi-directional cloth on the **45°** bias and apply two strips to the junction between Bulkhead E and the fuselage **below** the **2-1/2"**-wide solid glass band across the top of the bulkhead. These strips should lap equally onto the bulkhead and the fuselage shell, and because of their width, should lap up onto the foam-core portion of both parts, as shown in Figure 1b.



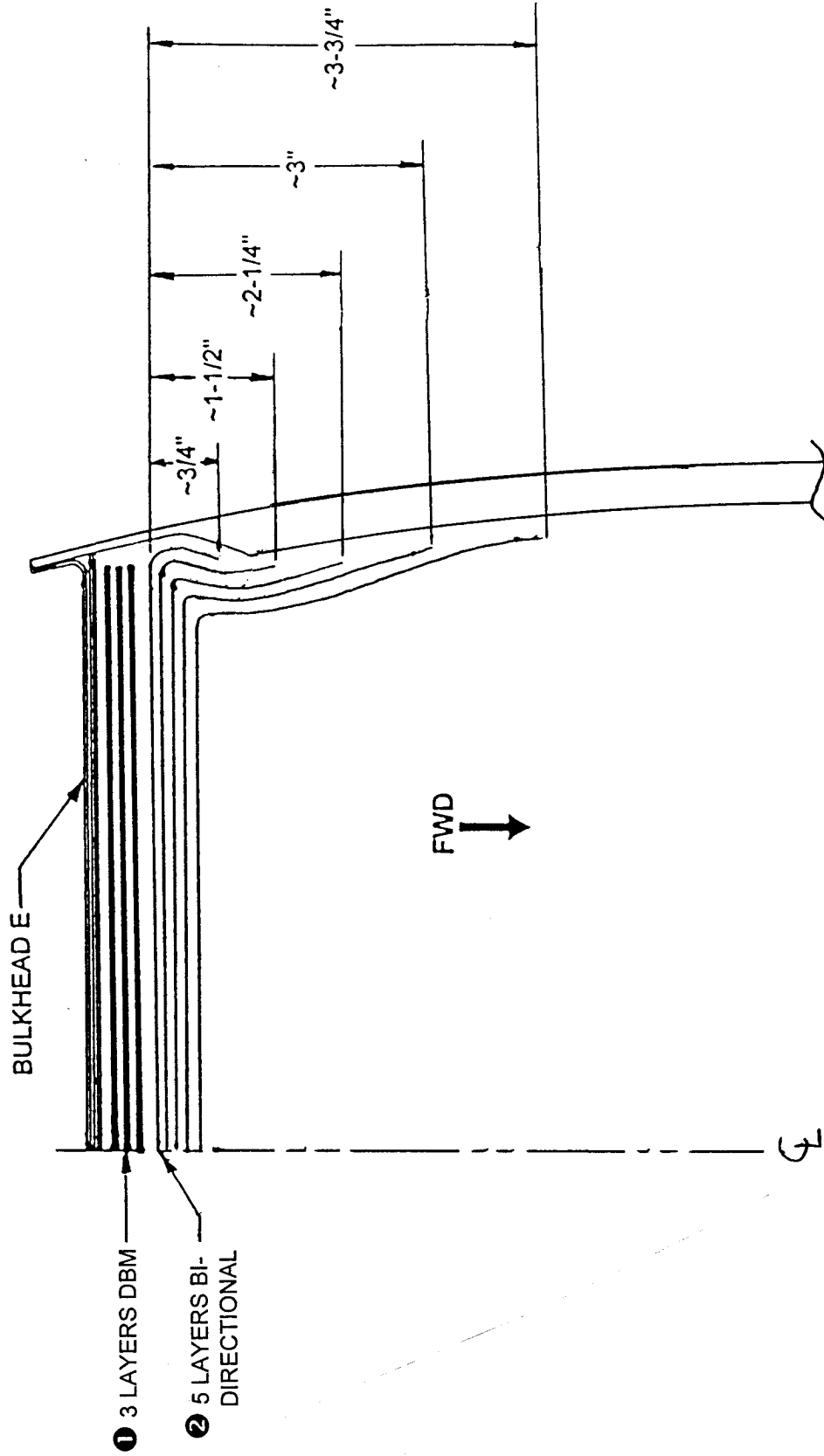
VIEW LOOKING AFT

**Figure 3: Bulkhead E Forward Laminates**

***Step 2: Apply Reinforcement Laminates to Bulkhead E***

Figure 4 illustrates the schedule of laminates to be applied to the forward face of Bulkhead E from the foam core upward to the top of the bulkhead. These layers can all be applied in a single laminating session, or you can let the resin cure between layers or groups of layers at your discretion. All told, the laminates will bring the thickness of the solid fiberglass upper half of the bulkhead to approximately **1/4"**.

Note that the layers of DBM cloth called out in Figure 4 cover the upper portion of the bulkhead but do **not** lap over onto the fuselage shells. By contrast, the layers of bi-directional cloth do lap over, and each succeeding layer of bi-directional cloth laps over **3/4" further** than the preceding layer. Also, the DBM cloth should simply butt up against the beveled foam core that remains on the forward face of the bulkhead, whereas the bi-directional cloth should lap downward about **1"** onto the foam core. All the bi-directional cloth should be cut on the 45° bias.



**Figure 4: Laminating Schedule for Reinforcing the Upper Portion of Bulkhead E**

### ***Step 3: Drill the Aft Stabilizer Attach Bolt Holes and Install the Nutplates***

The original dimension given in Steps 79 and 81 of the *Manual* for shimming the horizontal stabilizer to the proper angle of incidence set the angle at approximately 2.2° nose down. This was in error; original flight testing of the GlaStar prototype indicated that the angle should optimally be set between 1.25° and 1.5° nose down. The best procedure for achieving this depend on whether you have already set your stabilizer and/or your stabilizer strakes. Follow the instructions below that are appropriate to your stage of construction. Instructions common to all GlaStars continue on Page 9.

#### **IF YOU HAVE *NOT* DRILLED THE AFT STABILIZER ATTACH BRACKET BOLT HOLES:**

Simply follow the instructions in Step 81 of *Manual* "SECTION VIII: FUSELAGE ASSEMBLY," **with the following exceptions:**


- A) Shim the stabilizer to a height of **3.45"** above the waterline, rather than **3.6"** as the text indicates.
- B) After you have shimmed the stabilizer, but before drilling, use a digital level to **confirm** that the angle of incidence of the stabilizer is between **1.25°** and **1.5° nose down**. Check this at both ends of the stabilizer by holding the level on the chord line of the stabilizer—i.e., on the line that bisects the airfoil shape. Adjust the shim thickness if necessary to achieve an angle of incidence in this range, and then drill as instructed in Step 81.

#### **IF YOU *HAVE* DRILLED THE AFT STABILIZER ATTACH BRACKET BOLT HOLES:**

The four bolts holes you drilled for the aft stabilizer attach bracket will still exist in the remaining aft laminates of the original Bulkhead E. However, the process of apply the extra laminates on the forward side of the bulkhead will have filled the holes sufficiently that it's unnecessary to take any further steps to fill them before drilling new holes.

#### **If you have *not* installed the stabilizer strakes:**

Simply proceed as if you had never drilled the aft stabilizer attach bracket bolt holes by following the instructions in **A)** and **B)** above.

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## If you *have* installed the stabilizer strakes:

Depending on how tightly you positioned the strakes around the leading edge of the stabilizer, you **may** have to move the **forward** stabilizer attach bracket as well as the aft. The reason for this is that as you lower the trailing edge of the stabilizer to achieve the desired incidence angle, the stabilizer will pivot around the forward attach bracket bushings, causing the leading edge of the stabilizer to raise up. The stabilizer flanges of the strakes may interfere with this movement.

Begin by trying to shim the stabilizer to a new height of **3.45"** above the waterline as instructed in **A)** above. If the stabilizer sits on the shims at this height naturally, without requiring any pressure from above or bending the stabilizer flanges of the strakes, then you don't have a problem; you can go ahead and follow the instructions in **B)** above for confirming the angle of incidence and then drilling the holes.

If, on the other hand, the leading edge of the stabilizer binds against the strakes when you try to lower the trailing edge the prescribed .15", then you'll have to relocate the forward attach bracket as well as the aft. In this case, you will in essence be pivoting the stabilizer around its leading edge rather than around the forward attach bracket bushings.

If you determine that this is necessary, unbolt the forward stabilizer attach bracket from Bulkhead D, clean the eight bolt holes thoroughly with acetone and fill them with a thick resin/mill fiber mixture. Then relocate the bracket about **1/16"** lower on the bulkhead. This small shift will allow the trailing edge of the stabilizer to pivot the required amount without running into the strake flanges.



**Note** If you move the forward stabilizer attach bracket, the 3.45" shim dimension for the stabilizer trailing edge **will no longer apply**. You will need to rely solely on the digital level readings (described in **B)** above) to establish the positions of the aft stabilizer attach bracket holes. Once again, the target incidence is 1.25°–1.5° down.





**Note** The following instructions apply to all GlaStars, regardless of whether the stabilizer had already been set or has just been set.

As in the original design, the aft stabilizer attach bolts will be secured with F5000-4 floating nutplates on the forward face of Bulkhead E. However, because the bulkhead is now solid fiberglass in this area, blind rivets can no longer be used to secure the nutplates. Instead, you must drill the #40 rivet holes for the nutplates all the way through the bulkhead, countersink these holes on the **aft** face of the bulkhead, and use AN426AD3-7 flush-head rivets to rivet the nutplates in place.

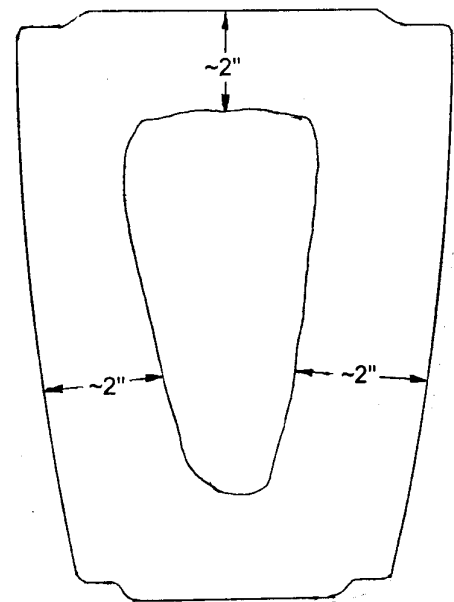
#### ***Step 4: Laminate Attach Flanges for the Aft Inter-Bulkhead Shearweb***

The aluminum shearweb that you'll install between Bulkheads D and E requires attach flanges on both bulkheads and on the fuselage sides. All four flanges will be laminated, as were the side flanges for the forward shearweb between Bulkheads C and D.


Make a cardboard template the shape of the area between Bulkheads D and E and the fuselage sides. Trim it to fit snugly about **3/4"** below the top edges of the fuselage shells and bulkheads. Make relief cutouts in the corners of the template as necessary to clear the forward stabilizer attach bracket bolts and the aft stabilizer attach nutplates.

Transfer the final shape of the template to a scrap piece of .032"–.063" sheet metal or Formica and cut the shape out of that material. Then, as shown in Figure 5, cut a hole in the middle of the piece about **2"** inside the perimeter. This piece will serve as a former against which to laminate the attach flanges.

Using 60–80-grit sandpaper, thoroughly roughen the insides of the fuselage shells, the aft face of Bulkhead D and the forward face of Bulkhead E from the tops down about **2"**. Clean the sanded fiberglass with acetone. Then apply mold-release wax to the entire underside of the former and use hot-melt glue and/or tape to position it between the bulkheads, once again about **3/4"** below the tops of the bulkheads and shells.



**Figure 5: Laminating Former**

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For each of the four sides of the laminating former, cut **two** strips of DBM cloth, each just a bit shorter than the side of the former it's intended for in order to clear the bolts and nutplates in the corners. Laminate these strips against the underside of the former just as you did the side attach flanges for the forward inter-bulkhead shearweb (see *Manual* "SECTION VIII: FUSELAGE ASSEMBLY," Step 73).



**Note** It is **not** necessary to apply a Q-cell radius between the fiberglass and the former as Step 73 suggests. This is extremely difficult to accomplish working upside-down, and is unnecessary from a structural standpoint.

When the flanges have cured, remove (but do not discard) the former. Trim the flanges to an even width of **1"** and slightly round the corners.

### Step 5: Cut and Install the Aft Inter-Bulkhead Shearweb

Using the laminating former as a pattern, cut the actual aft inter-bulkhead shearweb from .063" 6061-T6 aluminum sheet. Do **not** cut out the center of the shearweb, however. Use files and/or a belt sander to reduce the outside dimensions of the shearweb by **1/16"–1/8"** all the way around so that the shearweb will slip easily into

place between the fuselage shells and Bulkheads D and E.

Fifteen AN3-4A bolts will be used to secure the shearweb to the underlying attach flanges. Figure 6 shows the suggested layout of these holes. Mark the locations on the shearweb, position it and drill through the shearweb and the flanges with a **#10** bit, Clecoing as you go.

Thoroughly deburr the shearweb and corrosion-proof it as you see fit.

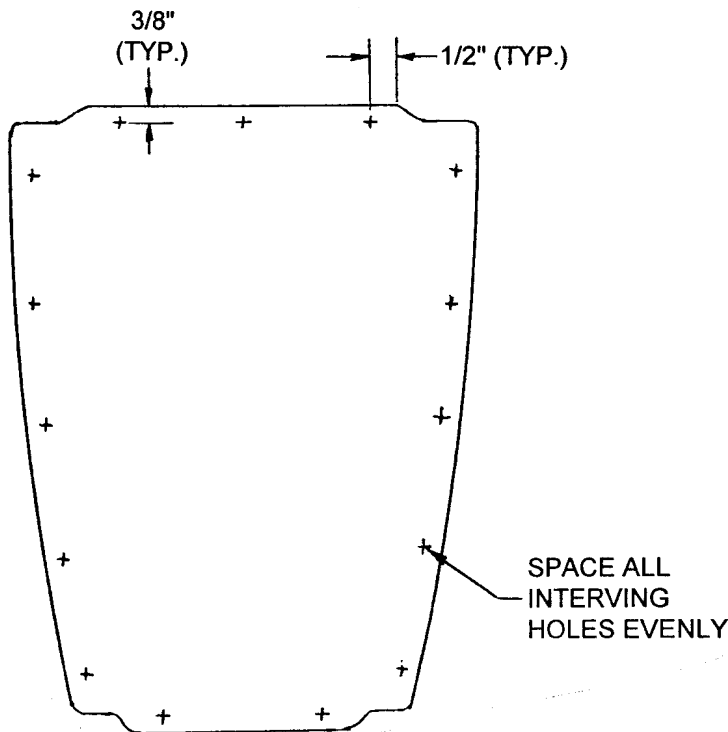


Figure 6: Shearweb Bolt Hole Pattern

Because there is a large inspection hole in the fuselage bottom between Bulkheads C and D, you were able to use regular nylon self-locking nuts on the bolts securing the forward inter-bulkhead shearweb. For this aft one, however, nutplates are required. Use AN426AD3-4 flush-head rivets to install MF5000-3 floating nutplates under the attach flanges at each hole location.

When you ultimately install the shearweb for flight, use AN960D10 aluminum washers under the bolt heads.

**Required Parts:** The following parts are required to perform these mandatory modifications .

<b>Part Name:</b>	<b>Qty:</b>	<b>Part No.:</b>
DBM cloth, 3" width	8 ft.	027-00002-01
Aluminum sheet, 6061-T6, .063" X 12" X 12"	1	075-01011-01
Bi-directional cloth, 50" width	1 ft.	270-0110-002
Bolt	15	AN3-4A
Flush-head rivet, 3/32"	40	AN426AD3-4
Flush-head rivet, 3/32"	12	AN426AD3-7
Aluminum washer	15	AN960D10
Floating nutplate	15	MF5000-3

These parts will be incorporated into the next revision of the fuselage kit parts list (Revision 04). **If you take delivery of your fuselage kit after the date of Revision 04**, then the parts will be provided as a standard part of that kit. (The parts list revision number and date are given at the top of each page of the parts list in the paperwork accompanying your kit shipment.)

**If you take delivery of your fuselage kit prior to Revision 04**, then the required parts will be shipped to you separately. Because the need for these parts was not anticipated by our Purchasing Department, it will take some time for them to be brought into stock and processed for shipping. We anticipate beginning to process the shipments toward the end of November 1996. Please be assured that we will get the parts to you as quickly as possible.